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Editors
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Professor
Instructional Technology and Distance Education
Nova Southeastern University
Fischler Graduate School of Education and Human Services
North Miami Beach, FL
and
Margaret Crawford
Information Specialist
Mason City Public Schools
Mason City, IA

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Preface

For the twenty-eighth year, the Research and Theory Division of the Association for Educational Communications and Technology (AECT) is sponsoring the publication of these Proceedings. Papers published in this volume were presented at the National AECT Convention in Orlando, FL. A limited quantity of these Proceedings were printed and sold in both hardcopy and electronic versions.copies of both volumes were distributed to Convention attendees on compact disk. Volume #1 will be available on microfiche through the Educational Resources Clearinghouse (ERIC) System.

The Proceedings of AECT's Convention are published in two volumes. Volume #1 contains papers dealing primarily with research and development topics. Papers dealing with instruction and training issues are contained in volume #2 which also contains over 100 papers.

REFEREEING PROCESS: Papers selected for presentation at the AECT Convention and included in these Proceedings were subjected to a reviewing process. All references to authorship were removed from proposals before they were submitted to referees for review. Approximately sixty percent of the manuscripts submitted for consideration were selected for presentation at the convention and for publication in these Proceedings. The papers contained in this document represent some of the most current thinking in educational communications and technology.

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Expository and Discovery Learning Compared: Their Effects on Learning Outcomes of Online Students

Omur Akdemir
Tiffany A. Koszalka
Syracuse University

Abstract

Researchers compared the effects of expository and discovery types of instructional strategies on learning outcomes of adult online students. Statistically no significant results were found between the reported perceived learning outcomes, and effort and involvement of adult online students completing expository and discovery course modules. Implications of this research for online course designers are presented in this paper.

Introduction

Availability of communication technologies has generated growing interests in the use of distance education methods to reach larger student populations. Numerous universities, and school districts have started to offer online courses to meet the growing needs of education in responding to demands for flexible learning environments (Gunawardena & McIsaac, 2004). Online courses provide opportunities for individuals who would otherwise not have opportunities for learning (Deal, 2002). Offering courses on the Internet, however, has brought many challenges for instructors and instructional designers since designing meaningful and effective learning environments on the Internet is a challenging task (Hill, Wiley, Nelson, & Han, 2004).

Educators and instructional designers use different types of instructional strategies to help learners acquire knowledge in a most efficient and effective way. By definition, instructional strategies describe the general components of a set of instructional materials and a set of decision that result in plan, method, or series of activities aimed at obtaining a specific goal (Dick & Carey, 1978; Witkin et al., 1977). Implementation of online courses should be achieved through careful analysis of instructional methods used in online courses (McCarron, 2000). "If an instructional experience or environment does not include the instructional strategies required for the acquisition of the desired knowledge or skill, then effective, efficient, and appealing learning of the desired outcome will not occur" (Merrill, Drake, & Lacy, 1996).

The primary purpose of this exploratory study was to investigate effects of expository and discovery types of instructional strategies on learning outcomes for online students. Two research questions and accompanying experimental hypotheses tested in this study were:

1. Is there a difference between the reported perceived learning outcome of adult students completing expository online course module and the reported perceived learning outcome of adult students completing discovery online course module?

   Ho_1: Reported perceived learning outcomes of adult students completing the online course module which used expository instructional strategies are the same as reported perceived learning outcomes of adult students completing the online course module, which used discovery instructional strategies.

   Ha_1: Reported perceived learning outcomes of adult students completing the online course module which used expository instructional strategies are different from the reported perceived learning outcomes of adult students completing the online course module, which used discovery instructional strategies.

2. Is there a difference between the reported effort and involvement measure of adult students completing expository online course module and the reported effort and involvement measure of adult students completing discovery online course module?

   Ho_2: Reported effort and involvement measure of adult students completing the online course module which used expository instructional strategies are the same as reported effort and involvement measure of adult students completing the online course module, which used discovery instructional strategies.

   Ha_2: Reported effort and involvement measure of adult students completing the online course module which used expository instructional strategies are different from the reported effort and involvement

measure of adult students completing the online course module, which used discovery instructional strategies.

Investigating the effects of these instructional strategies in online courses is important to identify effective instructional strategies for adult students who learn online.

When expository types of instructional strategies are used, instruction usually begins with the introduction of the concept. Then the structure of the material is presented in order to guide the students. Afterwards, students are given a general orientation to the material, a conceptual framework, and some key ideas to work with (Andrews, 1984). Information is presented within a context. Following the presentation of the information, students are asked to apply the general concepts in organizing the information.

As oppose to the expository learning, the basic assumption of discovery learning instructional strategies are that students can learn better when they are given opportunity to generate conclusions inductively from ambiguous materials (Andrews, 1984). The advocates of discovery method proclaim that the key for effective learning is to teach individuals how to discover answers themselves. Incorporating scenarios that are realistic in the instruction activates individual's curiosity and increases their motivation. Discovery types of instructional strategies require individuals to make decision and solve problems (Johnson & Aragon, 2003).

Method

Instructional Context

Three graduate courses from the Instructional Technology department of a private university located in the northeastern United States were used in this study. The Instructional Technology department was one of the pioneers in the private university offering graduate level online courses. Online courses had been offered in the Instructional Technology department for years. The professors of the Instructional Technology department had variety of experience designing and offering online courses. Two online course management systems, WebCT and Blackboard, were used to deliver online courses in the department. Using the expository and discovery instructional strategies, identical online course modules were designed for online courses. An experienced instructional designer reviewed developed modules to ensure that they represent the characteristics of two instructional strategies.

Subjects

The study was conducted with thirty-five adult students taking graduate courses from the Instructional Technology department of a private university located in the United States. All participants were twenty-five years old and older. The majority of participating subjects were females. Females constituted 69% of participants, and 31% of participants were males in this study.

Instrument

The online module evaluation form was used to measure the perceived learning outcomes of students, and effort and involvement of adult students. The online module evaluation form was adapted from the Student Instructional Report II (Centra, 1998). The reported test-retest reliability of the instrument to measure perceived learning outcomes of students is ranged from .78 to .93 and the reliability of instrument to measure the effort and involvement of students is .88 (Centra, 1998). A java script was written to ensure that students respond all questions in the form before submitting it. The results of online module evaluation form were then automatically emailed to researchers once students completed it.

Procedure

A convenient sampling was used to select online courses from the Instructional Technology department of a private university. After receiving the Human Subjects Approval to conduct the study, researchers used emails and personal visits to contact the course professors and explained the purpose of the study. Three graduate courses whose professors showed interest and agreed to integrate designed modules in their courses were used to conduct the study.

Adult students from three courses completed the expository and discovery online course modules successively. After each online course module, students completed the online evaluation form to report their perceived learning outcomes, and their effort and involvement. The results of online evaluation form were automatically emailed to researchers. The data of students who gave permission to researchers were used in the study.

Analysis

A statistical analysis package (SPSS release 12) was used to test the experimental hypotheses. All the data received through the emails were ported into the statistical analysis package. Paired sample t-tests were conducted to test the two experimental hypotheses. All statistical analysis reported in this research were conducted with a significant level of .05.

Findings

The first hypothesis stated that reported perceived learning outcomes of adult students completing the online course module which used expository instructional strategies were the same as reported perceived learning outcomes of adult students completing the discovery online course module The result of the paired sample t-test supported this hypothesis. No significant differences were found when adult students' reported perceived learning outcomes were compared in expository and discovery course module. The null hypothesis was not rejected t (34) = -1.78, p> 0.05 (See Table 1). Table 2 presents the descriptive statistics for the perceived learning outcomes of adult students in expository and discovery online course module. The change in mean scores of participants in expository and discovery online course modules is presented in Figure 1.

Table 1. The results of the paired sample t-test for reported perceived learning outcomes of adult students in expository and discovery online course modules

		Paired Differences					T	df	Sig (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair1	Expository-Discovery	-1.54	5.11	.86	-3.3	.21	-1.78	34	.083

Table 2. The descriptive statistics for reported perceived learning outcomes of adult students in expository and discovery online course modules

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Expository	18.85	35	4.54	.76
Discovery	20.4	35	3.28	.55
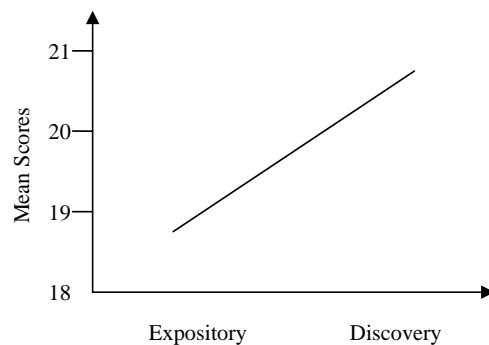
Figure 1. The graph of distribution of participants' mean perceived learning outcome scores by types of instructional strategy

The second hypothesis stated that effort and involvement measures of adult students completing the online course module which used expository instructional strategies were the same as effort and involvement measures of

adult students completing the online course module, which used discovery instructional strategies. The paired sample t-test was run to test the second hypothesis. No significant differences were found when adult students' effort and involvement measure was compared in expository and discovery course module. The null hypothesis was not rejected t (34) = -1.83, p> 0.05 (See Table 3). Table 4 shows the descriptive statistics for the effort and involvement measure of adult students in expository and discovery online course module. Figure 2 presents the change in mean scores of participants in expository and discovery online course modules.

Table 3. The results of the paired sample t-test for reported effort and involvement measure of adult students in expository and discovery online course modules

		Paired Differences					T	df	Sig (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair1	Expository-Discovery	-0.91	2.94	.49	-1.92	.09	-1.83	34	.075

Table 4. The descriptive statistics for reported effort and involvement measure of adult students in expository and discovery online course modules

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Expository	11.14	35	3.03	.51
Discovery	12.05	35	2.35	.39
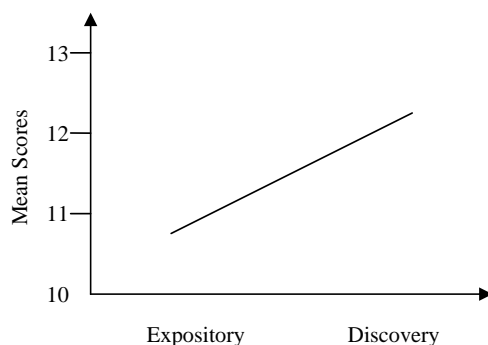
Figure 2. The graph of distribution of participants' mean effort and involvement scores by types of instructional strategy

Conclusion

The effectiveness of different instructional strategies in various settings has been studied by researchers (Andrews, 1984; Hopkins, 2002; MacNeil, 1980). Investigating the effects expository and discovery formats on college students taking face-to-face courses, Andrew (1984) discovered that field independent students outperformed the field dependent students in the discovery format while field dependent students did better than field independent students in expository format. Using undergraduate students as subjects in the face-to-face courses, MacNeil (1980) found no difference when the effects of expository and discovery instructional strategies on the change in learning performance of field dependent and independent subjects were investigated. Findings of these studies in face-to-face courses are contradictive. Comparing the effectiveness of expository and discovery format on computer-based instruction, Hopkins (2002) found no difference between the expository and discovery format for

undergraduate student population. The effects of the expository and discovery types of instructional strategies were investigated on online courses with adult students in this study which also suggests no difference in perceived learning between the different instructional strategies.

The lack of understanding how online environments can be designed to be most effective is problematic for instructors as well as students. This research studied this problem through a focused investigation of the effects of expository and discovery learning on adult online students' perceived learning outcome measure, and their effort and involvement measure. The no statistically significant difference does shed light on instructional design and development issues.

The results of this study suggested that using the expository and discovery types of instructional strategies in online courses did not affect adult students' perceived learning outcome. Both expository and the discovery format seem to foster student learning in the same manner. If similar results can be achieved for the larger adult student population taking online courses, there may be implications for designing instruction for online courses. Since the effects of expository or discovery course modules on adult students' perceived learning outcome were not different, online course instructors and instructional designers are suggested to either use the expository or the discovery types of instructional strategies to design online courses for adult students to provide similar learning benefits. This study also suggests that instructional strategies are not necessarily the most important factor to adults in online courses since no significant differences were found in this study which suggests that instructional designers should focus more on content and rich activities that can appeal to a wide variety of learning.

Future researchers should consider changing the order of instructional course modules since in this study adult online students completed the expository course module first and then they completed the discovery course module. Therefore changing the order of instructional strategies may produce different results. Also testing the effects of these instructional strategies using different content may have different effects on the findings. Moreover, other instructional strategies such as problem-based learning, collaborative learning, and generative instructional strategies should also be examined in similar studies with adult students. Therefore other types of instructional strategies should be tested using different content and ordering effects of each instructional strategy should also be considered in the research design process.

This study is among the few studies conducted to date in online courses with adult students to identify effective instructional strategies for online courses. Results of this study and similar studies will guide the instructional designers in designing effective and appealing online courses. Findings of this study suggested that instructional strategies in online courses may not be a significant factor affecting adult student's learning. Therefore online course instructors and instructional designers should focus on designing instruction where the goal of the instruction is consistent with the strategies used to teach this goal to achieve optimal learning (Merrill, 1999).

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An Experimental Evaluation of Tutorials in Problem Solving (TiPS): A Remedial Mathematics Tutor

Robert K. Atkinson
Arizona State University

Mary Merrill-Lusk
Louisiana State University i

Abstract

Our laboratory conducted an experimental evaluation of Tutorials in Problem Solving (TiPS), a computer environment representing a schema-based approach to training arithmetic and problem solving skills in remedial adult populations. Specifically, this project was designed to accomplish several objectives: (1) document the level of instructional adaptation provided by the TiPS system; (2) provide a basic evaluation of the overall TiPS system; (3) determine the amount of instructional time involved with the use of TiPS system; and (4) determine the affective nature of the TiPS learning experience. According to our evaluation project: (1) TiPS does monitor the learners' performance and adapt instructional delivery to meet their needs; (2) the average posttest score for participants in a TiPS group was significantly higher than their peers in a untreated control group; (3) the average time for completing the Tips computer instruction was 3.84 hours (SD = 0.97) and ranged from 1.83 to 6 hours (excluding test-taking time); and (4) the learners exposed to TiPS reported feeling that the instructional material, including the examples and problems, helped them to understand how to approach and solve word problems and that, overall, the instructional environment was well designed.

The purpose of this project was to conduct an experimental evaluation of TiPS (Tutorials in Problem Solving), a computer environment representing a schema-based approach (e.g., Marshall, 1995) to training arithmetic and problem solving skills in remedial adult populations. Specifically, this project was designed to accomplish several objectives: (1) document the level of instructional adaptation provided by the TiPS system, (2) provide a basic evaluation of the overall TiPS system (3) determine the amount of instructional time involved with the use of TiPS system, and (4) determine the affective nature of the TiPS learning experience.

To accomplish these objectives, this project involved two phases in which rigorous empirical standards were applied during each phase. The initial phase, which focused on addressing the first objective, involved an analytic investigation of how the TiPS system behaves in response to various types of simulated performance. This analytic investigation was based on iterative "user" trials where graduate students in our lab used the TiPS system while adopting the behavior of "users" with a wide-range of ability levels. The second phase of our project addressed the remaining three objectives through the employment of a regression-discontinuity (RD) design, a pretest-posttest program-comparison group strategy where participants are assigned to program or comparison groups solely on the basis of a cutoff score on a pre-program measure (i.e., pretest).

Background

On TiPS, students receive instruction within the context of problem solving scenarios, designed to gradually build their skills and abilities that should enable them to reason about complex real-world problems. The instructional objectives of TiPS instruction include fostering everyday mathematics and problem-solving skills. In particular, these objectives include fostering the development of: (a) arithmetic schemas—conceptual structures shown by cognitive research to underlie human understanding of mathematics; (b) self-monitoring ability—the tendency and ability to be aware of one's own level of understanding and to check one's problem-solving performance to avoid careless errors; (c) supporting beliefs—the maintenance and use of beliefs associated with good problem solving; (d) selective encoding ability—the ability to identify important information and exclude extraneous information from the problem statement or situation; (e) strategic search ability—the ability to recognize the need for carrying out searches for problem information available through common indexed sources; and (f) strategic planning ability—the ability to select and organize schemas into solution steps that achieve an overall conceptualization of a solution to complex problems.

Despite the potential of TiPS to address a wide range of instructional objectives, several controlled field

studies designed to test the pedagogical efficacy of the TiPS learning environment have generated results that are suggestive at best. One field study, which entailed high school students working with TiPS, identified that one important issue related to its effectiveness is the appropriate level of ability for students given TiPS instruction. Students that started with high math ability prior to the TiPS instruction—as evidenced by a high pretest score—did not appear to benefit from the system. On the other hand, there was evidence to suggest that students that struggled with the pretest and indicated that they were either in the middle or bottom third of the math classes they took in high school improved their performance on the posttest instruments. This represents a potential indicator of learning from the TiPS instruction. It is possible that these students derived greater benefit from the TiPS instruction, albeit this could also have been an example of regression towards the mean as well. Another field study conducted in conjunction with the Madison Area Technical College (MATC) adult literacy program did not generate significant gain scores (pretest to posttest differences). However, the results of a post-instruction questionnaire suggested that the participants enjoyed working with the system. In particular, the participants indicated that they liked the system's worked examples, thought the system helped them solve the posttest problems, and would recommend the system to a friend. Against this background, this project was designed to replicate and extend these initial findings.

Technical Approach

As previously mentioned, this project was designed to accomplish several objectives: (1) document the level of instructional adaptation provided by the TiPS system, (2) provide a basic evaluation of the overall TiPS system (3) determine the amount of instructional time involved with the use of TiPS system, and (4) determine the affective nature of the TiPS learning experience. To achieve these objectives, this project involved two phases: Phase 1 focused on addressing the first objective by relying on an analytic investigation of how the TiPS system behaves in response to various types of simulated performance; and Phase 2 addressed the remaining three objectives in the context of a regression-discontinuity (RD) design, a powerful pretest-posttest program-comparison group design that minimizes regression to the mean as a threat to internal validity. Each of these phases is described in detail below.

Phase 1: Analytic Investigation of the Tutor's Behavior

TiPS was designed to tailor itself to the individual learner based on its integrated Bayesian student model, which represents a theoretical model of problem solving knowledge. For instance, it was designed to adjust hints, evaluations scores, and other feedback provided during local problem solving; it adjusts the mastery level communicated to the student; and it may eliminate (indicated by grayed buttons) or add (indicated by active buttons) recommended practice problems. For example, a student who has achieved mastery at a certain level may be moved forward to a new lesson, or a remedial sequence may be suggested for a student that is having trouble.

During Phase 1, we conducted iterative user trials with systematic observations of system performance to help us document the level of instructional adaptation provided by the TiPS system, including verifying network functioning, that is, whether the Bayesian net registers beliefs about student problem solving that are consistent with the intuitive, common sense judgments of human teachers. This process enabled us to examine whether TiPS is doing any significant adaptation of instruction, including how much instructional variation it is actually producing. For instance, we predicted that the student model—if working properly—should catch people who do not need the additive portion of the TiPS instruction and (given adaptive instruction) move them through the curriculum expeditiously. Iterative user trials allowed us also to investigate the extent to which the key instructional decisions— such as which lessons to view—were decided by the software or are, conversely, under the learner's control. This is particularly important given that the nature and amount of learner control programmed into TiPS has not been sufficiently documented.

Sample and Design

To accomplish our experimental goals, we conducted iterative laboratory-based user trials with several graduate students. Essentially, the design consisted of a series of case studies where the students were systematically observed interacting with the TiPS system while adopting the behavior of "users" with a wide-range of ability levels. We acknowledge that the most obvious limitation of relying on these uncontrolled evaluations is the fact that the role of TiPS on performance cannot be isolated unambiguously. However, this was the focus of Phase 2 of our project.

Computer-Based Learning Environment

The TiPS problem-solving interface was designed to help promote the learners' ability to model and reason about story problems (Derry, Wortham, Webb, & Jiang, 1996; Derry, Tookey, Smith, Potts, Wortham, & Michailidi, 1994; http://www.wcer/wisc/edu/tips/) and was built to adapt and extend Marshall's (1995) Story Problem Solver

(SPS) interface. The SPS interface is designed to provide users with a small set of conceptually distinct diagrams for displaying and solving arithmetic problems. This approach represents a natural extension of classic expert/novice studies, which characterized good problem solvers as those possessing many conceptually rich knowledge structures, or "schemas," related to their domain of expertise. Marshall viewed schemas as abstract structures (instantiated either mentally or externally) that: (1) represent fundamental relational concepts within a domain; (2) suggest the existence of different problem classes; (3) suggest procedures associated with problem types; and (4) serve as conceptual building blocks for representing complex problems. The goal of SPS was to help students construct expert math knowledge by having them solve and analyze math story problems employing schematic diagrams representing basic semantic concepts.

The TiPS graphical user interface (GUI) supplies five schematic diagrams designed to serve as conceptual support for problem solving. Similar to SPS, each of the five TiPS core diagrams represents a different basic mathematics schema. The design for the diagrams was based on empirical evidence showing performance differences in problems solvable with the same arithmetic operations, but that have different semantics. The group relation, the comparison type, and change relation form a set of three additive classes found in arithmetic story problems. In addition, in both TiPS and SPS there are multiplicative situation classes as well, represented by restate (linear function) and vary (proportions) diagrams.

TiPS has a series of lessons associated with the goals of learning the five problem types and how to analyze and solve problems with their associated TiPS schemas. The system consists of two sets of lessons: (1) basic schema tool lessons and (2) advanced lessons. In the basic schema tool lessons, there is one instructional unit each for the Change, Group, Compare, Vary and Restate tools. With the exception of the Vary unit, each instructional unit consists of one lesson. There are four lessons associated with the Vary unit (i.e., proportion, rate, percent, and "slice of life problems"). Thus, there are a total of eight lessons that make up the basic schema tool lessons. The advance lessons consist of two lessons, one that involves a set of mixed one-step problems representing the five problem types and another that involves multi-step problems. In the mixed one-step advanced lesson, the practice set requires students to discriminate among all five problem types for tool schema selection. The multi-step advanced lesson focuses on advanced problem solving, including problem solving practice with complex, multi-step problems.

Within these lessons, students study dynamic worked examples that illustrate expert problem solving on TiPS, and they complete practice problems that are similar to the worked examples. The worked examples illustrate desired problem solving performance with didactic audio explanation from a tutor. The worked examples incorporate the schematic diagrams used in the problem-solving interface. Thus, they are designed to illustrate a schema-based approach to problem solving. The lessons also include a set of 6-9 regular practice problems plus up to 4 optional skill building practice problems.

Students receive hints and evaluative feedback designed to help them learn the problem solving skills associated with each lesson. These hints are provided by a local evaluation component of TiPS. The TiPS system also has a global evaluation component. These two components of evaluation are independent yet interrelated. The local evaluation component is concerned with accurate diagnosis and feedback on a particular problem whereas the global evaluation component is concerned with building a picture of overall problem solving competency and behaviors of the student over time. The local evaluation component is provided by the cognitive diagnoser described previously. The heart of the global evaluation component is represented by a Bayesian network. Both the local and the global evaluation components work together. Based on its integrated Bayesian student model, TiPS is capable of adapting the system to tailor its actions in several ways. It can adjust hints, evaluation scores, and other feedback provided during local problem solving; it is capable of adjusting the mastery level communicated to the student; and it may eliminate (indicated by grayed buttons) or add (indicated by active buttons) recommended practice problems.

Procedure

As previously mentioned, the graduate students interacted with the TiPS system while simulating the behavior of users with a wide-range of ability levels and the progress through the system was systematically observed. We started the process simulating students on the extremes of the ability continuum and observing how TiPS adapts its instruction accordingly. For instance, we examined what happens if a "student" performs perfectly—does that student get asked to solve every problem, get rapidly advanced to the "advanced" lessons or not. We also examined what happens if a simulated student makes lots of errors, systematic (on a certain type of problem) or not. We continued this process by introducing simulated users with less extreme ability levels until we documented under what conditions the Bayesian inference network was able to adjust rapidly to the characteristics of whatever student it encounters.

Results

The tutorial program was completed under six different circumstances with a focus on different parameters for the various runs. The first two runs were designed simply to determine how the program reacts to students who work all problems correctly versus students who make continuous errors. The third run focused on discrepancies in scoring, primarily due to mislabeling, entering data in the wrong use of hints. The final two runs were conducted by students and recorded using pcAnywhere software.

Discussion and Conclusions

The results of the first two runs—All Problems Worked Correctly and All Problems Worked Incorrectly—provided clear evidence that the Bayesian Student Model does monitor student performance and respond appropriately by tailoring instruction, as indicated by the significant reduction in the number of required problems for students who work the problems correctly. As previously indicated, TiPS is designed to automatically "gray out" problems at a given level once it has determined that a student has achieved mastery at that level, thereby effectively reducing the required number of problems to work. A comparison of the total number of "Problems to Work" for these two cases shows a decrease of 22 problems (from 80 to 58) for the student working all problems correctly versus no decrease for the student working all problems incorrectly. Therefore, the design feature for graying out problems based upon topic mastery seems to work properly.

The third run—All Problem Worked Correctly but Answers Varied from TiPS Solution—demonstrated how scoring was affected due to a variety of factors, including "improper" tool selection, improper mapping, and failing to label set properly. Basically, we were seeking to identify the impact of submitting answers that appeared superficially (but not conceptually) different than what TiPS expected, such as using a different tool than the one TiPS considered to be the best tool or mapping the sets differently from what TiPS expected. All problems in this run were still set up logically and worked correctly in the sense that the correct answers were obtained. As before, due to the accuracy of the solutions, TiPS decreased the number of problems to work by graying out 19 problems (from 80 to 61). This provided additional evidence that TiPS is capable of recognizing a student's level of mastery and making instructional adaptations accordingly. However, on several occasions, we found that the scoring penalty was sometimes quite harsh (up to 9 out of 10 points deducted) for using a tool other than what TiPS expected, even though that tool might still be considered a logical tool for the problem. On the other hand, the penalty for mapping the set into the "wrong" part of the diagram or for failing to label sets properly in the problem setup was usually minor (e.g., one point). Overall, the system does not appear to penalize the user too dramatically for varying from the "expert" solution in TiPS.

It is, however, noteworthy that some of the Vary Lesson problems in the third run had various "glitches" that appear to make the TiPS scoring particularly unpredictable. For example, proportions set up correctly, but different than the TiPS solution model, were often docked 3 points, even though still worked logically to obtain the correct answer. Other problems had 3 points deducted for not multiplying the answer by 1 or dividing the answer by 1 (which would have no effect on the answer).

The fourth run—All Problems Worked Correctly but Hints Used Excessively—examined how TiPS reacted in terms of scoring and graying out problems when all three levels of hints were repeatedly used to obtain the correct answer (compared to the situation in the first run where all of the answers were correct and no hints were used). Basically, the hint button in TiPS allows a user to solve each problem correctly using a "brainless" approach if he or she wanted to by simply clicking on the button repeatedly in order to obtain "hints" that illustrate how to correctly solve each of the individual problems in the curriculum. Distressingly, when compared to the first run in which no hints were used, both had identical mastery scores (perfect). Moreover, the "graying out" feature of TiPS differed across the first and fourth runs. For the first eight lessons (Change lesson through Vary 4 lesson), TiPS grayed out 8 more problems on the run that used no hints. Then on the ninth and tenth lessons (Advanced 1 and 2), TiPS grayed out both lessons completely for the run using hints while leaving 12 problems (6 in each advanced lesson) to work for the run that didn't use the hints. The final tally, therefore, is deceiving in that it indicates the "brainless approach" use of excessive hints gives a perfect mastery score and requires the least number of overall problems to work. In a worst case scenario, a student could complete the entire tutorial and achieve a perfect score without having read any of the problems and without having learned anything about their solutions.

The last two runs—"Average-to-High" Ability Student and "Average-to-Low" Ability Student—were actual test runs by students. The first student had a stronger background in math than the second and the comparison of the numbers of problems grayed out captures the difference in ability. As with the third run, several instances were discovered where the student worked every aspect of the problem correctly and still had points deducted. Also, we noticed that TiPS appears to have a problem following proper order of operations in problems that involve fractions (1st Student, Vary Lesson 2, and Practice Problem 1).

In sum, on the positive side, certain aspects Bayesian Student Model worked properly. TiPS did consistently adjust the mastery level communicated to the student and eliminated (as indicated by grayed buttons) and added (as indicated by active buttons) recommended problems and practice problems. This analysis also suggested that TiPS was relatively tolerant to solutions that were conceptually accurate but deviated in some superficial way from the "expert" solution presented by TiPS. On the negative side, the most glaring problem is the fact that the rate and level of hint use does not appear to inform the Bayesian Student Model. Instead, a student could use hints to complete the entire tutorial, while along the way be required to solve the least number of overall problems and achieve a perfect score—all without having to cogitate on a single problem.

Phase 2: Laboratory-Based Evaluation of TiPS

This phase is designed to accomplish three of the proposed project's four main objectives, including (1) provide a basic evaluation of the overall TiPS system, (2) determine the amount of instructional time involved with the use of TiPS system, and (3) determine the affective nature of the TiPS learning experience. To accomplish this task, we relied on a RD design, a powerful methodological alternative to quasi-experimental or randomized experiments when conducting evaluations of education programs. According to Braden and Bryant (1990), a RD design is "among the strongest models for testing program efficiency when selection into a program is based on a continuous criterion and random assignment is not possible [and that] other alternatives (e.g., contrasting pretest to posttest 'gain' between selected and excluded group) are susceptible to regression to the mean, attrition, and changes in the interval between selection and outcome testing" (p. 234). We used the RD design to examine whether differences exist between the treatment group (TiPS users) and an untreated comparison group (non-TiPS users).

Sample and Design

The laboratory-based experiment was conducted with adult remedial volunteers drawn from Mississippi State University that appeared to match the achievement and aptitude profile of the Naval recruits who would most likely use the TiPS program. According to the admissions office at Mississippi State University , a land-grant institution with a 71% acceptance rate and where the average composite ACT score falls between 19-27, many of the young adults entering the institution as undergraduates demonstrate inadequate readiness in English, reading, or mathematics. As a result, these students are required to participate in remedial programs offered on campus. Thus, at least a portion of the undergraduate population at MSU appeared comparable to the Navy recruits considered to be in need of remedial instruction

The "basic" RD design is a pretest-posttest, two-group design. The term "pretest-posttest" implies that the same basic measure—or in our case, alternative forms of the same measure—is administered before and after a program or treatment. The key feature of the RD design is assignment to the program is based on a cutoff value on the pretest, where the cutoff rule is essentially: (1) all persons on one side of the cutoff are assigned to one group, (2) all persons on the other side of the cutoff are assigned to the other, and (3) there needs to be a continuous quantitative pre-program measure (i.e., pretest). In this case, the selection of the cutoff was made on the basis of a pilot study.

Since the general rule of thumb for the RD design is 30 or more subjects in the program group (i.e., TiPS condition), with at least twice as many in the excluded group, we decided to test a large number of students to ensure that a sufficient number would fall below our designated cutoff. As a precaution we tested approximately 300 students. To ensure adequate participation in the study, the initial group of volunteers was offered $5 for taking a pretest and an additional $20 if they were willing to return and take the posttest at a later date. Of the students eligible for TiPS (i.e., students that score below our criterion on the pretest were eligible to work on the TiPS system), those that elected to participate in the treatment portion of the study were paid a pre-determined amount for each training module they completed. The TiPS system consists of ten lessons. Participants were paid $8 for each of the first four stages they completed, $10 for each of the next four stages, and $12 for each of the final two stages.

Two hundred and eighty three students were administered the pretest. Of the 283, 124 students—or 44%—scored below the cut-off score (earning a score of 40% or less) on the pretest. Of the 124 students, we randomly selected half of them to approach and notify that they were eligible for the treatment. Of the 62 we approached, 43 (35%) expressed a willingness to participate in the treatment portion of the study. Two of these students that initially expressed interest, however, did not complete the TiPS instruction and were excluded from the final analysis. Thus, a total of 41 students completed the entire TiPS curriculum. Of the remaining 62 students that scored below the cut-off score on the pretest but were not selected, 41 took the posttest and the other 21 did not take the posttest. Of the 159 students that scored above the criterion, 116 took the posttest while the remaining students did not take the posttest. Thus, there were three groups that participated in the entire study and were used in the final analysis:

- **41** students (14 males and 27 females) in the **TiPS treatment group**. The average ACT math score for

these students was 18.10 ($SD = 3.07$). Of the 41 participants in this condition, 19 were Caucasian, 21 were African American, and 1 described himself as "other." Eleven of the 41 participants classified themselves as lower-division undergraduates with the rest classifying themselves as upper-division undergraduates.

- **41** students (11 males and 30 females) that were eligible for TiPS but were not randomly selected to receive TiPS treatment (i.e., **eligible/untreated group**). The average ACT math score for these students was 18.36 ($SD = 3.18$).). Of the 41 participants in this condition, 19 were Caucasian, 20 were African American, and 2 described themselves as "other." Thirteen of the 41 participants classified themselves as lower-division undergraduates with the rest classifying themselves as upper-division undergraduates.
- **116** students (42 males and 73 females) in the comparison or **untreated control group** . The average ACT math score for these students was 22.80 ($SD = 5.03$). Of the 116 participants in this condition, 89 were Caucasian, 17 were African American, 1 was Hispanic, 2 were Asian American, and 7 described themselves as "other." Thirty-seven of the 116 participants classified themselves as lower-division undergraduates with the rest classifying themselves as upper-division undergraduates.

Computer-Based Learning Environment

The computer-based environment used during Phase 2 was the same as the one used during Phase 1.

Materials

The pencil-paper materials included a demographic questionnaire, a pretest, a posttest, and an affective questionnaire. The demographic questionnaire asked each learner to provide background information.

To determine the effects of TiPS instruction on word problem performance, a pretest and posttest was administered to each student immediately prior to and following instruction. The pretest and posttest was adapted from a set developed by Derry and her students to evaluate the system. Based on prior research with TiPS (Wortham, 1996), adult remedial learners typically enter TiPS instruction already performing well on one-step change, group, and compare (additive) word problems, but not on one-step vary and function (multiplicative) word problems or on multi-step problems involving both multiplicative and additive schemas. To obtain an instrument that would allow one to measure the instructional impact and that could be completed in a reasonable time period, two eight-item tests were created each consisting of four one-step multiplicative word problems (involving the vary and function schemas) and six multi-step word problems involving both multiplicative and additive schemas. These tests were based on the tests used in two field studies described previously. Two equivalent forms (A and B) of a test were developed, each consisting of four one-step, three two-step, and three three-step word problems. With respect to mathematics operations, underlying concepts, sizes of numbers, and basic grammatical features such as sentence structure, problems on the two forms were structurally isomorphic to one another. Statistical treatments were designed to assess whether the instruments perform similarly. One single-step and one two-step problem on each test were obtained from the National Assessment of Education Progress (NAEP). Test administration was counterbalanced so that half the students received form A prior to instruction and form B following instruction.

An affective questionnaire was also created that asked each participant to judge the effectiveness of the instructional program. Specifically, the questionnaire consisted of a set of seven statements to which the participants responded on a 5-option Likert-type scale from "I disagree" to "I agree". For instance, the following statements may be used: (1) "I have learned to solve word problems based on this instruction"; (2) "Learning was fun"; (3) "I would prefer learning from TiPS when I have to study "mathematized" contents next time; (4) "I felt curious"; (5) "The examples and problems in TiPS helped me to understand word problems"; (6) "I was interested in learning about word problems"; and (7) "The instruction in TiPS was well designed".

Procedure

In order to identify at least thirty students that would fall below the cutoff—and thus be deemed eligible for TiPS instruction, a large pool of participants were recruited as volunteers from remedial mathematics classes at the Mississippi State University. As previously mentioned, the selection of the cutoff was made on the basis of a pilot study. All participants received cash payments for their participation based on their level of participation. During the Pretest Session, the volunteers were requested to provide consent and then asked to complete the pretest.

Based on the results of the Pretest Session, individuals that scored below the cut-off score were identified and asked to return for subsequent sessions. As previously mentioned, to help ensure that these individuals were sufficiently motivated, we provided payments for work completed. Also, at this point, every effort was made to ensure that there are no intervening relevant instructional experiences, inside or outside of the study.

For the TiPS-based treatment sessions, experimenters followed an invariant data collection protocol that they were trained to employ. The steps in this protocol included: 1. Preliminary preparation (e.g., readying the

computer, ensuring students properly log into TiPS); 2. Administration of TiPS instruction; and 3. Administration of posttest and affective questionnaire. Since the instruction was self-paced, the actual length of time necessary to complete the data collection protocol varied across participants. To ensure that the individual sessions during step 2 do not get too long, the participants were not be permitted to work with the system for more than an hour a day.

The students in the comparison group—that is, the students with scores above the cutoff on the pretest—and the students in the eligible/no treatment group that participated in the Pretest Session were asked to return for the Posttest Session in which the posttest was administered on either an individual or group basis. This session was timed to coincide with the last session of the participants exposed to the TiPS system.

Scoring

The protocols generated on the pretest and on the posttest were coded for conceptual scores according to a set of guidelines for analyzing the written problem-solving protocols derived from research by Derry and her students (Atkinson & Derry, 2000; Derry, Weaver, Liou, Barker, & Salazar, 1991; Tookey & Derry, 1994). These guidelines were designed to help gauge where the participant fell along a problem-comprehension continuum. According to these guidelines, each item will be awarded a conceptual score, ranging from 0 to 3, depending upon the degree to which the participant's solution is conceptually accurate. Thus, the overall score for both the pretest and the posttest ranged from 0 to 30. The cutoff criterion was 40% or a score of 12 on the pretest.

One research assistant who was unaware or "blind" to the condition independently coded each protocol. To validate the scoring system, two raters independently scored a random sample of 20% of the problem-solving protocols and agreed on scoring 97% of the time. Discussion and common consent were used to resolve any disagreement between coders. Once the pretests and posttests were scored, gain scores were calculated designed to capture any pretest-to-posttest differences.

To create an average affective score, the participants' responses to all of the questionnaire items were coded on a scale of 1 to 5. The participants' responses will then be summed across all of the seven questions and divided by seven, thereby generating an average response on the affective measure, with values ranging from 1 to 5.

Analysis

The unadjusted pretest and posttest scores for the three conditions appear in Table 1. To determine if there are learning gains associated with TiPS, the analysis of problem-solving measures consisted of two complimentary alpha-controlled sets of analyses. First, an analysis of covariance (ANCOVA) was used for testing regression discontinuity effects (Braden & Bryant, 1990; Cook & Campbell, 1979). We entered pretest scores as the covariate, entered placement (TiPS group or comparison group) as the independent variable, and designated posttest scores as the dependent variable in the ANCOVA. With this approach, the difference or discontinuity at the cutting point between the regression surfaces in the two groups can be taken as evidence of a treatment effect. The interaction between pretest and placement was also entered to test whether there is or is not a difference in slope between the two groups (i.e., homogeneity of regression lines).

Second, since it is possible for the ANCOVA to be misspecified such that the shape of the regression surface is not properly modeled—for instance if there is a curvilinear relationship between the pretest and posttest, we attempted to exactly specify the true model. When we exactly specify the true model, we obtain unbiased and efficient estimates of the treatment effect. Our general strategy was to begin specifying a model that we are fairly certain was over specified. Although the treatment effect estimate for this initial model was likely to be unbiased, it was also considered inefficient. Through successive analyses, we gradually removed higher-order terms until the model diagnostics indicate that the model fits poorly. Specifically, the basic model specification analysis for RD designs involves five steps: (1) transform the pretest, (2) examine relationship between pretest and posttest visually, (3) specify higher-order terms and interactions, (4) estimate initial model, and (5) refine the model (Trochim, 2001).

We also focused our attention on the participants that interacted with the TiPS system in order to address the remaining two objectives. For instance, we calculated the instructional time and the number of problems the students solved during instruction. In addition, we examined the posttest questionnaire for evidence that the participant was affected by the TiPS instruction.

Finally, we also examined the relationship between those students that were eligible—by scoring below the cutoff criterion—to participate in the treatment portion of the study but randomly selected to not participate in the treatment (eligible/non-participants) and the students that were eligible and did participate in the treatment.

Results and Discussion
Comparing TiPS Group to Untreated Control Group

Figure 1 shows the bivariate distribution between the pretest and posttest for this experiment. Each dot on

the figure represents an individual student's pretest and posttest. The vertical line that appears at the pretest score of 12 on the x-axis represents the cutoff criterion. The dashed lines that appear through the bivariate distributions on both sides of the cutoff score are the regression lines associated with the TiPS group (on the left of the figure) and the control group (on the right of the figure). On the basis of a visual inspection of Figure 1, one can perceive a "jump" or discontinuity in the regression lines at the cutoff point. Specifically, it appears that—on average—the points to the left of the cutoff (TiPS treatment group) have been raised by approximately 4 points on the posttest. Although one might conclude from a visual inspection of Figure 1 that TiPS on average raised posttest performance by 4 points on our scale, we wanted to confirm it by employing an ANCOVA to statically test for the presence of a regression discontinuity effect (Braden & Bryant, 1990; Cook & Campbell, 1979). First, we tested the posttest for homogeneity of regression and the results were found to be non-significant—$F < 1$. Thus, we were able to conclude that there was no difference in slope between the two groups.

According to the results of the ANCOVA, the adjusted mean scores associated with the posttest for participants in the TiPS group ($M = 20.24$, $SE = 1.05$) were statistically significantly higher than those of their peers in control group ($M = 16.47$, $SE = 0.50$), $F (1, 154) = 8.05$, $MSE = 20.65$, $p = .005$. Cohen's d statistic for these data yields an effect size estimate of .46, which corresponds to a medium effect. Overall, the results indicate a positive, practical effect that can be attributed to the TiPS instruction.
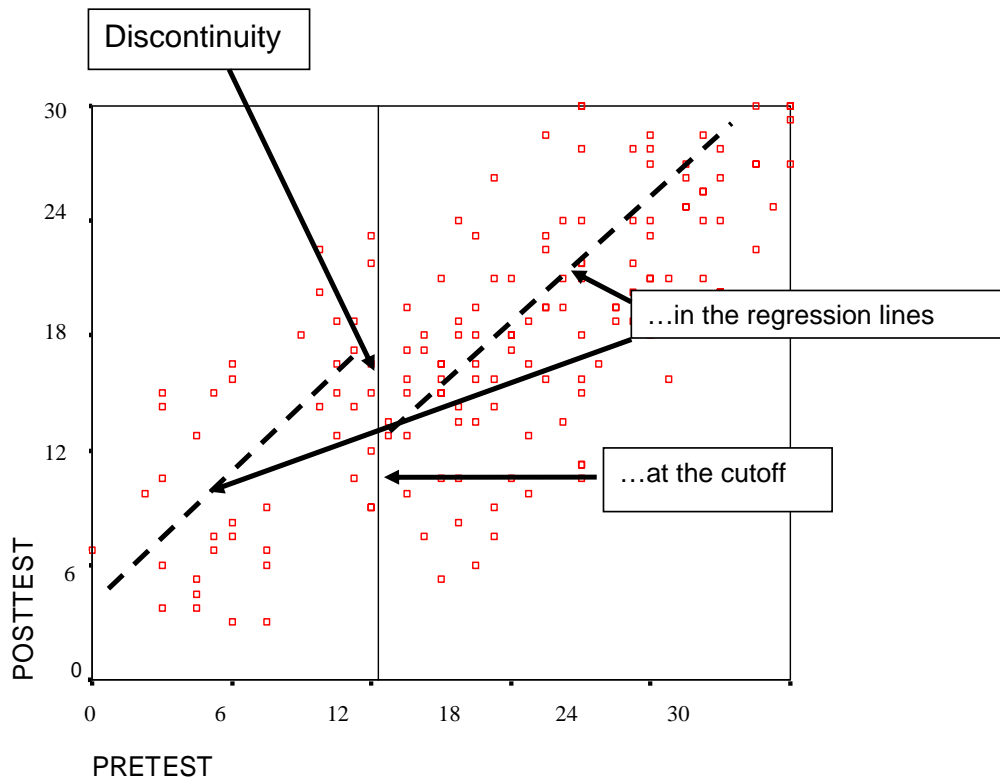
Figure 1. Graph of the pretest scores and posttest scores of the TiPS and control participants. The TiPS group's regression line is represented by the dashed line on the left and the control group's regression line is represented by the dashed line on the right.

As previously mentioned, since it was possible for the ANCOVA to be misspecified (e.g., the shape of the regression surface is not properly modeled due to a curvilinear relationship between the pretest and posttest), we

attempted to exactly specify the true model by following the steps outlined in the analysis section. We pursued this model specification process since it we felt that it would help ensure that we would not erroneously conclude the TiPS treatment made a difference when it in fact did not.

First, we regressed the posttest scores on the modified pretest (SPSS variable = "precut"), the treatment variable (SPSS variable = "group"), linear interaction (SPSS variable = "linint"), higher order transformation including quadratic (SPSS variable = "quad") and quadratic interaction (SPSS variable = "quadint").

The treatment effect initial estimate is 4.35 (SE = 1.95)—very close to our estimated treatment effect of 4 derived from our visual examination of Figure 1. However, there was also evidence that several of the higher-order terms were not statistically significant and, thus, were not needed in the model. To refine the model, we dropped the two quadratic terms.

Refining the Model

In the refined model, the treatment effect estimate was 3.94 and the SE of 1.45, which is lower than the initial model. This indicated a gain in efficiency due to the elimination of the two unneeded quadratic terms. However, again we found evidence that the linear interaction was not statistically significant and, thus, were not needed in the model. To refine the model, we dropped the non-significant linear interaction term and respecified the model.

Final Model

In the final model, the treatment effect and SE were almost identical to the previous model and all of the terms were statistically significant, indicating that this final model fit the data well and, thus, did not need any further refinement. This also indicated that there was no evidence of a curvilinear relationship associated with the bivariate pretest-posttest relationship. Instead, we were able to conclude that a straight-line model, such as the one assumed in our aforementioned ANCOVA analysis, accurately captures this data. As evidence, this model—like the other analysis—indicated that the TiPS treatment produced a statistically significant effect, t(154) = 2.837, p = .005. In fact, the results of our ANCOVA and our model specification process were identical (in a two group situation, t^2 = F; thus, squaring our t-value or 2.837 equals 8.05, the F-value we obtained from our ANCOVA).

Beyond providing a basic evaluation of the overall TiPS system, we wanted to determine the amount of instructional time involved with the use of TiPS system The average time for completing the Tips computer instruction was **3.84 hours** (SD = 0.97) and ranged from 1.83 to 6 hours (excluding test-taking time), during which time they completed an average of **64.28 problems** (SD = 7.68) on the system (overall range from 54 to 80 problems). This instructional time result diverged from the results of the previous field trial where it was found that the average time for completing the Tips computer instruction was 5.81 hours and ranged from 3.63 to 9.52 hours (excluding test-taking time). However, unlike the field trial that permitted the student to work on TiPS in session ranging from three to six hours, the participants in the present study were not be permitted to work on TiPS for more than an hour a day. This latter type of arrangement may have encouraged the students to use their time more efficiently on the system.

With regard to our final objective, the affective nature of the TiPS learning experience, we examined how the TiPS students responded to the affective questionnaire. In response to the statement:

- "I have learned to solve word problems based on this instruction", 21 out of 41 (51.2%) students agreed or somewhat agreed.
- "Learning was fun", 27 out of 41 (61%) students agreed or somewhat agreed.
- "I would prefer learning from TiPS when I have to study 'mathematized' contents next time", 27 out of 41 (61%) students agreed or somewhat agreed.
- "I felt curious", 23 out of 41 (56.1%) students agreed or somewhat agreed.
- "The examples and problems in TiPS helped me to understand word problems", 32 out of 41 (78.1%) students agreed or somewhat agreed.
- "I was interested in learning about word problems" 20 out of 41 (48.8%) students agreed or somewhat agreed.
- "The instruction in TiPS was well designed", 31 out of 41 (75.7%) students agreed or somewhat agreed.

Comparing TiPS Group to Eligible/Untreated Group

To examine the performance of the TiPS group relative to the eligible/no treatment condition, pretest to posttest gain scores were calculated for these two groups and analyzed with an independent sample *t*-test. According to the results of the *t*-test, there was a statistically significant difference between the posttest performance of the

participants in the TiPS condition and their peers in the eligible/no treatment, $t(80) = 2.23$, $p = .029$. The participants assigned to the Cohen's d statistic for these data yields an effect size estimate of .50, which corresponds to a medium effect. Again, this result indicates a positive, practical effect that can be attributed to the TiPS instruction, as opposed to some intervening relevant instructional experiences (inside or outside of the study) that perhaps all of the students at Mississippi State that performed below the cutoff criterion were exposed to during the course of this study.

It is also worth noting that, according to the results of an ANCOVA, the adjusted mean scores associated with the **posttest** for participants in the **eligible/untreated group** ($M = 18.09$, $SE = 0.97$) were **not statistically different** than those of their peers in **untreated control group** ($M = 16.47$, $SE = 0.50$), $F(1, 154) = 8.05$, $MSE = 20.65$, $p = .29$. Moreover, our attempts to specify an analytic regression model in this case did not produce statistically significant results (see below).

Taken together, this implies that none of the 124 students that scored below the cutoff criterion would have been able to produce (statistically) significantly higher posttest scores, after adjusting for pretest performance, than their peers in the untreated control group without the targeted intervention provided by TiPS.

Conclusions

In sum, it is apparent from the evidence compiled in during the present project that remedial learners engaged in mathematical thinking can benefit on a variety of cognitive (i.e., transfer) and affective measures by working within TiPS, a computer-based learning environment designed to develop learners' problem solving skills. In particular, we empirically documented that learners excelled—after who spent an average of four hours on the TiPS system were typically rewarded with a 15% improvement—a 1½ letter grade improvement, by conventional standards—in their problem-solving performance. We attribute this effect to the collection of features inherent to TiPS, including: (a) instruction within the context of problem solving scenarios, designed to gradually build the learners skills and abilities that should enable them to reason about complex real-world problems, (b) auxiliary representations depicted in its problem-solving interface to help learners model and solve problem situations, (c) worked examples to provide the learners with an expert's solution, which they can use as a model for their own problem solving, and (d) the Bayesian student modeler that monitors the learners performance and adapts instructional delivery to meet their needs. In addition to the enhanced problem-solving performance, the learners exposed to TiPS reported feeling that the instructional material, including the examples and problems, helped them to understand how to approach and solve word problems and that, overall, the instructional environment was well designed.

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Blended Pedagogy Research:
Pathways for Developing Problem-Solving Reflective Practitioners

Maria D. Avgerinou
DePaul University

Margaret Kelly Carroll
Maureen V. Spelman
Saint Xavier University

Kathleen Hanlon
Dominican University

Abstract

The purpose of this study was to track and share the journey that teachers make as they evolve as professionals. Pre-service and in-service teachers were required to participate in reflective practice activities. Continua of analysis from paper and pencil to face-to- face to online discussions; pre-service entry level to veteran professionals; loosely structured to highly structured requirements for reflection; and informal to formal goals for reflective projects are examined via the case studies of four teacher education professionals and the problem-based field experiences of their students. Research findings indicate that custom design of reflection opportunities is the best choice for teacher education professors.

Effective teachers engage in reflective practice. The Interstate New Teacher Assessment and Support Consortium's (INTASC, 1991, p. 31) ninth core standard for teachers is worded: "The teacher is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally." Mewborn (1999) argued that pre-service teachers need time to learn and practice reflective skills in a non-evaluative environment. Bullough and Baughman (1997) asserted that the first five to seven years of teaching careers constitute the novice period; these years should be marked by ongoing reflection, typically in the form of journaling: diaries, notebooks, dialogues, integrative entries, and evaluative entries (Sileo, Prater, Luckner & Rhine, 1998). Experienced teachers also benefit from ongoing reflection in similar formats (Bean & Stevens, 2002). For pre-service or in-service teachers who are reflecting on their teaching practice as they do it, not simply reflecting on a past experience, reflection typically leads to the solution of specific practical problems (Smith & Hatton, 1993). Styler and Philleo (2003) recommended the use of technology to enhance reflective journaling. Whipp (2003) reported on research about teacher candidates engaging in field experiences in urban middle schools in which teacher candidates engaged in increasingly higher levels of reflection because of online discussions. Rodgers (2002) proposed four phases in the process of reflection, asserting that reflecting *on* action becomes practice for the reflection *in* action, necessary for teachers who must make decisions and responses on the spot repeatedly throughout each teaching day.

Description of the Study: Purpose, Setting, and Methods Employed

The purpose of this study was to track and share the journey that teachers make as they evolve as professionals. The pre-service and in-service teachers involved in this study were enrolled in one or more teacher education courses offered at Saint Xavier University from August 2004 to June 2005. The pre-service and in-service teachers in these courses were required to participate in reflective practice activities, either in paper and pencil formats or sophisticated rubric-driven journal entries in face-to-face and web-based instructional applications. These designs are intended for a continuum of developmental reflective practice for pre-service observers, methods course students, student teachers, novice in-service teachers, and experienced in-service teachers. An additional continuum concerns media from paper and pencil to online discussions. A third continuum refers to the degree of structure required of the professor to elicit reflective journaling from pre-service and in-service teachers; requirements of length, type, milieu, respondents, classmates, colleagues, and frequency vary along this continuum. Finally, a fourth continuum of reflection goals underlying the associated instructional activities can be noted. The four researchers participating in the study explored the reflective practice models they had designed for pre-service

and in-service teachers, and demonstrated where the intersections along the identified continua occur.

Professor A Case Study

Context/Course: Student teachers are at the end of a program of teacher preparation and are no longer in frequent face-to-face contact with their professors. Now their primary experience is with the cooperating teacher to whom they have been assigned and with the students whom they are teaching. A common design is that student teachers are observed approximately six times by the university professor over the time period of placement (often 10-16 weeks) and meet with the university professor and other student teachers once weekly on campus.

Problem: In a large metropolitan area, student teachers were assigned to schools that are not close to the campus, let alone close to each other. Given bus schedules and high school/elementary school schedules, school start and stop times vary considerably. Finally, many student teachers are asked to assume after-school responsibilities, including tutoring and co-curricular experiences. As a result, the 21 student teachers in the sample were unable to meet on campus on any day of the week and be present at a reasonable hour concurrently (some were also taking evening classes, mitigating against a meeting time beginning later than 5:00).

Solution: Virtual communication! The professor structured minimum entries (two per week) and headings under which the discussion could ensue.

Reflective Project and Project Structure: Teacher candidates were required to post on a Blackboard Discussion Board at least twice per week. Postings could be in response to any of the prompts and beginning their own thread or responding to colleagues. The professor participated too.

Prompts for Student Teacher Reflection and Discussion: Prompts related to a variety of practice issues, from using effective materials for instruction to managing behavior.

Assessment: Assessment was the least structured aspect of this reflective experience. No student teacher could complete the course without posting at least twice per week, as per syllabus requirements. On the other hand, no requirements, other than the minimal volume and frequency, were made. No specification about how long each comment or posting would be or that a posting had to respond to the posting of another teacher candidate, etc. was made. The intensive nature of student teaching is stressful and exciting; it would be quite unusual for teacher candidates to be without comments. Further, the nature of the teacher candidates' relationship to each other as the only other persons who are experiencing this intensive activity at the same time with the same population (all 21 student teachers were placed in special education assignments) meant that teacher candidates naturally clung to each other for support and ideas. In addition, the student teaching supervisor not only saw each teacher candidate in the field regularly but participated in the discussion, bringing to the forefront observations that had been made and issues that arose as a result. The discussion took a truly conversational format as a result.

Professor B Case Study

Context/Course: This 10-week course initiated the graduate study research requirement for the Master of Arts in Teaching and Leadership (MATL). Course content explored the foundational assumptions, methods, and designs of educational research through both qualitative and quantitative paradigms, with particular reference to Action Research and school improvement. Extant research was reviewed and analyzed. A statement of classroom-based research inquiry was developed, and a preliminary literature review was conducted.

Target Population: Three MATL groups were involved in this study. The groups were taught simultaneously by the same instructor, in out-of-campus, geographically dispersed locations. The participating graduate students (*N*= 54) were in-service teachers with at least 2 years of teaching experience.

Medium: The vehicle of reflection in this case was a Written Reflective Journal that students were required to post weekly on Blackboard's Discussion Board (Group Area).

Degree of Scaffolding/Weekly Prompts: Weekly prompts provided by the instructor, were semi-structured in that they helped students focus specifically but not exclusively on issues of both content, and process related thematically to our weekly face-to-face meetings. Examples of prompts include the impact of the first research class in student understanding of, and feelings about educational research (Week 1); impact of the second research class on student understanding of, and feelings about the various types of educational research (Week 2); student efforts to select a research topic and/or a group to collaborate with (Week 4); student assessment of the first 5 weeks of the course (Week 5); student reflection on the mechanics of retrieving research literature (Week 6); student reporting on their demographic data collection (Week 7); and, student course evaluation (Week 8). Also, the journal's length was required to be no more than 2 paragraphs (i.e. one screen-full) unless otherwise specified.

Reflective Project: The students posted on Blackboard a reflective journal for 7 of the 10 weeks of the course with the view to achieving the goals listed below. The journal could consist of the student response to the weekly readings; their questions, fears and/or concerns with regard to their own study progress but also their group

dynamics and communication; their thoughts, ideas and/or suggestions concerning the literature, their research project, the instructional modus operandi of the class, etc. Those journals were posted in the group Discussion Board, that is, an open forum that fosters and supports a collaborative community of learners. Student postings remained published in the Discussion Board area until the end of the course.

Reflection Goals and Associated Levels of Reflection: The instructor identified four levels of reflection (Cranton & King, 2003; Mezirow, 1991) which subsequently served as the theoretical framework of the reflective activities: (a) Content Reflection (description of problem/examination of content); (b) Process Reflection (evaluating the problem-solving strategies one uses toward resolution of a problem); (c) Premise Reflection (questioning the problem itself); and Critical Self-Reflection (trying to comprehend why we are doing what we are doing). These levels of reflection evidently shaped and became inextricably linked to the entire instructional design of the course, with particular emphasis to identified reflection goals, their implementation and assessment. Through their engagement in reflective practice activities within the context of this class, students were essentially expected to demonstrate active and critical engagement with the literature on educational research methodology, its findings, and applications to own educational context (Content, Premise, & Process); to establish and maintain commitment toward improving their own collaborative learning skills (Process, & Critical Self-Reflection); to systematically expand their understanding of instructional technology applications and their potential for research and communication purposes (Process, Premise, & Critical Self-Reflection); to begin developing action research skills (Content, Premise, Process, and Critical Self-Reflection); and, to improve their practice as educators through self-examination and analysis (Critical Self-Reflection).

Reflection Assessment: The online reflective journal carried a weighting of 30% of the student's overall grade. The journal was assessed for clarity, organization, and content (depth of analysis).

Data Analysis: In order to address the research questions of this study, a mixed method triangulation design was adopted. Content Analysis was performed on data (text) collected through the Online Reflection Journals, Student Formative Evaluation Reports, the Reflective Piece in Student Final Research Papers, and, Student Summative Evaluation Reports on Faculty and Course. Emerging response patterns & themes were compared and cross-checked. Furthermore, Descriptive Statistics were generated from (a) the Course and Faculty Ratings yielded through Student Summative Evaluation Reports, but also from (b) the Grades students earned for their Online Reflection Journals, as well as their Final Research Papers. Although Inferential Statistical analysis was seriously considered, it was finally deemed more appropriate for a later stage of the study.

Results yielded through the data analysis procedures were compared, while their common threads are identified and discussed later in this paper, in relation to the research questions posed.

Professor C Case Study

Context/Course: The course is a full-semester course for secondary teacher preparation program candidates to learn to teach and facilitate the development of literacy skills in their classes. Employing a critical/constructivist model, the focus is placed upon developing a repertoire of strategies to improve middle and secondary students reading comprehension, writing, higher order thinking, metacognitive and interactive skills. Reflective practice is a continuous thread throughout the teacher preparation program as is ongoing field experience designed to provide opportunities for observation and application of strategies. Teacher candidates are typically within a semester or two of student teaching.

Setting: Teacher candidates are required to complete 15 hours working with secondary students who are identified by teacher/agencies within the region as needing additional academic assistance and support. Sites included a large Chicago public school, a home for "at risk" girls, and a private college preparatory all-girls school. Teacher candidates chose sites from among these three sites arranged by the instructor.

Design of the Activity: Teacher candidates were required to participate in online discussions using Blackboard in two different groups. In the first group, candidates discussed their experiences at the same field experience sites (six reflective pieces were required); in the second group, candidates shared their experiences across assigned field experience sites (reflective postings as well as specified numbers of responses to the postings of others). Teacher candidates gained experience with the integration of technology and they received collegial assistance in the development of strategies to promote literacy development within their content areas. Finally, candidates took turns being responsible for summarizing the postings to a particular prompt.

Reflection Prompts: Prompts for reflection consisted of bundled questions. These questions probed the relationship between tutor and tutee, materials development, methods evaluation, assessment techniques, and satisfaction with these elements.

Assessment: Given that the field work, reflection and peer interaction were integral components of the course, teacher candidates received a 20% weighting on the course final grade for their performance on Discussion

Board: 10% was allotted for the quality of their individual reflective work and 10% for the quality of their peer interaction. Rubrics were provided to teacher candidates for the assessment of both the quality of their reflective responses and the quality of their peer responses as were basic guidelines for feedback and use of Blackboard. Teacher candidates assessed issues/concerns at the mid-point orally in class. Teacher candidates completed a survey at the end of the course which addressed the use of technology, group interaction online, nature of reflective responses and ways to improve the project.

Professor D Case Study:

Context/Problem: The clinical practicum represents the capstone experience for pre-service elementary education teacher candidates. Throughout the 16-week experience, teacher candidates work closely with the on-site cooperating teacher and are supported by periodic (minimum 6-8) visits by the university clinical practice supervisor. All elementary education teacher candidates meet weekly in small, on-campus discussion groups with the clinical practice supervisor acting as facilitator. In addition, teacher candidates are also enrolled in a concurrent seminar course that meets weekly.

These initial certification teacher candidates may be assigned to field experience sites alone, in pairs, or in small groups. Such isolated clinical practicum placements do not provide the support and community of learning that has been a part of the prerequisite field experiences. As a result, the following blended activities were designed to support growth in reflective practice by providing several alternative opportunities to interact with fellow teacher candidates and supervisors.

Project Structure/Degree of Scaffolding: Paper/pencil reflections on daily lesson plans and subsequent weekly log entries provide opportunities for unstructured free writing and interactive journaling between the teacher candidates and the university supervisor. Through these paper/pencil activities and follow-up conferences and/or seminar discussions, teacher candidates focused on the initial phases of the reflective cycle. Using interactive journaling opportunities, the university supervisor prompts teacher candidates to achieve a state of mindfulness, "seeing" and to begin to describe, differentiate, and see the nuances present in the classroom (Rodgers, 2002).

Online, asynchronous discussion opportunities are provided in three separate Blackboard discussion groups: the large group of current elementary education student teachers, grade level assignment clusters, and seminar group members. Initial discussion prompts were detailed and encouraged teacher candidates to add depth to their responses. Gradually the prompts were shortened to allow for open response to topics. These opportunities for collaborative reflection are provided to support Dewey's (1944) criterion regarding the need to reflect within community. Discussions here move in and out of the various phases of the reflective cycle depending on topics and peer responses. The Discussion Board activities provide opportunities for describing and differentiating as well as pushing candidates to think and respond from multiple perspectives.

Weekly/Bi-weekly/Monthly Prompts: Prompts for reflection consisted of bundled questions. These questions probed the relationship between teacher and learner, materials development, methods evaluation, assessment techniques, and interrelationships among disciplines and teaching/learning.

Goals/Assessment: The ultimate goal of reflective practice is student learning. Working toward this goal requires that elementary level student teachers maintain an alert presence in the classroom. Here they refined their skills in assessment-driven instruction by "seeing" what and how their students were learning. From there teacher candidates were supported by a community of learners as they practiced "describing and differentiating" the multiple elements present in selected teaching/learning situations (Rodgers, 2002).

In the next phase of reflection teacher candidates were supported in their efforts to develop "analysis" skills through opportunities to thoughtfully reorganize and restructure classroom experiences. Teacher candidates were encouraged to make meaning of classroom happenings by examining problems from multiple perspectives and forming multiple explanations. This thorough analysis paves the way for the formation of hypothesis and learning to "experiment" – taking intelligent action (Dewey, 1944). Experimentation is the final phase of the reflective cycle, but by its very nature it sets the stage for the start of a new cycle. Taking risks, testing hypothesis, and experimenting with new strategies results in new opportunities for reflective practice.

Data Analysis Methods: Assessment data has been collected through several vehicles: (a) paper/pencil reflections on daily lesson plans, (b) paper/pencil weekly logs, (c) three separate online asynchronous group discussions, (d) exit surveys, and (e) final course evaluations.

Each reflective entry collected via on of the five different vehicles will be coded on a rubric from 0 – 4: 0: Superficial Summary of the Experience, 1: Presence in the Experience, 2: Description of the Experience, 3: Analysis of the Experience, and 4: Experimentation. A rubric was constructed to assess the phases of the reflective cycle represented by each set of data. The rubric was organized by medium to examine which reflective activities scaffolded teacher candidates in moving forward in the phases of the reflective cycle. Data was also examined by

graduate and undergraduate groupings to examine similarities and differences of reflective abilities between these groups. Finally, data was organized along the continuum of scaffolding to determine whether candidate growth was influenced by the addition or omission of prompts.

Methods Viewed Along the Continua

The case studies comprising this larger report investigated reflection by teachers and teacher candidates. The designs differed along a number of continua: level of experience, medium employed, structure for reflection, and goals for reflection. These are represented in Figure 1. The methods are then compared along their various continua to answer the following research questions:

1. Have employed strategies (online reflections) resulted in students demonstrating evidence of reflective practice?
2. What types and patterns of reflection can be identified?
3. What factors seem to be important in fostering this development?
4. How can more effective strategies be developed, and how can the conditions for encouraging reflective practice be improved?

	Context/Course	Target Population	Medium	Degree of Scaffolding	Reflection Goals	Reflection Assessment
A	Graduate student teaching	Pre-service and in-service teachers	Online written reflections and discussion	Semi-structured with prompts	Presence; Description; Analysis; Experimenta-tion	Semiweekly participation required; integral to course, cannot pass without participation
B	Graduate research	In-service teachers	Online with written reflections	Semi-structured with prompts	Content; Process; Premise; Critical self-reflection	30% of overall grade
C	Undergraduate and graduate secondary methods	Pre-service teachers	Online written reflections	Highly structured	Content; Process; Critical self-reflection	20% of overall grade
D	Undergraduate and graduate student teaching	Pre-service student teachers	Paper-pencil reflection; online asynchronous discussions	Open, unstructured self-analysis; semi-structured with prompts	Presence; Description; Analysis; Experimenta-tion	Daily/weekly participation required; overall growth represents an essential portion of final grade

Figure 1. Matrix of Analysis

Case Studies: Results and Conclusions

Professor A: Case Study Results

#1. Have employed strategies (online reflections) resulted in students demonstrating evidence of reflective practice? The most primitive results are the most interesting. Teacher candidates were required to post reflections twice per week for a sixteen week period. At 32 entries for each of 21 candidates, the expected total of entries would have been 672; add 32 for the professor and the total is 704. In fact, the number of reflective entries was 949. This suggests that the online conversation was useful and appealing in its own rite to the candidates, in a lonely profession.

#2. What types and patterns of reflection can be identified? #3. What factors seem to be important in fostering this development? Based on Miles and Huberman (1994), the qualitative date was analyzed on several levels: present, descriptive, analytical, and experimental. From the beginning, candidates routinely reflected primarily in the experimental phase, with more than half of their comments in each month relating to experimenting with effective strategies for their classrooms. Fewer than three percent of their entries were merely at the "present"

reflective level and 11% or fewer of their comments in each month were simply descriptive. *#4. How can more effective strategies be developed, and how can the conditions for encouraging reflective practice be improved?* At least a third of their reflective comments were analytical in nature. This correlated well with the average score of 3.9 (scale of four) on the indicator of "reflects on one's practice to improve instruction and guide professional growth" of a special educator standard. The level of support that they offered to one another was also high. They provided advice and offered suggestions to solve problems as well as praised one another's efforts. Approximately half of the analysis reflections were positive evaluations of a colleague's strategies or tenacity.

Professor A: Case Study Conclusions

The high level of participation is testimony to the need of teachers to vent and be supported, especially in their early years of teaching. The high level of reflection on the part of special education student teachers might be attributed to the fact that they were placed in difficult situations and had to analyze and experiment to survive as teachers. Occasional comments were made about the value of the group interaction and how it was facilitated by the use of Blackboard. The distance that separated these teacher candidates was significant. Even if the one hour weekly face-to-face meeting had been held, it would not have been possible to have such widespread participation in the conversation. In one hour, 21 candidates might have each spoken in small groups, but not all 21 would have been able to give lengthy and complete reflections. An advantage of writing, rather than speaking, was the opportunity to think and write, read and correct, before submitting. The reflections were not perfect in form or grammar but the depth of thought was apparent. Candidates were able to attach descriptions of ideas and recommend websites easily in writing, usually copying and pasting the actual web addresses because they were already working online.

Fifteen of the candidates were members of a cohort group and had sustained each other through trying circumstances over the course of a two-year program, taking all of their prior classes together in face-to-face formats. Six of the candidates had completed the program with various timing, including taking longer than two years to get to the point of student teaching. The six candidates knew each other from at least one class before student teaching. This created one subgroup and one quasi subgroup. In the beginning of the semester, the candidates were likely to respond to the reflections of those in their respective groups. However, as the semester wore on and the strain of working under difficult conditions took its toll, the candidates began to cross barriers and reach out to or respond to other candidates on the basis of similar needs or requests rather than perceived group memberships.

Another significant factor in reflection appeared to be the participation of the professor in conversation. The professor routinely answered questions, posed questions, gave suggestions, linked candidates, and praised candidate efforts and innovations. It appeared that candidates imitated the professor and provided similar support for one another. The professor also gave examples from observations made in candidates' classrooms and this prompted other candidates to join in with similar concerns and alternative solutions.

Professor B: Case Study Results

#1: Have employed strategies (online reflections) resulted in students demonstrating evidence of reflective practice? The answer to this question is strongly positive. The students were able to not only demonstrate their reflective ability in the journals they produced during the life time of the course, but interestingly enough, many of them opted to infuse their final research paper (Chapter 1) with a reflective piece on themselves as teacher/researchers, as well as on their collaboration with their group members, or the entire cohort (if they worked independently). Understanding action research, feeling comfortable to see themselves as teacher-researchers, and eventually realizing their potential as agents of educational change were the three most important outcomes of the course that the vast majority of students had identified (and celebrated) at the end of the course. Data analysis corroborates this finding while attributing it mostly to the strong reflection requirement of this course.

#2. What types and patterns of reflection can be identified? All four levels of reflection were demonstrated at various points during the course, depending mostly on the nature of the specified focus for each particular week. Higher levels of reflection, such as premise and self-reflection, were observed from mid-point in class and onward. Through data analysis the following patterns of reflection emerged: (a) Content: understanding the theories and concepts of educational research, understanding the concept of action research, becoming acquainted with the deployed technology (Blackboard, Power Point), identifying a research focus/question for their project, and completing Chapter 1; (b) Process: understanding the mechanics of educational research, understanding the modus operandi of action research, appreciating the educational and communication potential of Blackboard, appreciating the benefits of co-operative learning, understanding how to follow action research procedures for their own project, and appreciating the instructional design of the class; (c) Premise: questioning the research

focus/problem, questioning the theoretical foundation and applications of action research, questioning aspects of the instructional design of the class, and; (d) Critical Self-Reflection: questioning their ability to conduct research (early in the course); seeing and accepting themselves as teacher/researchers in the research class but also in their own teaching context (as the course progressed), understanding their potential as agents of educational change (end of course), and questioning their teaching philosophy and methods.

#3. What factors seem to be important in fostering this development? Basic technology knowledge and skills seemed to be an important factor toward this development. Although at the outset of the course a small percentage of students (5%) came to experience a steep learning curve technology-wise, at the end they all appeared to not only have become confident in using Blackboard's conferences, but they also seemed to endorse the great educational potential of the platform. A critical factor in changing student attitude about online assignments was the instructor's constant help and support toward familiarizing the students with the technology, but also the students' own perception about the level of their cohort's (and later on, research group's) cohesiveness. Since the students were used in a co-operative learning face-to-face class format, they wanted to extend this opportunity online through Blackboard's discussion board. As a result, when weekly reflections were produced and shared through the online conferences, the students would experience comfort, affirmation, and reassurance for a variety of reasons, the most important one being the realization that: (a) the nature of everybody's project was evolutionary; (b) other students were experiencing similar situations; (c) their project was on the right track; (d) their group was very supportive; (e) they could share their newly found interest in research; and (f) it was okay to feel frustrated and overwhelmed.

From the teacher's perspective, cooperative online learning proved consistent with the constructivist course framework primarily due to the role of social interaction. According to Eggen and Kauchak (2001) learners co-construct more powerful understandings than individuals can construct alone. This was particularly true in this case, as students not only were completely novice to the course content, but as is often the case with teachers and educational research (Labaree, 2003) they had entered the course with negative pre-conceptions about educational research, as well as their ability to engage with any aspect of it. Nevertheless, cooperative learning online did not allow for the student biases and/or sentiments of stress and dejection, to grow and taint further student understanding of research. To the contrary, the students were able to transfer online their sense of belonging to this community of learners who explored new ground and eventually built together a solid understanding of the theories and concepts of educational research. And, perhaps most importantly, through this constructive learning environment students gained confidence and pride in their own research abilities. Besides, as Avgerinou and Carter (2005) point out "In keeping with the philosophy of action research, collaboration within a learning community is one of the fundamental skills that need to be developed signifying that the researcher has been fully immersed in the process" (p. 27).

An important aspect of this introductory research course was the requirement of the student applying critical thinking and problem solving skills in identifying and selecting an action research focus or problem upon which they also had to conduct a preliminary literature review. In other words, not only did students need to identify their focus of investigation, but they also had to seek, find, and evaluate various information sources that related to it. Daunting as this task may seem especially if required of novice researchers in such a short period of time, all students accomplished this goal promptly and successfully. Data analysis results confirmed that students' explanation as to why and in what ways they were able to arrive at producing high quality coursework, was powerfully co-related with their weekly reflections. As stated above, students were strongly encouraged to reflect upon, and evaluate their progress throughout the life of the course. Moreover, the fact that weekly reflections were an integral part of the course assessment, increased student motivation to do well on the course. This aspect of the course set up apparently allowed them to pace the work accordingly, create realistic deadlines, and meet them successfully. Students also reported that frequent and constructive feedback provided by the instructor, as well as her expertise, passion and enthusiasm for action research, were great motivators for them to meet the instructor's high expectations particularly as far as practicing self-reflection was concerned. Interestingly, students identified as one of the course strengths that they were constantly challenged to question assumptions, and to make sound research decisions.

#4. How can more effective strategies be developed, and how can the conditions for encouraging reflective practice be improved? A few students commented that online written reflections in combination with oral reflections at a relaxed, not-class-like setting, would have helped them improve further their reflective ability. This is an important recommendation especially as far as the identified conditions are concerned. Apparently, a rigid classroom setting which does not allow for co-operative group work and open discussions, does not lend itself readily to articulating oral reflections, let alone sharing them with anyone else other than the instructor. Conversely, a truly constructivist, cooperative, dialogue-based classroom is an ideal environment for student debating and critiquing content and process aspects of the course, as well as their own role and growth in it.

Professor B: Case Study Conclusions

In conclusion, the preliminary results of this study seem to indicate that the online reflective journals were successful as a vehicle of propelling, supporting, and enhancing student understanding and growth of both their own teaching practice, and action research skills. All levels of reflection, namely Content, Process, Premise, and Self-Reflection, were demonstrated by the overwhelming majority of the participating students at various points in the course. Basic technology literacy and skills, as well as sound pedagogical appreciation of both f2f and online manifestations of co-operative learning and the overarching constructivist framework of the class, seemed to be the most important factors in fostering this development. Integration of weekly reflections into the course assessment policy, but also continuous feedback by the instructor, were also reported by the students as strong motivators toward practicing and further advancing their reflective skills. Finally, students indicated that online written reflections when followed by oral reflections at a relaxed, not-class-like setting, could help improve further their reflective ability as this relates to their research project, but also to their daily teaching practice.

Professor C: Case Study Results

Six reflective journal responses from each of 33 teacher candidates produced in relatively equal time cycles over the course of the semester addressed six structured prompts. Three of the reflective responses were communicated to teacher candidates assigned to the same field site while the other three reflective responses were communicated in groups of teacher candidates assigned to varied field sites. End of the semester anonymous survey responses were also evaluated.

#1. Have employed strategies (online reflections) resulted in students demonstrating evidence of reflective practice? Using a rubric, the professor scored the reflections. A rating of three or four suggested that the candidates demonstrate the ability to reflect and connect the site experiences to their work as a teacher and a person. Looking at total group quality ratings, about half of the candidates demonstrated reflective competence at this level. Using the same scores, the professor evaluated ratings by prompt. The results of aggregate responses to each prompt are that for Prompts #1 (relationship between tutor and tutee), #3 (perceived success as a tutor), #5 (rewards and challenges of the experience), and #6 (connections made to readings, course resources and candidates' work as teachers), more than half of candidates earned ratings of three or four. On the other hand, Prompt #2 (strategy applications) resulted in fewer than a third of the respondents earning a rating of 3 or 4 and Prompt #4 (growth and personal competency) resulted in only marginally more than a third of the candidates earning a three or four rating.

#2. What types and patterns of reflection can be identified? Individual analysis was conducted to determine whether candidates demonstrated consistently strong reflections, an improvement in the quality of reflections, or consistently weak reflections. Nearly a third of candidates demonstrated consistently strong reflective writing, while a third demonstrated chronically weak reflective writing, and over a third of the candidates showed growth in their reflection over time.

#3. What factors seem to be important in fostering this development? Candidates were provided with a rubric to score one another's reflective entries but they generally ignored this tool. Generally, their responses to one another were supportive and positive. Candidates empathized with peers and made some connections among their respective experiences but did not raise challenging questions for one another. Problems with posting after the due dates left candidates unable to respond to a number of entries.

#4. How can more effective strategies be developed, and how can the conditions for encouraging reflective practice be improved? In the exit survey, most candidates noted that they had prior experience with Blackboard, the online medium used in this blended pedagogy. Fewer than half thought that Blackboard was a good medium for dialogue and the candidates were evenly split on whether the online medium facilitated or detracted from their face-to-face interaction. Fewer than half of the candidates reported that online reflecting helped them express their ideas in writing as well help their ability to reflect. Over half, however, reported that the activity helped them respond more thoughtfully and constructively to the experiences of others. In general, the six structured prompts received favorable comments. The self-evaluation of respondents regarding how critical and thoughtful their reflective responses were (about two-thirds thought so) aligned with the professor's ratings at about a third of the reflections as chronically weak. Almost half of the candidates admitted that they did not meet obligations for posting in a timely fashion. Apparently, simply requiring participation, even with the use of a rubric, did not necessarily stimulate reflection.

Professor C: Case Study Conclusions

Most teacher candidates found online reflection and interaction within small groups to be both effective and beneficial. Half felt that more face-to-face interaction and dialogue is needed to improve this experience. Individual reflections as well as group reflection and dialogue were facilitated by the instructor providing structured prompts to

focus attention during tutoring/observation.

The instructor rated the quality of teacher candidate reflective work as less thoughtful and less critical than did many of the candidates. Late posting and not posting reflections for the group to respond to was the most frustrating aspect of the small group activity. One field site where a large number of candidates were assigned was often critiqued as problematic for a number of reasons. Participants recommended that this site not be used for tutoring in the future.

Forces that may contribute to strong reflective work and positive change include: increasing comfort with electronic medium, positive impact of non-judgmental peer support and feedback, models of reflection provided by group members, structured prompts that provide focus and the practice of reflection over time, strong writing skills. In similar fashion, forces that may have contribute to consistently weak reflective work include: preference for face-to-face interaction and discussion, comfort or familiarity with medium, personal access to a computer, lack of instructor feedback or accountability, mismatch between site context and reflective expectations, group dynamics, limiting prompts and weak writing skills.

Professor D: Case Study Results

#1. Have employed strategies (online reflections) resulted in students demonstrating evidence of reflective practice? Based on Miles and Huberman (1994), the qualitative date was analyzed on several levels. Initially, the qualitative data from each source was coded according to the rubric designations. This process allowed the researcher to summarize segments of the data collected. The next level of analysis involved identifying patterns and explanations. Finally, the researcher compared the data across cases and across the previously identified continua.

#2. What types and patterns of reflection can be identified? An examination of the rubrics for each teacher-candidate reveals a number of patterns and findings. The traditional paper/pencil activities showed mixed results in teacher candidates' progression through the phases of the reflective cycle. Generally, the reflective levels represented in the paper/pencil reflection activities fluctuated according to the daily/weekly activities in the classroom. Candidate responses tended to maintain a narrow focus and remained primarily at the "presence" and "descriptive" phases of the reflective cycle. Towards the latter part of the semester, as candidates moved away from daily lesson plan reflections to weekly log entries, reflections tended to start at the "description" level and occasionally move in the direction of the "analysis" level.

#3. What factors seem to be important in fostering this development? An analysis of the data regarding online asynchronous group discussions produced mixed results according to the discussion groups. The weekly online discussions, with the smaller group of seminar members, produced the highest number of interactions and the strongest movement toward the "analysis" and "experimentation" phases of the reflective cycle. Teacher candidates did not participate as regularly in the bi-weekly discussions with grade level groups or the monthly discussions with the larger group of student teachers. In fact, the reflective level of entries in these two discussion boards fluctuated in a pattern similar to the paper/pencil exercises.

A correspondence between the levels of reflection achieved in the seminar group asynchronous discussions and final evaluations surfaced in a comparison of these two pieces of data. Teacher candidates that responded at the higher levels of reflection in the seminar asynchronous discussions tended to receive higher ratings in acquisition of professional competencies by both cooperating teachers and the university supervisor. Conversely, candidates whose reflective responses remained primarily in the early phases of reflection also consistently received lower ratings in their final practicum evaluations.

#4. How can more effective strategies be developed, and how can the conditions for encouraging reflective practice be improved? The data did not indicate any significant correlation between the amount of scaffolding provided for online discussions and the level of candidate response. In addition, the data did not indicate any significant differences between the responses of undergraduate verses graduate initial certification candidates. However, exit survey data revealed that candidates preferred collaborative reflective activities. Several candidates mentioned the reaffirming benefits of sharing perspectives, experiences, and support. In addition, exit survey data demonstrated overwhelming agreement among teacher candidates regarding the importance and benefits of collaborative reflection.

Professor D: Case Study Conclusions

The findings for this particular study design provide the basis for several conclusions as well as a number of questions for further consideration. Teacher candidates who work at being present in the classroom were more inclined to become more sensitive to the relationship between their teaching and student learning. In this study, two particular candidates demonstrated difficulty in moving from summarizing the classroom situation to observing the nuances of student learning. These same candidates lagged behind their colleagues in their progression toward the

acquisition of professional competencies. One, in fact, failed to complete the student teaching experience.

Those who progressed through the stages of the reflective cycle were able to make the paradigm shift to seeing their teaching as a response to student learning rather than a cause of student learning. Similarly, those candidates who grew in reflective abilities as the semester progressed also increased the frequency and depth of their online communications. While a number of participants indicated the benefits of face-to-face discussions in seminar sessions, the opportunity to collaborate asynchronously between seminar sessions was seen as providing the continuing support of a community of learners.

Data indicating that the paper/pencil exercises failed to support candidate progression through the reflective cycle raises questions regarding the benefit of such a time-consuming exercise. In addition, this same data raises questions regarding the benefits of scaffolding provided by the supervisor verses the scaffolding provided by peers. The frequency and depth of small group asynchronous discussions casts doubt regarding the benefits of the grade level and large group discussion board activities. Finally, exit survey comments regarding the benefits of reflection indicate a need to provide better instruction and more opportunities for reflection in a community of learners during this important phase of teacher preparation.

General Conclusions

In addition, there are some overarching conclusions. First, taking teachers seriously at every level of preparation (in-service and pre-service) and permitting choice as to when to reflect as well as some choice in the topics or questions for reflection appears to be critical. This is in accord with the work of Day (1999) who noted the need for teachers to be permitted to develop as professionals on the basis of their concerns, taking into account the moral purposes of teachers. This is true because teaching is a profession in which feelings and emotions play an essential role (Hargreaves, 1998). The prompts all provided teacher candidates and candidates with the stimulus to reflect and include their emotions about their experiences.

It also appears that it is critical for those who reflect to receive a response. In some of the cases described, the responses came from the professors. In all of the cases described, responses came from colleagues/classmates in the context. It seemed important that ideas were "heard" and understood. Further, it appeared that writers tended to extend their own thinking in response to those who commented on their original postings. Teaching and learning has a social component and is not an isolated act.

In particular, *custom* design of reflection opportunities appears to be the best choice for teacher education professors. This is especially true when those custom designs are based on the instructional design (particularly objectives) and delivery of the course, strengths as well as specific needs of the teacher candidates and their instructors, and the ongoing call for thoughtful reflection in a "people-based" profession where infinite variables continue to influence effectiveness.

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Readiness and Willingness of the Learners in Traditional Distance Higher Education Programs of Turkey for Online Learning

Cengiz Hakan Aydin
Anadolu University
Eskisehir, Turkey 26470

Abstract

This presentation intends to reveal the results of a study in which readiness and willingness of the learners in traditional distance higher education programs of Turkey for online learning were investigated. It might especially be beneficial for those who would like to learn the ways of integrating online technologies into traditional distance learning courses and what kinds of online learning opportunities Anadolu University provides its nearly 1.200.000 distance learners. The presentation also summarizes the results of a study in which traditional distance learners' readiness and willingness for online learning were investigated.

Introduction

Although controversies over the effectiveness of online distance education continue, the number of online programs and courses has increased dramatically over the last decade. Almost all higher education institutions have launched or started to think of launching online distance education programs mainly in order to be able to reach more students with fewer expenses (Duffy & Kirkley, 2004).

On the other hand, effectiveness of the online distance education programs relies on different variables. Learners' readiness and willingness are usually listed among these variables. Experts agree on the importance of the learners' readiness for online learning. For instance, Guglielmino and Guglielmino (2003) state that learners' readiness makes an online learning initiative whether an efficient, effective and economical approach or a frustrating, time and resource wasting attempt. Since learners' readiness is crucial factor, many online learning providers try to determine the likelihood of prospective students' success in order not to fail in their initiative. Majority of these efforts include asking students to take a pretest –usually in an online form- to see if they are likely to fit in an online program. These tests commonly consist of items aims to measure learners' access opportunities to computers/Internet and their computer/Internet competences.

However, access and technology experience are not the only factors that can be used as predictor of success for online learning. Hiltz and Shea (2005) note that what the learners bring to the learning situation heavily influence the success in any mode of learning and there is evidence that learners with high motivation, greater self-regulating behavior and confidence in their ability to use computers and to learn online do better than those who lack these characteristics. Self-efficacy is one of these characteristics has been considered as a construct to predict success in online learning.

Albert Bandura introduced self-efficacy theory to the scientific community. Bandura (1978) considers self-efficacy as "a judgment of one's ability to execute a particular behavior pattern" (p.240). According to this definition self efficacy beliefs form a central role in regulatory process through which an individual's motivation and performance attainments are governed (Wood & Bandura, 1989). On the other hand, self efficacy judgments or beliefs determine how much effort people will spend on a task and how long they will persist with it. Studies have revealed that self-efficacy is a strong predictor of academic performance in traditional face-to-face classrooms. Multon, Brown, and Lent (1991) reviewed a list of studies that examined self-efficacy in achievement situations. They found that self-efficacy beliefs were positively related to academic performance. Similarly, Ames (1984) and Nicholls and Miller (1994) found that students' self-perceptions of ability were positively related to achievement and student motivation. Increasing number of researchers (e.g. Joo, Bong & Choi, 2000; Lee, 2002; Pajeres, 1996; Schunk, 1994) have been interested in the roles and effects of self-efficacy in online learning. Results of the studies are confusing. Some studies, such as Lim (2001), suggest a positive relationship between computer self-efficacy and success and/or satisfaction in online learning while some others, such as DeTure (2004) conclude online technologies self-efficacy as poor predictor of learner success in online distance education courses.

Purpose and Research Questions

This study intended to examine the readiness and willingness of learners who study in traditional distance programs for online learning in Turkey. The research questions are formulated as:

1. What is the extent of the learners' readiness for online learning according to their self-efficacy levels for using online tools?
2. What is the extent of the learners' willingness for taking their courses completely online?
3. How often do the learners use online support services provided by Anadolu University?
4. Is there a difference between female and male learners' readiness and willingness for online learning?

Methodology

This study was conducted in Anadolu University, well-known with its distance programs. A three-part questionnaire was used to collect data from the learners who participate the voluntarily face-to-face pedagogical support service provided by the university during the after work hours. Following section includes details about the participants, setting and the instrument.

Participants

Anadolu University provides several support services to its distance students. The face-to-face, after-work-hours classes are considered as the essential pedagogical support service of the University. According to recent numbers, approximately 20,000 learners use this service through out the country. In Eskisehir where the University located around 1,500 learners join these classes every year (Cekerol, 2005). This study was intended to collect data from those learners attending the Anadolu University Open Education Faculty evening classes in Eskisehir. A total of 1,120 questionnaires were distributed to the learners but only 269 wanted to take a part in the study (24 percent). Of these participant learners, 161 (60 percent) were females while 104 (40 percent) were males along with 4 missing data.

Setting

This study was conducted at Anadolu University. According to the World Bank, Anadolu University is the world's largest university due to its student body (Potashnick & Capper, 1998). The University actually is not an open university. It has a dual mode education system. The on-campus education is offered though its 9 colleges (or faculties, "faculty" is a term used in Turkey instead of "college" or "school"), 10 vocational schools, 18 research centers and the state conservatory (school of music and theatrical acting). The distance education programs are organized under three faculties: Open Education, Business Administration, and Economics.

Anadolu University was established in 1981 from an older institution, the Academy of Eskisehir, Economics and Commercial Sciences (EAECS). In accordance with the Higher Education Act of 1981, it was also authorized to provide distance education in Turkey on a national scale. As a result in 1982 the former Faculty of Communication Sciences of the EAECS was transformed to become the Faculty of Open Education, or, as it is called commonly, the Open Education Faculty (OEF). This faculty was an outgrowth of the newly established Anadolu University because at that time, it was the only institution that had experience in the technical and theoretical aspects of distance education. The first educational television pilot project of Turkey was undertaken here during the 1970's under the auspices of the Educational Television department of the EAECS (McIsaac, Murphy & Demiray, 1988).

In the 1982-1983 Academic Year, the OEF started to offer two, four year undergraduate distance education degree programs in Business Administration and Economics. That year 29,478 students enrolled in the programs. By 2004-2005, the number of enrolled distance students at Anadolu University reached approximately 1 million. Today, the OEF, along with other two distance education faculties, is offering 8 different BA degree and 22 associate degree programs to students in Turkey, the Northern Cyprus Turkish Republic and some of the European countries such as Germany, Netherlands, and France. The programs vary from Business Administration to Pre-school Teacher Education. Recent figures show that majority of the distance learners of the University have jobs (78 percent). Among these students 30 percent live in villages and small towns, 62 percent are over 24 years old, and 45 percent are married. Moreover, 40 percent of them are female.

The distance programs of Anadolu University are primarily textbook-based and require self-study. In other words, students are expected to study their textbooks at their own pace, alone, and to take scheduled centralized exams administered at remote locations. Textbook-based instruction is also supported with several services including broadcast television programs aired by a state channel throughout the country, video and radio programs distributed on cassettes, CDs or DVDs, remote evening classes, and computer-supported learning environments. The

rationale behind this sort of an instructional approach is common to all open and distance learning initiatives in emerging countries. These are based on (1) outreach to as many learners as possible in cost effective ways, and (2) providing alternatives for learners' limited access to the other technologies including VCRs, computers and even television broadcasts. Figure 1 reveals that distance learning is a necessity for Turkey rather than a convenience owing to the shortage of higher education institutions and the increasing demand for education. Since printing and mailing do not cost as much as advanced technologies, Anadolu University is able to accept thousands of learners every year into its programs. In addition, recent figures show that the majority of distance students cannot access computers and other technologies, despite the improvements in technology distribution. For instance quite a number (30 percent) of the current distance learners of the University live in rural areas where they have difficulties receiving television broadcasts, especially the channel that airs the University's programs. Also, the percentage of students who own a computer and have Internet connection at home is even lower. This situation is related to the home computing ratio in Turkey. In general Figures show that only around 12.5 percent of the population has computers at home and only 7 percent have an internet connection (TUBITAK, 2000). Although the number of students who are able to access the Internet at work or in Cyber Cafés is growing, students are having difficulties (such as heavy work conditions and high costs) using the Internet for learning. Thus, the majority of Anadolu University's distance programs are still textbook-based. The number of learners in online (only 2 percent of all learners) and hybrid (10 percent) programs is quite limited despite the improvements.

Currently there are about 400 textbooks used at the programs. All are designed and produced in-house. The University has modern printing facilities where these textbooks and other print materials are printed. The total number of textbooks printed at the beginning of 2004-2005 academic year was more than 3 million copies.

Anadolu University has also its own television program production and broadcasting facilities. Around 4,300 television programs have been designed and produced in the Educational Television Centre (ETV) since it was first establishment in 1982. The centre, supported with editing and post-production units, has two production studios and a mobile production vehicle. Currently 165 technical and administrative staff is employed in the centre. The University just recently launched its own television channel, entitled TVA. However, it is a local channel and is not eligible to air the programs according to the legislations. So, the University broadcasts nationwide six hours of programming everyday (total around 900 hours of broadcasting every academic year) on Channel 4 of the Turkish Radio and Television (TRT4) Corporation. Learners in Turkey may also acquire videocassette or VCD/DVD formats of these programs with a minimum charge for shipping expenses, while those in Europe get this service free owing to the fact that they cannot watch TRT4 where they are. In addition, Anadolu University in collaboration with the TRT4 offers live broadcasting three times in a year just before the centralized exams. During those live broadcasts, learners may reach the instructors in the studios via phone and ask their questions.

For certain courses, academic support is also provided via face-to-face lecture sessions. The University has agreements with local universities (currently 38 universities) in 59 provinces of the country to hire their personnel and facilities to offer these lectures to its learners. The lectures are given during the evenings (after work hours) and weekends. Every year approximately 20.000 learners regularly attend those lectures.

Student success is determined by multiple choice tests. Each academic year, a mid-term, a final and a make-up exam are centrally administered to the students to evaluate their performance in the courses. The weights of these tests for the final grade are 30 percent and 70 percent. An average score of 50% is required in order to "pass" a course. The students who fail are given an opportunity to recover their final test score at a make up exam. Exam papers are graded by computer and the results are delivered either by mail or through the Internet. The Centre for Research in Testing of the University is responsible for the preparation and maintenance of a question data bank for the exams. Tests are prepared at this centre by a joint committee of authors/editors, field experts, technical consultants and scientific assessment specialist. Those scheduled exams are administered in 88 provinces in Turkey and 11 centers in Europe. The University usually uses 55,000 classrooms in 4,000 buildings and hires 50,000 personnel (local teachers, school staff and administrators, transporters, etc.) to administer the exams.

Furthermore, Anadolu University provides administrative support to its distance learners through its 84 offices in 77 provinces of the country. Those offices are run by the University's own staff (total 335 staff) and almost all the properties of the offices are owned by the University. In addition, learners may reach the University via email and phones to receive help for their administrative and technical problems. In terms of social support, the University encourages the learners to attend graduation ceremonies and local events organized by the administrative offices. Moreover the University has an online weekly newspaper that gives news and recent developments in the University.

On the other hand, critics of Anadolu University's distance programs essentially focus on its centralized structure and the number of the learners (e.g. Cagiltay, 2001). The assessment system, fixed programs, lack of interaction, and widely felt sense of isolation are the most frequently criticized aspects of the programs. Also, the

credit given to the distance learning programs is still low in Turkey. Askar (2005) reports the results of a study in which she interviewed learners and faculties about distance learning. She found out that both learners and faculties regard distance learning as a chance for those who have no other options, and that it is not an alternative but a supplement to conventional universities. Moreover, high drop out rates as a common characteristic of distance education learners prevails also in Anadolu university distance programs. The overall drop out rate of the system is 40 percent and most of the dropouts are observed in the first year of the study.

Anadolu University takes these or similar criticisms into consideration and so, has always been in search of bringing new technology into its programs. Therefore, since early 1990s, the university has been trying to integrate computers and computer-based technologies into its distance programs. As a result of this continued search, authentic ways of technology utilization for distance learning have been generated over time. For instance, the university has been providing opportunity to its distance learners to email their questions to the content experts. Additionally, since early 1990s, the learners have been able to use multimedia programs produced by the Computer-Based Instruction Centre of the University. During the first years, these programs were delivered via CDs but currently they are on Internet available to all learners who have valid student IDs. Furthermore, since 2000 the learners may choose to take online self-tests in order to learn how they are ready for the exams.

Instrumentation

A three part questionnaire was developed to gather data about the research questions. The first part included questions about demographic characteristics of the learners. The second part helped to learn both frequency of the learners' online services usage and their willingness to take their courses online. The last part contained the Self-efficacy for Online Technologies instrument originally created by Miltiadu. The Self-efficacy for Online Technologies instrument items were divided into four categories, each of which represented one subscale (1) web surfing, (b) synchronous interaction, (c) asynchronous one-to-one interaction, and (d) asynchronous one-to-many interaction. This instrument was first adapted and translated into Turkish. Later, it was checked and corrected by one language expert and two educational technology experts, both of whom had graduate degrees earned in the States so that have enough English competency along with knowledge about the field of educational technology. No data was available concerning the reliability of the Turkish version of the instrument prior to the study. The reliability coefficient was calculated, however, after the administration of the instrument. The Likert type instrument consisted of 30 items. Each statement was preceded by the phrase "I feel confident…" For each item, students were asked to indicate their attitude from "Strongly Disagree", "Disagree", "Neural", "Agree", to "Strongly Agree." The 3.41 mean score identified as the expected level of self-efficacy with the item while other responses enabled learners to show higher or lower levels of self-efficacy. The 3.41 mean average was determined after identifying the critical level: 4 intervals/5 categories = 0.8.

Procedure and Data Analysis

The study was conducted in May 2004. The questionnaire was distributed to the learners who came to join face-to-face classes in Eskisehir just before the classes started. The learners were asked to return the questionnaire at the end of the class. The mean scores, standard deviations, t-tests and ANAVO analyses are used to interpret the data gathered via the instrument. SPSS reliability analysis (Cronbach's coefficient alpha) showed that the reliability for the Self-efficacy for Online Technologies was .9461.

<div align="center">

Results and Discussion

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The reporting of results and discussion is organized into five sections. The first section discusses the reliability of the survey instrument. The second section reports results for the first research question, extent of the learners' readiness for online learning; while the third section summarizes results for the second research question, extent of the learners' willingness for online learning. The forth section uncovers how often the learners use the online services that Anadolu University provides. And the last part reveals whether or not the learners' readiness and willingness for online learning differ according to their gender.

Reliability of Analysis of the Instrument

Examination of the experts, literature and theoretical constructs were used to determine the content and construct validity of the survey instrument. According to the Cronbach's Alpha analysis, the reliability of instrument was found overall to be quite high (0.9462). The reliability for the Self-efficacy for Online Technologies was higher (0.9461) than the reliability of the frequency of using online services (0.7069).

Readiness for Online Learning

     The first research question concerned about extent of the learners' readiness for online learning. The Miltiadu's Self-efficacy for Online Technologies instrument used to gather data for this question.

Table 1 Descriptive statistics for Self-Efficacy for Online Technologies

Subscales	N	M	SD
Web surfing	266	3.4872	0.9018
Synchronous interaction	264	3.5619	1.0249
Asynchronous one-to-one interaction	264	3.6224	0.9477
Asynchronous one-to-many interaction	261	3.1731	0.9942
Overall	266	3.4606	0.8331

Table 1 illustrates the overall mean scores of the participants' responses and the mean scores of items related to each subscale. From the table, it can be observed that the overall mean score is slightly higher than the expected level of readiness (M_o=3.46 > M_{er} =3.41). Based on this result, one can infer that learners in the traditional distance programs, within the limits of the learners surveyed, are barely ready for online learning and definitely need to improve their online technology skills. They especially need to improve their asynchronous one-to-many interaction skills because the mean score for this subscale is not only the lowest but also lower than expected level of readiness ($M_{asOne2many}$=3.46 < M_{er} =3.41). Since collaboration among learners have been considered one of the essential components of an effective online learning course (Carr-Chellman & Dushastel, 2000), this skill can be considered as being very important to be able to be a successful online learner. So, those learners who are planning to attend online courses should improve their online discussion skills and the administrators should find ways to help learners on this issue in Turkey.

Willingness for Online Learning

     The second research question focused on extent of the learners' willingness for online learning. The participant learners were asked to indicate their intent to take their courses completely online. Figure 1 shows the overall frequency and percentage of the learners who would like to take their distance courses online. As can be found in the table, more than half of the learners (51.7%) indicated their intent to take their courses online.
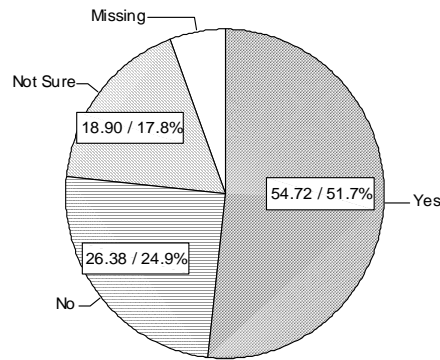
Figure 1: Learners' willingness for online learning

Frequency of Using Non-Compulsory Online Student Support Services
As mentioned before, Anadolu University provides several online support services to its distance learners: (1) using web sites to learn exam results, (2) interacting with course coordinator(s) via email, (3) taking online self-evaluation tests, and (4) studying the multimedia learning materials on the net. The learners were asked to indicate their frequency of using these services.

Table 2 Descriptive statistics for learners' frequency of using online support services

Online Support Services		Frequencies				
		Never	**Barely**	**Sometimes**	**Often**	**Always**
Learning the exam Results	F	25	39	15	39	150
	P	(9.3%)	(14.6%)	(5.6)	(14.6%)	(56%)
Interacting with course coordinator	F	193	11	26	17	19
	P	(72.5%)	(4.1%)	(9.8%)	(6.4%)	(7.2%)
Taking online self-evaluation tests	F	120	25	37	45	40
	P	(44.9%)	(9.3%)	(13.9%)	(19.9%)	(15%)
Studying multimedia materials	F	128	31	32	48	26
	P	(48.3%)	(11.7%)	(12.1%)	(18.1%)	(9.7%)

As can be observed in Table 2, the majority of the learners do not often use some of the online services, such as using e-mail to interact with course coordinator(s), taking online self-evaluation tests, and studying the multimedia learning materials on the net. However, quite a number of them frequently use the Internet to learn their exam results.

Gender Differences about Readiness and Willingness for Online Learning
The last research question of the study examined the differences occur in the learners' overall readiness and willingness scores for online learning due to their gender. The independent sample t-test analysis and chi-square analyses have been conducted to see of gender makes any difference in the participant learners' readiness and willingness. According to the results, the male learners scored higher than female counterparts overall and also in every subscale. However, there were no significant differences between the female and the male learners' readiness levels as well as their willingness for online learning.

Discussions and Conclusion
This study was investigated readiness and willingness of the learners in the Anadolu University's traditional distance courses for online learning. One of the major results of the study was that the participant learners' perceived self-efficacy levels for online technologies was (3.46) just a little bit higher than expected level of self-efficacy. In other words, in general the participant learners neither have a high level nor low level self-efficacy for online technologies. Since literature suggests that learners' self-efficacy levels positively correlated with their learning and satisfaction in an online course, it can be drawn that the distance learners of the University who would like to attend online courses should improve their online technology skills, especially online collaboration competencies. Additionally, the University or the similar online learning providers should provide opportunities for these learners to improve their online technology skills before starting an online course. Furthermore, the half of the learners have indicated their willingness to take their distance courses online while only a quarter of the learners stated their unwillingness. Others were not sure. The researcher has a feeling that the majority of the learners who indicated their unwillingness or who were not sure had no idea about online learning. So, if online learning would be introduced to these learners, they might change their thoughts about participating online courses. Moreover, the study has shown that quite a number of learners do not often use the online services, such as using e-mail to interact with course coordinator(s), taking online self-evaluation tests, and studying the multimedia learning materials on the net. However, they frequently use the Internet to learn their exam results. This result can easily be related to the goal

orientation of these learners. Unfortunately, earning a diploma is more appreciated than learning new knowledge, skills and attitudes for the majority of the distance learners. So, these learners focus on passing the exams rather than learning. Also, this result can be inferred as that building is not enough. The administrators and designers should also think of components that encourage learners to get benefit of these voluntary support services.

On the other hand, the learners' access opportunities to online technologies have increased over the last year. Additionally, more talented learners are entering the distance learning. Maybe, now the number of the distance learners who use the online services is also raised. So, it might be beneficial to repeat this sort of a study continuously to get a feedback for the implementations of the University. Also, conducting with a larger group of learners may also provide better insight about the issue.

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The Usage of Internet Communication Technologies by Low-Income High School Students in the Completion of Educational Tasks Inside and Outside of the School Setting

Eun-Ok Baek
Seth Freehling
California State University San Bernardino

Abstract

This qualitative research study examined the use of Information and Communicative Technologies (ICT) complete assigned and unassigned homework outside of the traditional high school setting by high school students from economically-disadvantaged households. Student participants in the interview phase ascribed their choice of using ICT to be attributed to the ease of use and the perception that utilizing ICT as a resource resulted in tasks being accomplished at a quicker rate. The multi-tasking capabilities of computer technologies were found to be the key facilitating as well as hindering factor in student use of ICT outside of the school. The use of ICT as a supplemental resource in the completion of traditional homework assignments was a notable pattern in the findings.

Introduction

With the increasing prevalence of Internet access found within the modern classroom and the more recent trend in households of students from low-income backgrounds having access to online resources, the ability to exploit this powerful educational tool is within the reach of many students inside and outside of the classroom. The trend of declining computer prices by an average of 16.5 percent annually (Nomura & Samuels, 2004) has allowed many students from economically disadvantaged backgrounds to bridge this divide and take advantage of online access from within their households.

Gaining an understanding of how high school teenage students use the Internet as a resource in order to complete homework assignments will generate data that can be used by the classroom teacher in order to design independent out-of-class assignments that support well-designed curriculum-based lessons. Moreover, an understanding regarding the support requirements that are required by the student when using online resources at the household will help gain maximum usage out of a student's instructional time outside of the class. Therefore, it is alarming that those students who have this resource available at school and at home are performing worse than peers that do not have computers at home (Woessmann & Fuchs, 2005).

Like its instructional media predecessors, a contrast exists between the anticipated benefits of Internet technology and the actualized benefits this technology is currently having upon educational practices (Reiser, 2002). With this in mind, the purpose of this project is to develop an in-depth portrait of the home Internet usage of high school students for the educational task of the completion of school assignments. In an effort to achieve the means to the development of strategies and resources along with justifying the proposal of offering school-based computer help, this study addresses three questions:

What is the frequency and contributing factors leading high school students to choose the Internet as an instructional resource in order to complete class assignments at their home?
What are the usage patterns of students using the Internet to complete assigned and non-assigned schoolwork outside of the traditional school classroom setting?
What are the factors that influence students' home Internet usage in the completion of assigned tasks? Specifically, what are the factors that facilitate or hinder high school students from the completion of educational tasks when utilizing the Internet at home?

Theoretical Background

The Narrowing Digital Divide

The term Digital Divide was coined in the early to mid-1990s in response to a large portion of the population not having computers and subsequent Internet access. This divide was attributed to the large cost associated with computer ownership and the infancy of Internet access that resulted in much content aimed primarily at scientists and researchers (Wilhelm, Carmen, & Reynolds, 2002). Presently, with the low-cost of computer ownership and the growing build-up of computer hardware in public schools, current government literature argues

that this Digital Divide between the economic classes has become increasingly insignificant. This can be judged by comparing the titles of the U.S. Department of Commerce, Economics and Statistics Administration, and National Telecommunications and Information Administration's October 2000 report entitled: Falling through the Net: Toward Digital Inclusion with the February 2002 report: A Nation Online: How Americans are Expanding Their Use of the Internet. The United States is not the only culture bridging the digital divide. Woessmann and Fuchs' (2004) research involving responses from 32 developed and emerging countries found that 43 percent of students polled had access to the Internet at home.

Computer ownership, specifically with Internet access, at home helps the student academically in a multitude of ways. Levin and Arafeh (2002) found that students who have access to the Internet at home come to rely on the technology to help them do their schoolwork and complete tasks more quickly. The researchers also found that students get less stymied by material they do not understand, and students write papers and reports that draw upon up-to-date sources. Students in Levin and Arafeh's study were also observed as greatly utilizing the Internet as a form of communication with other classmates. The students in the study were found to correspond with other classmates about homework, quizzes, and share websites that were helpful in their studies. Further benefits of home computer use can be seen by students getting better grades, watching less television and spending more time online (Landgraf, n.d.).

Current Trends in Teenage Online Habits

Of students' favorite Internet pastime, online gaming was found to be most frequently used aspect of ICT by teenagers (Nachmias, Mioduser, & Shemla, 2000). This was also found to be true in a study conducted with slightly older post-secondary students responding their most frequent use of ICT was for recreational endeavors (Murray, Hourigan, Jeanneau, & Chappell, 2005). After online gaming, high school students reported using email and participating in online chat sessions as preferred online activities (Turow, 1999). Notwithstanding the uncontested exploitation of ICT by teenagers for recreational activities, there exists evidence that students are taking advantage of ICT for the completion schoolwork. In Murray et al.'s (2005) research involving post-secondary students, over 90 percent of the participants claimed they had utilized the Internet as a learning tool.

Current literature suggests that students use ICT resources more frequently outside of the school setting than during the traditional school day (Papastergiou & Solomonidou, 2005). With the digital divide narrowing and allowing for ICT access at an unprecedented pace, this should not come as a surprise as it is generally accepted that most student learning takes place outside of the classroom in areas such as the home, cultural events, television, family interactions, and travel (Nachmias et al., 2000). Millard also concluded in 1997 that ICT access at home played a more significant role in educational pursuits than access at school.

Teacher Perceptions and Influence upon Information Communication Technologies

The evolution of ICT use within education has led to a body of research regarding teacher perceptions and attitudes towards using the Internet as a supplemental resource. Perceptions and subsequent use is described as an evolving process and is described by Hsu and others (2003) as being dynamic, changing from entry, adoption, adaptation, appropriation, to invention. Complex demands on technological resources and the inherent nature of the school exhibiting tight control over learning have impacted the perceptions and attitudes of teachers' view of using ICT. Teachers' views that students from low-income backgrounds do not have adequate Internet access inside and outside of the school setting plays an important role in decisions regarding their assigning schoolwork and homework that utilizes the Internet. Research conducted by Levin and Arafeh (2002) found that teachers were reluctant to assign Internet assignments to be completed outside of the classroom because of teacher perceived such practices as being unfair to those students not having household ICT access.

The teacher's role as the promoter, motivator, and instructor of ICT best practices greatly influence students' educational use of ICT inside and outside of the classroom (Cheung & Huang, 2005). Although a certain percentage of students will always represent students without Internet access available outside of the traditional school setting, teacher perceptions greatly influence ICT use within the class curriculum and subsequent assignments required of students. The availability, training, and use of ICT within the actual school site were found to be an influence upon a teacher's perception and integration of ICT with curriculum (Madden et al., 2005). Teacher perceptions about how students use the Internet also affect how this resource is integrated with the curriculum. An example of this effect is the not assigning of ICT homework because of the perception that students will view inappropriate content while completing the assignment.

The perception that students are more knowledgeable than their teachers is a view that is seen as an obstacle to the integration of ICT within the curriculum (Madden et al., 2005). However, with the evolution of ICT and influx of younger teachers into the profession, this perception may see a reversal. This common perception that

teenagers are more Internet savvy than adults is being questioned. A recent Nielsen study (Baig, 2005) found that teenagers completed specific tasks at lower percentages than adults. In the study, teenagers were only able to complete tasks such as making a DMV appointment and finding concert dates 55 percent of the time, compared with a 66 percent rate of completion by adults given the same task.

Methodology

Participants

This qualitative study was conducted at a secondary school located in a mid-sized city in Southern California. The secondary school is a fairly large, urban high school located in a low-income, older neighborhood with households reflecting a mix of immigrant, transient, and working class residents. The participants of this study were polled from The California Partnership Academy (CPA) programs. This program is a college preparatory course of study, differing only in the elective class chosen by the program administrator. It was established at the high school in 1991. The CPA programs are a state, grant-funded, school-within-a-school concept fashioned after the successful Philadelphia career academies. The primary purpose of this program is to offer students career-oriented training through a three-year sequence of elective courses in the student's career field of interest.

The pool of students for this study consisted of over 248 students enrolled in one of the two smaller learning communities. Students in the Public Safety small learning community consisted of students interested in police work, firefighting, or paramedic careers. These students were scheduled together throughout the school day in the same core academic content subjects. The students in this small learning community received no specific ICT training from the Public Safety teacher and were not given any ICT specific assignments by the teacher. The second smaller learning community consisted of students from the Business Academy. Students enrolled in this program received extensive ICT training and were required to daily utilize these skills in their business elective class. Students in this second small learning community were interested in pursuing careers in business administration and worked toward receiving certifications in Microsoft Office Software products. Participants from both smaller learning communities consisted of sophomores (grade 10), juniors (grade 11), and seniors (grade 12). Freshmen were excluded from this study as students enter the CPA program at the beginning of their sophomore year and remain in the program until graduation as a senior.

The student population in this study had varying degrees of access to ICT during the traditional school day. The high school campus has a robust, reliable computer network. The school's Internet access is serviced by two T-1 lines, and the campus has arranged the network in a VLAN in order to decrease network traffic and boost speeds. Every classroom and administrative office at the school has access to the Internet. Actual student access to ICT within the classroom varies from classroom and teacher. Whilst all classrooms have a teacher computer, it is the norm rather than the exception for this to be the only computer present in the majority of the classrooms; the exception to this norm is the elective, career-specific classes that provide computer specific instruction. However, students not enrolled in these specific computer-related elective courses are not permitted to use computers within these classrooms.

Data Collection

Due to the previously discussed limited ICT access students at this high school encounter, and also to remain within the scope and focus of this qualitative study dealing with how students use ICT outside of the traditional school setting, it was necessary to give a qualifying survey to the potential pool of students participating in the study. For the purpose of this study, participants were required to have the pre-determined qualifying factor of having access to a computer equipped with Internet access at their household. However, if participants had immediate Internet access by means of a friend or relative's household, this would also qualify a participant to take part in the study. Participants having access to the school library, career center, and public library did not qualify as participants of this study due to the mitigating access limitations.

Qualifying surveys were administered to 240 students currently enrolled the two smaller learning communities discussed in the previous section. Although used as a means to qualify participants to take part in the qualitative study, the qualifying surveys provided valuable data. Student participation in completing the qualifying survey resulted in 100 percent of the 240 surveyed participants.

Participant responses were recorded and scored according to participants' response to the second question: *Have you ever used the Internet at home to help you complete a school assignment*. A positive response to the first option (yes) or the third response (no, but I have used a friend's or relative's computer to complete an assignment when I needed to use the Internet) were determined as qualifying responses to participate in the interview phase of the study. Respondents who had immediate access to the Internet at their household represented 140 students (58%) and who had access to the Internet at Friends' or relatives' 28 students (12%) of the total 240 students participating

in the qualifying survey. From the data records of the 168 (70%) qualifying participants, eleven students were randomly selected to further participate in the next phase of the qualitative study. Of these randomly selected eleven students, ten qualified as participants by responding that they had ICT access at their household. The one randomly selected student participant responding to having immediate access at a friend's household subsequently gained household access between the time span of administering the survey and the commencement of the interviews.

Interviews were arranged during the students' sixth period class in agreement and coordination with each individual student's instructor for that class subject. Due to this arrangement, interviews were conducted over a six week period to ensure that students would not miss important instructional material covered while they were pulled out of their class for the interview. In order to eliminate distractions, the interviews were conducted in a classroom not being used for instructional purposes during this class period. Interviews with the participants lasted approximately twenty to thirty minutes. The participant interviews were tape recorded to ensure the development of accurate transcripts of student responses and for validation purposes. Upon the completion of the final interview, and a preliminary analysis of the typed transcripts, follow-up interview questions were developed for the eleven participants so as to deal with clarifications as well as investigation into areas not considered in the development of the original interview questions. Follow-up interviews were briefer, averaging approximately five to ten minutes in length.

A preliminary analysis of original participant interviews and subsequent follow-up interviews led to the necessity of developing an open-ended questionnaire to be administered to teachers at the high school. This questionnaire was administered to four teachers identified in student interviews as teachers that encourage or engage students in ICT use that led them to use ICT outside of the teachers' classroom. Due to time constraints and scheduling difficulties, the questionnaires were sent as attachments via email. All four identified teachers participated in responding to the questionnaires, returning completed questionnaires via email.

Student interview transcripts were validated by the interviewees to ensure accuracy of responses and to eliminate erroneous inferences by the researcher. The same procedure was followed for student follow-up interviews. This validation process was unnecessary for the written responses generated by the email attachments for the teacher participants.

Data Analysis

A content analysis was conducted on the original interview responses by the eleven participants. Subsequent follow-up interviews were also analyzed in the same manner. Teacher questionnaires were originally analyzed independent of student interview responses in original and follow-up interviews. A subsequent analysis of teacher responses was conducted collectively with student responses in regards to the research questions.

Data were first analyzed in conjunction with the original three research questions. Participant responses were codified and evaluated using conceptual analysis within the structure of the three original research questions. This conceptual analysis involved all three sets of data: original student responses, follow-up questions, and teacher responses. Upon the completion of the conceptual analysis, a relational analysis was conducted upon the three sets of data external of the three original research questions. This approach was undertaken in an effort to identify themes, trends, and patterns not originally considered by the researcher in the framing of the original questions in regards to ICT use by students outside of the classroom. Upon completion of the conceptual and relational analyses, concepts and subsequent inferences derived from the two analyses were peer reviewed to ensure the validity of the findings. This peer review was conducted by a teaching colleague working at the same school site in a separate academic department. The peer reviewer was knowledgeable about ICT use and was considered to be a technology advocate for students at the school site.

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Results & Discussion
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Frequency of Students' Use of ICT

According to the student participants in the qualifying survey, as stated in the Participants section in the Methodology, .70 of these students have ready and immediate access to the Internet at home or have access at a friend or relative's household. The frequency of home ICT use for the completion of schoolwork varied amongst the participants of this study. Answers varied from using ICT everyday to using this resource, on average, once a week. However, all participants interviewed stated that they use the Internet outside of school at least once a week for the completion of a school-related assignment or task:

[I use the Internet] a few times a week. Two, three, or four times (S3).

A few students commented that they daily use ICT in the completion of schoolwork. One student, an English language learner, commented:

Almost everyday I use the Internet to help me with schoolwork (S6).

This high frequency of ICT use was also seen in the one student interviewed that did not have Internet access at home, but would go to a friend's house or the public library:

I say at least 3 to 5 school days because I am always on the Internet working on school stuff (S4).

Contributing Factors Leading to Student ICT Use

Contributing factors determining student use of ICT outside of the classroom can be classified into two categories: 1) assigned ICT explicit schoolwork and 2) assigned schoolwork implicitly lending itself to ICT uses. Schoolwork falling into the first category contributes to student use of ICT depending entirely on the possibility of students being enrolled in a particular instructor's course that assigns such work. The second category is dependent upon a student having knowledge regarding the availability of resources readily obtainable as they are attempting to complete a particular assignment not explicitly lending itself to ICT use.

Term papers assigned by history teachers and English teachers were the most common of the explicitly assigned ICT homework documented in this study. Junior students in the study were in the last stages of completing their history term paper:

Mr. F's history biography report was the last assignment that I used the Internet. I don't think I could have done the report without the Internet because that was where I got all of my information from. I used the Internet for all of my work. If you are doing any report, your outline will always have sources that you have got from the Internet. (S4)

Assignments that were not explicitly assigned to be completed using ICT were identified as those assignments that could be completed in a quicker manner using these technologies as well as homework assignments that were considered difficult and needed further explanation to the student before the task could be successfully completed. Several students identified a homework assignment from their economics course that involved the tracking and recording of stock market data on a weekly basis over the period of one academic quarter. One participant explained that ICT was chosen over the traditional method of accessing stock data via the newspaper:

Ms. A had us pretend that we were investing money in the stock market. She had newspapers [in the classroom], but if we wanted to, we could use the Internet. I used yahoo. She did not give any sites or support if we decided to use the Internet (S5).

The ease of setting up an online stock portfolio that was automatically updated in real-time was explained by another student who was taking the course from this economics teacher:

In econ, the assignments related to stocks. The stock [assignment] is where we go online and find the high and low of the stocks and then sell stocks per share. I preferred to do it online because it's easier. I didn't have to look it up [in a newspaper], I have it set-up on my account (S3).

Teachers surveyed in the study were not reluctant to assign outside ICT projects with teacher responses indicating a belief that students will overcome obstacles to complete teacher-assigned ICT tasks. This finding is contradictory to the conclusions found by Levin and Arafeh (2002). This contradiction may be attributed to the manner that the identification of the four teachers surveyed in the study were chosen based upon student responses identifying them as teachers giving them assigned ICT homework. However, such attitudes lending themselves to the belief that motivated students will find ICT access in spite of not having access at their households may place students from low-income households at an unfair advantage.

A student's desire to excel and successfully complete assignments were also contributing factors for a student choosing to use ICT as a resource when not explicitly assigned to do so. Finding samples of math problems was once such case:

One math assignment I had was hard, so I went online and it guided me step-by-step on how to use it. I used AOL and went to the homework help section. My friend told me about the AOL section in middle school. I have been using it ever since, when I need help (S3)

The ability to view a large amount of material including explanations and samples is also seen in other academic subjects outside of mathematics. Frustrated with an English unit, and attempting to understand Macbeth, one student explained:

I just went online and got a summary of the story so that would help me on tests. I did a Google search on Macbeth to help me find a few good web sites (S9).

As well as speed, many participants felt the relative ease of using the Internet was a contributing factor leading them to choose ICT as a resource when at their households:

All yeah. It's easy, it's fast. I know a lot so I can find a lot of the same thing in different categories (S6).

This contributing factor of ease of use is no doubt a reflection on the amount of experience using this resource that this generation of students has attained since entering elementary school.

Usage Patterns of Students Using ICT to Complete Assigned and Unassigned Work

The usage patterns of economically-disadvantaged students in this study yielded findings that students are using personal, web-based email accounts as an educational resource. Student use of email was found to occur as a means to email teachers assignments, collaborate on group assignments, and use this technology as a file storage system. Student participants in this study do not have a school-based email account, leading to the use of web-based email systems such as Yahoo, Gmail, or hotmail.

Student use of email to correspond with teachers does not appear to be a common pattern in their usage. Only one respondent claimed to have emailed their teacher:

> We had to use the internet to email our teacher, Mrs. W. so that we could get our homework. I checked the email at home and at school (S8).

This finding is surprising considering the responses by most students in the study responding that email usage was their most frequent use of ICT at their household:

> I find myself checking my email mostly. It's the first thing I do when I'm at home or whenever I use a computer at school (S3).

The use of search engines in order to complete schoolwork was a recurrent theme in student ICT patterns of usage. Students mentioned using a variety of search engines as a major part of completing schoolwork at home. Search engines that were commonly mentioned included: Google, Yahoo, and Ask Jeeves. As a repeated activity, students positively responded that searching was a major ICT activity undertaken to complete schoolwork at home:

> I have been spending all my time working on the term paper for Mr. F. I looked up the years, the timeline. I went to Google to find the timeline (S2).

The use of search engines was identified as a major area of ICT use outside of the classroom. Student participants were confident about their abilities to conduct searches and generate the desired results in order to complete home work. This finding supports the finding by Fallows (2005) who found a large number of respondents, 92 percent, reporting high levels of confidence using search engines. Teacher involvement in instructing students on best practices when conducting searches was evident in the respondents. There is evidence that this ICT skill is being taught within the classroom curriculum in earlier grades such as middle school and perhaps even at the elementary level.

> Along with the pattern of the frequency of using search engines, student participants were generally confident about their ability to search and their effectiveness in finding what they were tasked to find. Along with confidence, students were quick to describe their searching strategies. Specifically, strategies were discussed when students did not get the desired search results that were needed to complete an assignment. Rewording searches was not the only pattern observed. Students also cited switching search engines in an effort to achieve the desired results:

> If one [search engine] doesn't work, I will just use another one. Like if Yahoo doesn't work, I'll use Google. I'm not really into getting into something deep (S4).

Unlike email skills, teachers were attributed with being the driving force behind students' acquisition of Internet search strategies:

> …back then, in middle school, teachers taught us how to do these things (S2).

> I learned this [search strategies] from all my teachers. But mostly from Mrs. W, my English teacher, and Mr. F [business teacher] (S8).

Like email and the utilization of search engines, students are utilizing a variety of ICT educational resources as supplements to complete homework. Moreover, these supplemental resources are being utilized without teacher direction or encouragement. One such supplemental resource is the use of online dictionaries. Many students interviewed discussed their use:

> I have a list of links saved in my favorite's folder like dictionary.com a thesaurus site (S6).

The use of chat rooms and message boards do not presently appear to be exploited by high school students, however, it is worth noting that students are aware of this resource and discussed how it is being used by other students:

> I post on a message board, and I see that a lot of kids are going there for [school] help. I remember just the other day, a girl was doing an assignment on Macbeth, and she wanted us to help her write an obituary for one of the characters. Or they ask for help to find research material that they couldn't find themselves, and they ask if we could help them find it. This is something that I have noticed on this board recently. I have seen this done on other boards, but you would have to search for them. I will probably use this resource in the future because it is convenient and right there in your home (S5).

Factors influencing Students' Home ICT Usage: Facilitators and Hindrances

The major factor facilitating students' use of ICT recurrent in interview responses was the positive view that the

Internet was a tool that aided them in completing work in a quicker and easier manner than traditional educational resources. This positive view is explained by a student:

> It [ICT] makes it so easy to complete homework. I wish all of my teachers would give more assignments that I do at home on my computer (S4).

This high degree in the level of confidence expressed by the student was a recurrent theme in the majority of student responses to feelings about ICT use. Likewise, students expressing a high degree of confidence in using this tool can be seen as a major facilitating factor driving students to utilize this resource:

> As soon as teachers give an assignment, I'm glad that I have the Internet. The Internet is reliable. I see it as it's there for you to learn (S4).

Teacher instruction and direction in best practices regarding Internet use is seen as also a causing factor to these high levels of confidence

> Yes I do [feel confident] because my teachers show me how to use the computers very well (S8).

In spite of past experiences and teacher instruction, the majority of participant interviewees responded that they desired more support and help from classroom instructors. Commenting on the history term paper, one student noted a desire for more specific support:

> Mr. F did not help us on how to use it. He only showed us how to do the works cited page. I would like more help because it would be easier and quicker, and that is how you get by these days (S4).

However, participants expressed doubt about teacher expertise and experience to provide them with the ICT support they needed:

> If they know how to use it then yes, I would like support. But most of the teachers don't even know how to use it themselves. This is because they are older and have been using what they have been teaching with themselves. This is just new to them (S5).

Teacher respondents also supported this finding that instructional time was not devoted to support or the teaching of best practices in the use of ICT. The math teacher surveyed suggested a desire for students to learn independently:

> I teach them some key words to search for to find the things that are applicable to their business. I do not tell them too much since I want them to be creative and to have to find the terms that they need (T2).

The findings by research (e.g. Nachmias et al., 2000) regarding the overwhelming use of ICT for recreational activities by high school students, was also found to be a recurrent them in student interview responses. However, the ability of high school students to utilize these recreational attributes of ICT whilst concurrently working on school assignments is another facilitating factor in students' choice to use ICT resources to complete homework. The multi-tasking capability of listening to music whilst working on school-related assignments was a recurrent theme:

> It's like you can open up Media Player and listen to your music at the same time as you do the work. That's what I like about it (S11).

However, listening to music, a desire to play games, and going to unrelated websites were other areas of distraction identified by students as hindrances to completing homework. The ability to play an interactive game whilst doing homework was also explained as a multi-tasking function:

> Games also distract me, I like Pogo. I am tempted [to play], and I have two windows open so that I am doing two things at the same time (S9).

Conclusions & Recommendations

The qualitative study conducted at this large, urban high school supports the assertion that the Digital Divide is narrowing amongst the social classes. This assertion was confirmed at this particular high school illustrated by the majority of students surveyed responding positively to possessing immediate Internet access from their household or having immediate Internet access at a friend or relative's household. The trend of growing home ICT access within this population of students from economically-disadvantaged households has positive implications on the education system as reflected by research studies reviewed previously in this paper. The finding that .70 of low income students in this study having access to the Internet outside of the school setting is a positive trend within this economically challenged subgroup of students. With such data, individual teachers will have to determine the appropriateness and fairness of assigning homework that specifically requires the use of ICT. However, the finding that the majority of high school students are online at their households should be a catalyst to provide best practices for using ICT as a supplemental resource to their instructional practices.

The use of ICT as a supplemental resource to aid the high school student in the completion of assignments not explicitly assigned to be completed using this resource provides opportunities for instructors to teach strategies and best practices in exploiting these supplemental resources. Student effectiveness using these resources should

first be studied and analyzed in an effort to identify strengths and weaknesses of each particular resource. For example, best practices in the use of email as a collaborative tool is one such resource that has potential to be exploited by educators in the completion of a multitude of assignments.

The findings related to the consensus of teacher attitudes regarding the explicit assigning of ICT-related homework need further investigation. The four teachers surveyed at this high school were identified by student interviews as being teachers who assigned ICT-related homework and projects that could not be accomplished during class time. Therefore, the confidence by these teachers that students can overcome obstacles and that self-motivation will lead students to find ICT access outside of the classroom needs further study. Likewise, studies involving multiple high schools from large, urban and economically-disadvantaged neighborhoods are needed to study these teacher perceptions and beliefs. Studying teacher beliefs regarding student ICT use would also ascertain if pre-conceived notions lead to the hindrance or facilitation of the support of student use of ICT as a supplemental resource at their households.

The ability of students to manage home computers and maintain the operability of software and operating systems can be attributed to skills learned in graduation-required computer literacy courses. The skills learned in these courses, and other teacher instructed lessons have contributed to the elevation of the high school student in the household as the responsible party for the upkeep of the family computer. As trends call for the elimination of such courses and place the teaching of ICT skills within the core content curriculum, valuable computer maintenance skills and Internet security strategies may not be gained by these responsible students. The continued offering of these courses and this important component within the curriculum is needed.

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Turkish Teachers' Experiences In Online Professional Development Environment

Bahar Baran
Kursat Cagiltay
Middle East Technical University
Ankara, Turkey

Abstract

This paper aims to explore teachers' opinions on traditional professional development (PD) courses and their experiences from an online course. For this aim, a qualitative research was designed and 10 teachers from a private school evaluated the learning process after the course. A focus groups discussion and individual interviews were performed to collect data. According to results of our research, the teachers generally emphasized the lacks of practice in both traditional and online courses. The results of this study can be used as lessons learned by designers and decision makers wanting to develop online professional development environment.

Introduction

Since our future depends on especially teachers, their professional development (PD) is significant. From years, lots of PD projects were arranged with different aims on the world. For instance, Department of In-service Training under Turkish Ministry of Education (MNE) offered 428 courses for only 22.398 personals. That is, only a small group teachers over 600 thousand teachers could benefit from those courses in 2004 (MNE, 2004). While whether or not these projects are sufficient for teachers life long learning can be discussable topic among educators, these projects were also evaluated with different perspectives by researchers. At the result of the studies, it could be seen clearly that professional development improved teachers' instructional skills (Borko & Boulder, 2004). However, there is some dissatisfactions from professional development programs. Although generally teachers are willing to participate in PD programs, they also reported problems (Ozer, 2004). Gabriel (2004) describes lacks of professional development as 1) Top-down decision making, 2) The idea that teachers need to be "fixed", 3) Lack of ownership of the professional development process and its results, 4) The technocratic nature of professional development content, 5) Universal application of classroom practices regardless of subject, students' age, or level of cognitive development. 6) Lack of variety in the deliver modes of professional development, 7) Inaccessibility of professional development opportunities, 8) Little or no support in transferring professional development ideas to the classroom, 9) Standardized approaches to professional development that disregard the varied needs and experiences of teachers, 10) Lack of systematic evaluation of professional development, 11) Little or no acknowledgement of the learning characteristics of teachers among professional development planners (pp.2-4).

Each of talked problems guided researchers to search new approaches for teacher training. Schaler and Fusco (2003) stated, "Teachers professional development is more than a series of training workshops, instates, meetings, and in-service days. It is a process of learning how to put knowledge into practice through engagement in practice within a community of practitioners" (p.205). In the last decades, Wenger (1998) has proposed communities of practice as a social learning theory which took attention of educators a lot too. Communities of practice is defined as "groups of people who share a concern, a set of problems, or a passion, about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis." (Wenger, 2002, p.4). The application of the theory in teachers' professional development has taken considerable attention of educators, recently.

Today, teachers' life long learning needs and dissatisfactions to traditional courses are taken into consideration, a training serving lots of teachers and providing time-place independency as social learning environment can be seen as future of the teacher training. Indeed, this type of training comes to educators the concept of "online professional development".

Although most of the teachers use computers daily, they prefer to use technology to make their daily life easy instead of using instructional purposes. They do not adapt technology sufficiently owing to their students' demands (Molenda & Sullivan, 2002). Teachers are generally considered as late adaptors because they met the technology late. Therefore, also, participating in online professional development enhanced with technology may change their attitudes, frequency of use and form of use technology.

The Purpose and Research Questions

In the light of teachers' professional development needs, a research project based on online teacher training has been designed. The research project in underway has two phases. The aim of the first phase of the project is to develop an online learning module for teachers' professional development, while the aim of the second phase is to provide practice sharing among teachers by interactive communication tools in an online environment. This study focuses on experiences on the first phase. Designed online learning module fits Clark and Mayer's first type "Receptive: information acqusion" (p.28). That is, it provides information to teachers. We hope that the results of the first phase will light the way of other online training projects for teachers' PD because the lessons learned from the first part will present informative findings.

The purpose of the study is to explore teachers' opinions on traditional PD courses and teachers' experiences in an online course. To achieve this aim, we discussed the teachers' prior PD experiences, comparison with traditional and online learning experiences, their evaluation of the online learning module and finally their expectations from online courses. So, the research has 3 main research questions. These are

How are in-service teachers' past experiences on professional development?
How are in-service teachers' experiences in an online professional development environment?
What do the teachers think about online learning?

Method

This methodology section contains the research method employed in the study. Especially the type of qualitative tradition, participants, context, data collection and process of data analysis will be presented.

Type of Qualitative Tradition

To make and in-depth analysis of ideas of teachers related to their professional development, mainly a qualitative research methodology as a scientific research method was used by the researchers. Therefore, the researchers tried to present whole picture of the environment related to the research questions. The study have five characteristics of the qualitative research as naturalistic, descriptive data, concern with process, inductive, and meaning (Bogdan & Biglen, 1998, p. 4). The study was intended to emerge rich views of teachers. The researchers tried to emerge some covered facts on teacher experience in an online learning environment.

Participants

The school and the teachers were selected intentionally by the researchers. Firstly, the school to be studied was selected. The researchers preferred to study in a private school because of technology limitation in other public schools. It was assumed that if teachers have easy access to computers in their schools, there couldn't be any problem to access the module. The school had computers in both its laboratories and lounges of each teaching units. Then, 10 teachers having different teaching disciplines from the school were selected. Main characteristics of teachers are described in Table 1.

Table 1. Participants

Teachers	Teaching duration	Teaching in private school	Teaching Field	Teaching level	Working hour
Nazlan	13	11	English language	K-6,7	23
Pınar	5	5	Science	K-6-8	23
Meral	17	15	Psychological adviser	K-1-8	30
Zulal	38	13	Turkish language	K-6	10
Cihan	3	2	Mathematic	K-6-8	20
Seçil	4 months	4 months	Biology	K-9,10	17
Melte	12	10	Computer	K-4-8	10

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Nurgu l	12	12	Social science	K-7,8	15
Onur	2	2	Computer	K-1-8	21
Ilker	1	1	Computer	K-1-8	20

Context

The teachers were participated in online course during one month. Before the course, teachers took a seminar about what online learning is and how they can use the learning module.

In the study, the online learning module developed by an online learning software company was used. The topic of the learning module was about learning theories. The module content was prepared by a full time academician, his degree on educational sciences, working in the Department of Educational Sciences in the Middle East Technical University. The learning module has voice, pictures, and animations to support the text. User interface of the module can be seen in Figure 1.
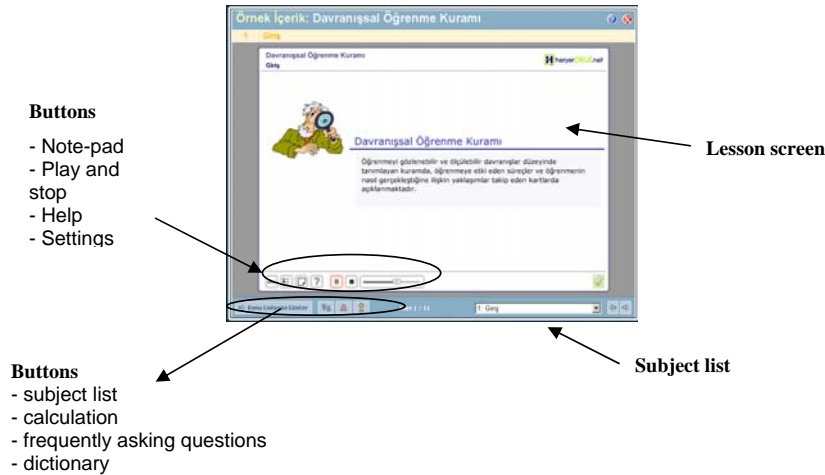
Figure 1. User interface of the online module

Data Collection

Experiences of teachers were evaluated by focus group interviews and individual interviews. Yıldırım and Simsek (2004) describe advantages of interviewing are 1) flexibility, 2) reply rate, 3) behaviors not being seen, 4) the control of the environment, 5) the order of the questions, 6) comprehensiveness, and 7) in-dept information (p.110).

A focus group interview was conducted to create a discussion environment about the learning module. Group meeting was arranged after teachers finished the daily teaching mission. Further, a semi-structured individual interview was conducted with each teacher. Two types interviews were hold through face-to face meetings. Before going to collect data, the researchers prepared an interview schedule. This schedule served as a way to get information about how teachers evaluate their past professional development experiences, how teachers evaluate their virtual experiences. The questions were open-ended and specific. The researcher tried to avoid leading the respondent to confirm the researcher's assumption. However, some probes presented to get detailed answers.

Data Analysis

Data analysis process has a bottom-up procedure. After interviews were transcribed, the data was coded. During this process, general themes were found and finally, the data were organized according to the general themes.

Teachers

The study involved 10 teachers working in a private school. While only 3 of 10 teachers are males, 7 teachers are females. The most experienced teacher is Zulal (38 years) and the most novel teacher is Secil (4 months). Statistical description of the participants' teaching experience, M = 10.33 years, Median = 8.5 years and Mode= 12 years. Further, if the teachers were examined according to their experience having from private schools, the most experienced teacher is Meral, the most novel teacher is Secil (Figure 2).
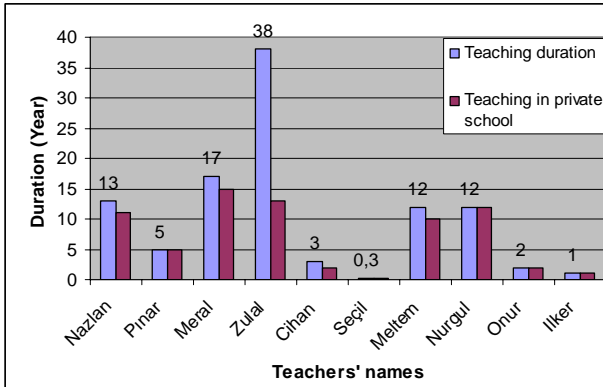
Figure 2. Teaching experiences of participants

Moreover, the teachers have different teaching areas. These are English language, science, psychology, Turkish language, mathematic, biology, social science, and computer. Additionally teachers teach grades from K1 to K8.

Professional Development

This part of the article presents us teachers' professional development backgrounds, their expectations from professional development programs and problems they face in teacher training courses.

Background of the teachers

The teachers have different professional development experiences. According to their PD backgrounds, their experiences can be classified into three sub-categories. These are 1) experiences from courses arranged by Ministry of National Education, 2) experiences from courses created by their private school and 3) experiences from individual efforts.

Generally except for Cihan, the other teachers didn't participate in any courses arranged by the Ministry of Education. He mentions his experience as "… Duration of the course was 3 months. It was bothered me. You have to go there on Saturday. We have gotten only 1 hour lesson. Only theory on the books transmitted to us".

3 of other 9 teachers were participated in courses arranged by their school board. These teachers were satisfied with participating in-service courses. For example, Nazlan explained her experiences as "sometimes, a famous psychologist come to our school to give seminars. His examples were directly from our daily lives. Therefore, we are generally happy when we heard his coming. Similar to this example, what we can do in practice is important. We must have learned theory in undergraduate."

Although the other 6 teachers were not participated in any courses, they mentioned some special case affecting their teaching expertise. For example, Zulal, an experienced teacher, explained how she got her professional experience as "I am working nearly 38 years. Most of this duration has passed in private schools. I have worked in different cities because of my husband's profession. In old times, there was no in-service training for teachers. Although, in the last decade, I was involved in some PD courses, I had already gotten my teaching expertise before that date. Indeed, my experience comes from my peers working with me in the same schools. We talked with them about classroom events, teaching strategies, etc. Old times were more effective." Zulal clearly elucidated how she directs novel teachers, based on her past experience. "…I discuss important points of the course with young teachers before they go to the class. I mention them what we should teach students. Indeed, this knowledge is based on my experiences. Sometimes, novel teachers may omit them. That is, I still use my old

experiences." As a novel teacher, Pınar explained her ideas as "I couldn't get any PD courses but I am a PhD student. I have learned necessary information from my PhD program. Therefore, I don't need any in-service course". She matched professional development courses with PhD courses as she thought that content of the training was the same.

Problems and Expectations

This part of the article presents combination of two main topics which teachers emphasized in focus group meeting; 1) problems in professional development and 2) what teachers expect from professional development.

During the discussions, teachers pointed out main problems in professional development such as unattractive topics, familiarized topic, forcing to participate in courses, academician tutors not having any school experience, and the absence of the practical knowledge. For Nazlan, course topics weren't attractive. She had got courses that she knew before and she was forced to be involved in courses. Although she hasn't participate in any training arranged by Ministry, Nurgul didn't believe effectiveness of courses given by Ministry of Education and she criticized them as the courses presented rote information. Zulal mentioned a lack of seminars with these words"… tutors who do not know children. They can be expert in their field but they are far from students. Teaching students is different thing from writing in the books. They have lacks about the topic." Pınar drew attention to need to expert teachers as instructors in PD courses. "I think that academicians do not have any real life knowledge. They know only theory. Therefore, PD courses should be given both academicians and expert teachers". Teachers also discussed what courses should include. Common point of teachers' opinions is "lacks of the practice" in the professional development courses. Learning other teachers' experiences is very important for them. Nazlan explained her opinion as "... To learn others' class applications is very important for me, I completed the theory in the my undergraduate. I think that other teachers must have completed theory in their undergraduate. Today, what we can do in the practice is valuable for teachers. It is more useful to get and to learn others' experiences that constructed during their teaching life…" Secil also explained her expectations from professional development courses by stressing importance of practice. "If I participate in a PD course, I expected to get practice. I don't want to get any theory. Teachers generally meet with theory in their undergraduate and after they graduate they need to learn classroom applications. For instance, I implement this topic in this way. But how do others implement this topic?" Nurgul described practical knowledge related to her teaching field history "…Practice is very important for us. Social sciences seem not to be lessons in which can be applied different teaching strategies by teachers. Only read and mention. Indeed, it is not true. For example, role playing is a successful strategy to teach history. At that point, I wanted to learn how other teachers use role playing in history classes"

Teachers also described their expectations from professional development courses. According to them, courses should be enjoyful and include daily life experience and other teachers' ideas. Indeed, they wanted to participate to courses in which they actively involved.

They preferred to participate in a course with their peers teaching the same field. Nurgul "I expected from PD courses which is related directly with my field "history". However, I can not obtain this opportunity because the school generally offers courses having general themes".

Finally, teachers discussed topics of courses in which they prefer to participate. Teachers came to an agreement on courses including practical knowledge. Pınar said that she didn't need a professional development. However, if a course is given, this course should be a material development course. Nurgul explained her ideas as "it can be classroom management but it can be a different topic. The most important thing influencing my preferences is that the knowledge which I will get can be applied in a real classroom. Especially, practice and relationship with my field is important issues. It can be material development or drama."

Online Learning

This part of the article includes information related to the teachers' evaluation of their own experiences and their suggestions for other online learning environments.

Online learning experiences

The teachers faced with the concept of online learning at the meeting which had been arranged before they were experienced with learning module. Aim of this meeting was to inform teachers about online learning. Before participating in the meeting, expectations of teachers are toward to a learning module for their students. They explained the reason of this situation that they needed especially materials to apply in their classrooms.

After facing with online learning module, the teachers had different experiences with the learning module. The most frequently discussed topic was the content of the module. Nurgul "the content of the learning module is completely wrong. If you insist on discussing this module on learning theories, I can not accept to get involved in an

online learning course after this application. Although the learning module can be well designed and well organized, as the topic of the module was not selected appropriately online learning seems me boring and incomprehensible". Pınar explained that she have already known learning theories. She had obtained this knowledge from the university education. That is, the learning module couldn't make any contribution to her. Further, Nurgul also explained her un-satisfaction as "I do wanted to learn the content of the module. However, I could not understand its jargons. There are too many jargons." More specifically, another critique is toward the concepts in module. Teachers wanted to see more widespread use of the concepts. For example, the concept of collaborative has 2 different translations in Turkish ("isbirlikci" and "kubasik"). The teachers couldn't understand of the mean of isbirlikci. They know collaborative as "kubasik".

There were teachers thinking positively about the online learning module. According to Nazlan, learning module provides time and setting flexibility to her. Further, she believed that she learned name of teaching method she have, from the learning module. "I learned from the learning module that I have already a teaching approach and there is a specific name in the literature of my teaching approach. That is, certainly I am a humanistic teacher. All of them are appropriate for me. I found out my self". Cihan said "I liked much. I went to my school to access to it on Saturday. I spent extra time and effort to learn. I got a cup of coffee and sat in front of the computer. It was funny for me."

Teachers also made some negative criticism about the online learning module. Most of the teachers can not remember any animation or picture placed in learning environment. One of the teachers, Meral explained the reason of the problem as "my field composes learning theories. Therefore, I understand my peers' problem to learn that topic. The biggest problem related to learning theories is that teachers couldn't make it concrete. When you teach description of learning or description of classical conditioning, they can not make them concrete. You should give them more specific examples. For instance, you can give a picture depicting bell with running children to their class instead of lemon picture for classical conditioning" (Figure 3). That is, the teachers especially emphasized the importance of giving specific examples for specific cases.

Figure 3. A screen-shot from classical conditioning

Teachers also had some technical problems. Internet Explorer pop-up blocker warning was new for them. They can not solve it. Therefore, they preferred to call computer teachers. Most of them overcame the problem with this way.

Suggestions for online learning

During discussions, teachers also discussed whether or not they want to participate in another online learning course and whether or not they propose e-leaning to other teachers. Their expectations from online learning matched generally with the expectations from face to face PD courses as explained in above.

General belief of the teachers was that they wanted to participate in another online learning course only if the topic and aim of the course was different. Ilker explained his ideas as "In my opinion, the content is important. If the content satisfies teachers, so online learning can be efficient. Generally, I am benefit from Internet to prepare lesson. In digital environments, you can communicate with only computers. Therefore, online learning can be supported by face to face session. However, if online learning presents me communication with my peers I can prefer it". A similar idea came from Nurgül "I like eye-contact. Human communication is important. If the virtual

environment has this attribute, I may prefer online learning". Seçil said "…online learning can contribute my teaching. I have a lot of classroom management course books. Suppose that I have a problem in my school. I open a book. However, if I had a support on the Internet, I would prefer it". Some of the teachers proposed courses presenting practical knowledge. Pınar stated definitely that she didn't want to get a course having theoretical base. She needs application of these theories. She explains her ideas as "I believe that teachers do not interest in reading constructivism. They have no time for this. When I am connected to Internet, I am looking for figures or questions classified according to topics. Indeed, I want to get information on whether or not this figure is appropriate for my lesson. For example "I enter "small intestine" and I can find all pictures related to this topic. The most important thing is whether or not these figures develop students' thinking skills.

The teachers also proposed that virtual courses should be classified according to teachers' fields and the courses include new approaches, novel things, projects, presentations, films, pictures. Finally, they suggested that virtual courses should be prepared via the collaboration of academicians and expert teachers. Nazlan proposed that virtual courses should have both theoretical and practical knowledge. Theory is also important for her. They need both of them. "I want to learn interesting topics including practice. For example, courses on differences of teaching methods in Turkey and other countries, philosophy under new methods and their advantages and benefits". Further, she believes that she, as an English language teacher, has more chance than other teachers since she has used learning theories for a long time. According to her, English teachers have sufficient experience to apply these theories into their classroom. However, other teachers in different fields have not applied multiple intelligence theory, yet and firstly, they need to learn this learning theory more detailed.

Another topic discussed with the teachers is whether or not other teachers want to use online learning. Zulal underlined the reason of the teacher's hesitation with these words "Innovations are not accepted, suddenly. Internet is also a new thing for teachers. Therefore, old teaches does not accept it voluntarily. However, I see young teachers of my school. They are very enthusiastic about online learning. I can see it." Other teachers agreed the necessity of online learning courses for teachers when they discussed the geographic wideness of Turkey. Pınar said that "we can access all materials or books when they are necessary. However, most of Turkish teachers can not obtain these sources when they need. I believed that online learning will be effective for them." However, the teachers stressed that there can be some limitations for Turkish teachers to prefer online learning courses. These limitations are unfamiliarity with computers, lack of effective computer use, computer anxiety, lack of computers, and lack of internet in the area. Nazlan explained her ideas as "…they didn't bring up with computers, so these people who can not use computers efficiently have a computer anxiety. That is, they can be afraid of using or turn on the computers. They will have a lot of questions such as whether or not the computer is crashed and broke down by him/her selves". Pınar adds "I don't know whether or not they have the Internet". Onur stated that we should educate teachers on computer use before providing the virtual professional development courses.

In addition to negative opinions, the teachers also mentioned some positive contributions of online learning to Turkish teachers. Firstly, the virtual course will help teachers who can have the location problem. These environments make easier to access the materials. Further, since they can use these environments without exploring from a library, they can save time. Finally they said that these environments would be more comfortable and convenient for teachers.

Conclusion

In the study, mainly, we tried to enlighten teachers' experiences in an online environment. So, firstly to learn their past experiences in traditional PD courses was important. The teachers listed problems in face to face courses as unattractive topics, familiarized topics, forcing to participate in courses, academician tutors not having any school experience, and the absence of the practical knowledge.

Mostly emphasized topic in problems was absence of the practical knowledge. This topic also was the most repeated topic while teachers evaluate the online module. Therefore, we conclude that what type of learning environment-online or face to face- is presented to teacher is not important. The most valuable thing is that in-service teachers should be satisfied with practical knowledge. It can be seen this conclusion from their course topic preferences. They preferred material development and classroom management course than theoretical based courses.

Further, teachers wanted to get professional development (PD) in homogeneous groups. That is, a mathematic teacher should have participated in the course with only math teachers. So, teachers could produce knowledge more related in their own field because they wanted to learn other mathematic teachers' experiences. They need this homogenous group to be able to exchange their practical knowledge with other teachers.
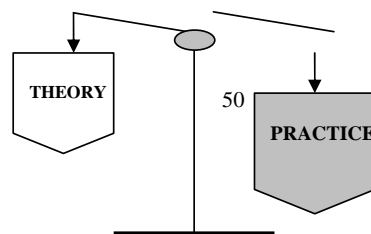
Figure 4. Comparison of theory and practice

In sum, we suggest following proposals to other online learning developers
- The course content should be more practical than theoric base.
- Widespread and most familiarized Jargons should be selected.
- Animation or pictures on online environment should be related to teacher profession.
- Technical support should be presented teachers
- Communication tools should be presented to teachers.

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Turkish University Students:
How Do They Use Technology and What Do They Think about Internet Based Distance Education?

Bahar Baran
Eylem Kilic
Aysegul Bakar
Kursat Cagiltay
Middle East Technical University
Ankara, Turkey

Abstract

In this paper, the researchers will present results from Turkish students' profiles related to Internet based distance education. For this purpose, a descriptive research study was conducted, and total 6504 surveys were returned from four universities in Turkey. The results of the research were reported into five main titles, description of the students, Internet and computer use opportunities, computer skills, studying style, expectations from Internet based distance education.

Introduction

Today, the global knowledge economy requires qualified labor. In Turkey, the need for qualified employers has been emphasized for many areas. Vision 2023 report conducted by the Turkish Scientific and Technical Research Council (TUBITAK) has also emphasized the importance of qualified employers for the country. The report proposes the reconstruction of Turkish Higher Education to catch up with the speed of the information era. According to the results of the report, the aim of new educational system should be "to develop individuals' creativeness, to provide learning opportunities for individuals, to improve their skills at the top level by taking into consideration their individual differences, to provide time and place independence, to be flexible to improve capabilities, and to focus on an educational approach emphasizing on learning and human values" (Tubitak, 2004, p.11). Since there is a high demand for university education, it is obvious that educators will have been searching alternative solutions to educate potential university students. One of the most promising ways to create new opportunities for the youth population is to effectively integrate technological innovations into conventional education.

Distance education can be defined as a type of education in which learners and instructor are divided in terms of time and place (Gunawardena & McIsaac, 2001). Investigating the development of distance education, it is possible to say that a great change has occurred as technology improves. Early, applications of distance education programs include corresponding courses which take a long period of time for learners and instructor to interact. Recent developments in technology have brought the use of Internet in higher education in addition to conventional learners (Molenda & Sullvian, 2002) which can now provide quick and easy interaction for distance education. Before changing the educational system completely, an analysis should be made of the present conditions in order to prevent a failure occurring. Since our era necessitates learner centered educational approaches, identifying learners' characteristics, expectations and the opportunities are value regardless of the technology used in distance education. In other words, analyzing whether using latest technologies for education meet the expectations and needs of learners are important before starting to use Internet based education at university campuses.

Being in the core of learning, learners are the most important components. Therefore, fundamental issue in an educational environment should be to support good quality teaching and to provide variety of learning opportunities for learners. Therefore, prior to design of an educational program, the learners' expectations and profiles should be investigated. In this research, the target group was Turkish university students in four distinct universities of the country. The researchers' aim was to find out Turkish students' Internet and computer use opportunities, their level of computer use, learning styles and expectations from e-learning. In sum, the purpose of the study was to determine Turkish students' profiles and expectations related to Internet aided education.

<div align="center">**Methodology**</div>

Knupfer & Mclellan (1996) emphasized the importance of the descriptive research methodology in educational research. This type of research studies is essential to understand the nature of the environment without any extraneous variable. So, descriptive research methodology was used in this study. The researchers wanted to explore Turkish university students' expectations from Internet based education.

The Context

The data of this research were collected for the need analysis stage of the e-campus project managed by the Middle East Technical University. This project aims to create new student capacity for higher education by using information and communication technologies. The project aims to provide both lifelong learning opportunities and undergraduate education. Some parts of education will be given via e-learning and standardized learning materials will be made available for all students from different universities. So, a consortium among some universities had been organized to implement the project (Yalabık, 2004).

Sampling

The data was collected from four universities; Middle East Technical University, Kocaeli University, Mersin University and Zonguldak Karaelmas University. In the population, the number of students of these universities is orderly, 3115, 11681, 5802, and 6053 (Council of Higher Education, 2003). Return rate was 6504 responses from total 26.631 students. Thus, the numbers of returned responses according to universities were 4609 (%70, 9) from Kocaeli University, 1025 (%15.8) from Middle East Technical University, 529 (%8.1) from Mersin University and 341 (%5.2) from Zonguldak Karaelmas University (Figure 1).
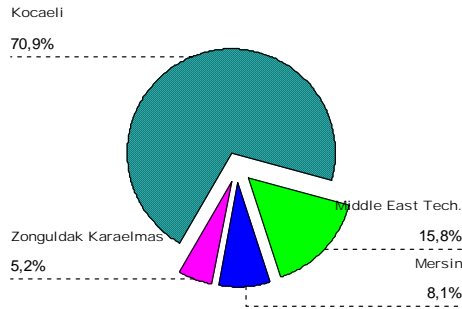
Figure 1. Response return rate

Data Collection and Data Analysis

Data collection instrument was a survey composing of 34 multiple choice questions. The survey has 3 main parts. The first part includes demographics of students. Second part includes perceived computer skill levels of students. Third part includes students' distance education preferences.

After the surveys returned from the universities, the data were entered into SPSS. During this process, it was realized that some items on the survey were damaged or missed. They were reported as "missing data" in the paper.

<div align="center">**Results**</div>

The results of the study was examined under five main titles, 1) Description of the students, 2) Students' Internet and computer use opportunities, 3) The level of computer use, 4) Studying style, 5) Expectations from e-learning.

Description of the Students

A question was asked to determine the faculties to which the students from Kocaeli University, Middle East Technical University, Mersin University and Zonguldak Karaelmas University attend in 2003-2004 academic year. 6150 (%95) of the students responded the item. The responses show that 3174 (50%) students were from Faculty of Engineering and Architecture, 929 (15%) from Faculty of Arts and Sciences, 750 (12%) from Faculty of Education, 804 (13%) from Faculty of Medicine, and 493 (8%) from Faculty of Economic & Administrative. Orderly, faculties

<div align="center">53</div>

in which participants registered were Faculty of Engineering and Architecture, Faculty of Arts and Sciences, Faculty of Education, Faculty of Medicine and Faculty of Economic & Administrative.

The question about their gender was responded by 6454 (99%) of total 6504 students. According to responses, the number of female students was 2214 (34%) while 4240 students (66%) were male. Investigating the ratio of each gender group, there were more male students than females.

The question about their ages was responded by 6419 (99%) of 6504 students. The responses indicate that 4579 (70%) students were 21 years old and above, 1040 (16%) were 20 years old, 622 (10%) were 19 years old, and 178 (3%) were 18 years old and below. The dominant age group was 21 and above followed by the ages of 20, 19, and 18.

Internet and Computer Use Opportunities

Participants were asked in order to determine whether they have home computer with Internet connection or not. 6439 (99%) of 6504 students responded this question. According to the responses 3961 (62%) students do not have home computer with internet connection while 2478 (38%) do. The responses indicate that the number of students who do not have home computer with Internet connection were more than the students who have.

Students were asked to evaluate the facilities that their university provides for computer use. 6421 (%99) of total 6504 students responded the question. The results indicate that 1777 (28%) students rated the university computer facilities poor, 1639 (26%) very poor, 1512 (23%) moderate, 1099 (17%) good and 394 (6%) very good. Students were also asked to evaluate the opportunities for Internet use in their campuses. 6370 (%98) students out of total 6504 responded the question. The responses indicate that 1675 (26%) students rate the opportunities for Internet use in campuses poor, 1513 (23%) moderate, 1464 (23%) very poor, 1189 (18%) good, and 529 (8%) very good.

A question was asked to participants in order to identify the length of time that the students connect the Internet for their course requirements. 6454 (99%) of total 6504 students responded the question. According to the results, 2923 (45%) students connect the Internet from 1 to 6 hours a week while 2479 (38%) students never use it for their course requirements. In addition, 522 (8%) students access the Internet around 7 to 12 hours a week, 293 (5%) students more than 24 hours a week, and 237 (4%) students from 13 to 24 hours a week.

In addition to the Internet use for their course requirements, the students were also asked to state whether they connect the Internet for their personal purposes if so how long they connect the Internet in a week. 6441 (99%) of total 6504 students responded this question. The responses indicate that 2869 (45%) students connect the Internet from 1 to 6 hours while 2371 (36%) students never use it for their personal purposes. In addition, 632 (10%) students connect the Internet from 7 to 12 hours, 304 (5%) students more than 24 hours, and 265 (4%) students from 13 to 24 hours. The students were asked to state the reason(s) why they use the Internet for their personal purposes. 5857 (%90) of total 6504 students responded the question. 1923 (33%) students connect the Internet for communication (sending and reading e-mail, chat etc.) (A), 599 (10%) students for following up newsgroups and discussion lists (B), and 1432 (24%) students for searching (C). In addition, 915 (16%) students use the Internet for communication, search and following up newsgroups and discussion lists (D), 669 (11%) students for communication and searching (E), 219 (4%) students use for communication and following up newsgroups and discussion lists (F), and 100 (2%) students use for searching and following up newsgroups and discussion lists (G).

A question was asked to identify the places where the students connect the Internet. 6360 (%98) students out of total 6504 responded the question. The responses indicate that 3218 (50%) students connect the Internet from Internet cafes, 1914 (30%) students from their home, 312 (5%) students from dormitories, 242 (4%) students from a friend's computer, 183 (3%) students from home and Internet cafes, 103 (2%) students from Internet cafes and a friend's computer, and 235 (4%) students from other places. In addition, the results of 153 (2%) students were made up of different combinations of the categories.

Computer Skills

The students' computer use skills were evaluated under 3 main topics including 11 subtopics. These main topics are 1) computer basics (subtopics are hardware and operating system), 2) office applications (subtopics are word processing, spreadsheet, presentation and database), and 3) Internet (subtopics are webpage development, internet browsers, search engine, e-mail and chat).

The most familiarized subtopic for computer basics is operating system. Turkish students know more about operating system than hardware. According to operating system rating, 6404 (98%) of total 6504 students answered the item. They rated 1232 students (19%) very good, 2518 students (39%) good, 1676 students (26%) moderate, 734 students (12%) poor, and 244 students (4%) very poor. In sum, most of the students evaluated him/herself good about operating system. According to hardware rating, 6414 (98%) of total 6504 students answered the item. It is

reported that there are 784 students (12%) very good, 1872 students (29%) good, 2177 students (34%) moderate, 1261 students (20%) poor, and 320 students (5%) very poor in hardware. In sum, most of students evaluated him/her self at "moderate" about hardware.

Among office applications, the most familiarized one is word processing. It is followed by spreadsheet, presentation and database applications. According to the responses to word processing, they consider themselves as 1377 students (22%) very good, 2424 students (36%) good, 1662 students (27%) moderate, 681 students (11%) poor, and 264 students (4%) very poor. In sum, most of the students evaluated him/herself good about word processing. According to spreadsheet ratings, 6409 (%98) of total 6504 students answered the item. It is seen from the analysis of the item that there are 822 students (13%) at very good level, 1907 students (30%) at good level, 1970 students (31%) at moderate level, 1281 students (20%) at poor level, and 429 students (6%) at very poor level. In sum, most of students evaluated him/herself at "moderate" level about spreadsheets. According to presentation application ratings, 6410 (98%) of total 6504 students answered the item. It is seen from the analysis of the item that there are 940 students (15%) at very good level, 1754 (27%) students at good, 1772 students (28%) at moderate, 1327 students (21%) at poor level and 617 students (10%) at very poor level. In sum, most of students evaluated him/her self at "moderate" level about presentation preparation. At last, for database, 6328 (98%) of total 6504 students answered the item It is seen from the analysis of the item that there are 279 students (4%) at very good level, 672 students (11%) at good level, 1209 students (19%) at moderate level, 2293 students (36%) at poor level, and 1875 students (30%) at very poor level. In sum, most of students evaluated him/herself at "poor" level about database.

For Internet, most familiarized topics are orderly e-mail, search engine, Internet browser, chat and web page development. For e-mail, 6345 (98%) of total 6504 students answered the item. It is seen from the analysis of the item that there are 2650 students (42%) at very good level, 2204 students (%35) at good level, 872 students (14%) at moderate level, 395 students (6%) at poor level, 224 students (3%) at very poor level. In sum, most of students evaluated him/her self at "very good" level about e-mail. For search engine, 6323 (98%) of total 6504 students answered the item. It is seen from the analysis of the item that there are 2258 students (36%) at very good level, 2118 students (33%) at good level, 1034 students (16%) at moderate level, 565 students (9%) at poor level, and 348 students (6%) at very poor level. In sum, most of students evaluated him/her self at "very good" level about search engine. For Internet browsers, 6322 (98%) of total 6504 students answered the item. It is seen from the analysis of the item that there are 2000 students (32%) at very good level, 2068 students (%33) at good level, 1095 students (17%) at moderate level, 670 students (16%) at poor level, 489 students (2%) at very poor level. In sum, most of students evaluated him/her self at "good" level about internet browsers. For chat, 6345 (98%) of total 6310 students answered the item. It is seen from the analysis of the item that there are 1282 students (20%) at very good level, 1500 students (24%) at good level, 1328 students (21%) at moderate level, 1147 students (18%) at poor level and 1053 students (%17) at very poor level. In sum, most of students evaluated him/her self at "good" level about chat. For webpage developing, 6321 (%98) of total 6504 students answered the item. It is seen from the analysis of the item that there are 354 students (%6) at very good level, 648 students (%10) at good level, 1069students (17%) at moderate level, 2033 students (%32) at poor level, 2217 students (%35) at very poor level. In sum, most of students evaluated him/herself at "poor" level about webpage developing.
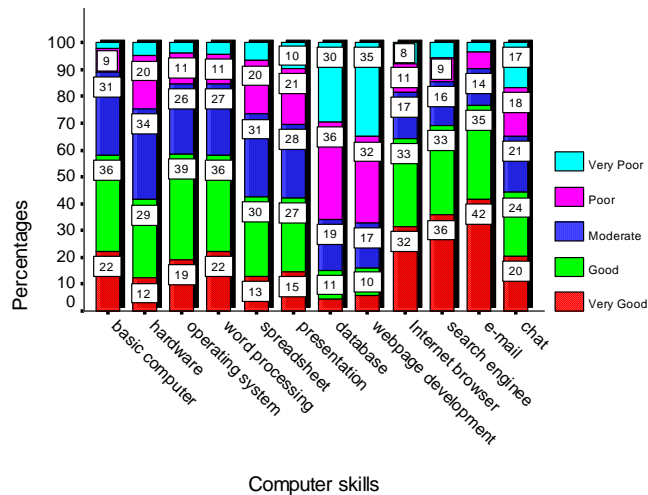
Figure 2. Computer skill levels (below 8% values were not reported)

Studying Style

The students were asked to define themselves in terms of completing their responsibilities. Since e-learning requires independent work and self discipline which are very important, students' studying habits were investigated in the scope of the study. 6265 (96%) students answered this question and there were 236 missing data. 2886 students (46%) said that they fulfill their responsibilities before the due date. 2422 students (39%) said that they usually fulfill their responsibilities on time. 957 students (15%) said that they need to be reminded in order to fulfill their responsibilities.

Students were also asked whether they often need to be reminded for their homework due date by their lecturers or not. 6303 (97%) of total 6504 students answered the question. 3431 students (55%) answered that they rarely need to be reminded by lecturer, 2224 students (35%) reported that they sometimes need to be reminded and 648 students (10%) need to be reminded by lecturer for their homework due date. The students were asked to compare study time for a traditional face to face course and a web based distance education course. 6243 (96%) of total 6504 students answered this question. 2690 students (43%) answered that the study time for a course given on the Internet is less than traditional course. 1795 students (28%) answered that they are the same. 1758 students (28%) answered that study time for a course given on the Internet is more than a traditional course. The students were asked to define themselves as a reader. 6336 students (97%) answered this question and there were 167 missing data. 4688 students (73%) answered that they are good as a reader and they do not need help from someone to understand. 1480 students (23%) answered that they are moderate as a reader such that they sometimes need to help from someone to understand. 169 students (4%) answered that they are poor as a reader and they often need help from someone to understand.

Expectations from Internet Based Distance Education

The students were asked whether or not they want to get a second diploma or certificate by attending an undergraduate minor program during their undergraduate education. 6304 (96%) total 6504 students answered this question. While 4124 students (65%) said "yes", 1126 students (18%) said "no" and 1054 (17%) students said that they are undecided. The students also stated their program preferences for such undergraduate minor program. 4085 (62%) students answered this question. 1267 students (31%) said that they want to attend "Information and Communication Technologies". 1002 students (25%) said as "Economy, Administrative and Finance", 736 students (18%) said as "Education", 647 students (16%) said as "others" and 433 students (10%) said as "Mechatronic program".

Further, the students were asked whether or not they want to get a second diploma, Master of Science degree or certificate after their graduation. 4966 (76%) of total 6504 students answered this question. 3286 students

(66%) said "yes", 1040 (21%) students said that they are undecided and 640 (13%) said "no". The students who want to get a second diploma, master degree or certificate after their graduation were asked their preferences program. 3852 students (59%) answered this question. 1068 students (28%) said that they want to attend "Economy, Administrative science, Finance", 1057 students (27%) "Information and Communication Technologies", 799 students (21%) "Others", 647 students (17%) "Education" program and 282 students (7%) "Mechatronic program".

The students were asked whether or not they could go to the campus for exam and laboratory work in case they enter a program after graduation. 4293 (66%) students answered this question. 2102 students (49%) said that they could go to campus at anytime, 1110 students (26%) students expressed that if the laboratory is open during weekends or nights, they could participate the exams and laboratory works, 1081 students (25%) said that they would have difficulty in coming campus for even during weekend and night.

The students were asked what type of learning environment they prefer, in case they entered any programs, 4282 students (66%) answered this question. 2376 students (56%) said that they prefer traditional and online programs, 1387 students (32%) traditional and 519 students (12%) online programs.

Conclusion

The results of the study show that most of the Turkish students want to attend a second certificate or diploma program not only during their undergraduate education but also after graduation. It can be concluded that most of the students want to improve themselves after their graduation. In another study, both traditional higher education institution graduates and distance education institution (DEI) graduates stated that they prefer to continue their education with DEI (Rüzgar, 2004). Therefore, it is obvious that Turkish students need distance programs. So it is important to find out students' preferences for educational method, the programs they want to attend and students' characteristics. Most of the students expressed that they do not want to attend such a distance program either online or conventional method. Their responses showed that they prefer to get education via mixture of conventional and online methods (blended) after their graduation. One of the earlier studies also showed that Turkish University students did not want to attend pure online education programs (Koçak & Kalender, 2002). Blended learning seems a more appropriate method for Turkish students because most of the students expressed that if laboratory is not opened at weekends or nights, they can not attend the exam and laboratory work and have difficulty in coming campus for weekend and night during their second certificate or diplomas program.

Generally, Turkish students prefer to attend "Information and Communication Technologies", Economy, Administrative, Finance" programs during their undergraduate education. In addition, they also stated that they want to attend graduate level of the same program after their graduation. Student readiness is also an important factor that influences achievement of the program (Vonderwell & Savery, 2004). In regard to students' readiness, characteristics such as self regulation and self efficacy are important issues that need to be discussed. In an earlier study, it is found that self efficacy is positively correlated with the achievement of the students in distance education (Ergul, 2004). Although there is huge amount of literature about the relationship between self regulation and achievement, it is found that there is no relationship between self regulation and achievement among Turkish university student. The study shows that the students' readiness in terms of self efficacy does exist. Most of the student expressed that they don't need help from someone while reading. In addition, most of the students stated that they can fulfill responsibilities before the time is up and they rarely need to be reminded by their instructors for their homework due date. These are valuable results that show that Turkish students are self regulated.

In the past, studies about Turkish university students and their online education preferences provided limited information because of small sample sizes. In this study, four major universities of Turkey and their undergraduate students participated to the research as subjects. How we have a more complete picture of this population and based on their characteristics policy members can initiate new large scale Internet based distance education programs in Turkey.

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Developing Pedagogical Technology Integration Content Knowledge in Preservice Teachers: A Case-Study Approach

Laurie Brantley-Dias
Mary B. Shoffner
Wanjira Kinuthia
Georgia State University

Abstract

This paper reports selected findings of a larger study examining the effects of case-based instructional strategies on the development of Pedagogical Technology Integration Content Knowledge (PTICK) in alternative teacher preparation students. This study is part of the Crossroads Project funded by the Preparing Tomorrow's Teachers for Using Technology (PT3) grant from the United States Department of Education. Sixty students completed a 6-week course in technology integration in teaching methods at a large southeastern university. Content analysis was used to examine student data: case study analysis and reflections. Student technology skills and demographics were also considered. This paper will discuss initial results and implication for using case studies with alternative teacher preparation students in order to develop PTICK prior to field experiences.

Introduction

According to Shulman and Shulman (2004), accomplished teachers are those who belong to a professional community, possess a vision, have motivation to act, know what to teach and how to teach it, reflect and learn from experience. Designing instruction is at the heart of teaching. This is a complex, intellectual process involving the application of learning theories, design principles, communication channels and decision-making processes to solve ill-structured problems. By nature, ill-structured problems contain ill-defined elements, vague goals, multiple solution paths and evaluation criteria, and unique attributes that require teachers to make judgments about the problem, pose solutions and, when necessary, defend their decisions (Jonassen, 1997). Designing reform-based, technology integrated lesson plans is particularly challenging for pre-service teachers who lack content knowledge, pedagogical content knowledge and pedagogical expertise of their more experienced colleagues**.** Thus, teacher-educators face a challenge when it comes to preparing the best possible teachers.

The journey from novice to expert is not one that results directly from instruction but rather from professional maturation and experiences (Lave & Wenger, 1991). According to Dreyfus and Dreyfus (1986), a person travels through five stages on the way to expertise: novice, advanced beginner, competence, proficiency and expertise. It is generally accepted that expertise is acquired through much longer exposure to content than one course could provide. For alternative teacher preparation students, the learning time is particularly condensed. With this comes an increased sense of urgency to move from the novice stage to the advanced growth stage. Therefore, how can an introductory technology integration course provide opportunities for alternative teacher preparation students, whose classroom placement is immediately pending, to develop problem-solving skills more in-keeping with an expert?

Theoretical Framework

Shulman (1987) proposed that there are seven categories of knowledge that underscore teachers' knowledge base for effective teaching: content, pedagogical, curriculum and pedagogical content knowledge (PCK), in addition to knowledge of learners, educational contexts and educational purposes. Of these, PCK is perhaps the most influential in redesigning teacher education courses and programs (see NCATE Unit Standards). According to Shulman (1986), pedagogical content knowledge (PCK) is a specific category of knowledge "which goes beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching" (p.9). It is the teachers' ability to identify learning difficulties and students' misconception combined with the fluidity to transform subject matter using "the most powerful analogies, illustrations, examples, explanations, and demonstrations—in a word, the ways of representing and formulating the subject that makes it comprehensible for others" (Shulman, 1986, p. 9).

The research community has blurred the boundaries of PCK and reconceptualized it in a variety of ways (Loughran, Mulhall & Berry, 2004; VanDriel, Verloop & DeVos, 1998). As a means to better identify "true technology integration," Pierson (2001) used the concept of PCK along with technology knowledge, which she

defined as "basic technology competency…[and] an understanding of the unique characteristics of particular types of technologies that would lend themselves to particular aspects of the teaching and learning process" (p.427). She characterized *technological*-pedagogical-content-knowledge as the intersection of knowledge in the areas of content, pedagogy, technological and pedagogical content.

The authors of this paper feel that pre-service teachers need not only procedural, conceptual and pedagogical content knowledge but also reflectivity and community development as well, specifically that related to technology integration: pedagogical technology integration content knowledge (PTICK). PTICK contains five dimensions: technical procedural knowledge (knowing and being able to operate the technology), technology integration conceptual knowledge (theories behind effective uses of technology for teaching and learning), pedagogical content knowledge (knowledge and ability to transform subject matter content for learners' needs), reflective knowledge (metacognitive abilities to reflect, problem-solve and learn from experiences), and community knowledge (knowledge and ability to develop a community of learners in the classroom as well as participate in a professional learning community.)

As part of this knowledge base, pre-service teachers should have cases or scenarios of exemplary instructional products and solutions upon which to draw. Field experiences during the pre-service teachers' education program often provide a context in which to apply these skills and to develop such scenarios. However, these opportunities may not be available to students until later in their course work and opportunities to integrate technology into their teaching may be limited by a variety of factors in their field placements.

One way to mediate the "theory to practice gap" and promote the development of PTICK is to infuse teacher and technology courses with a problem-centered approach via cases. Problem-centered instruction encompasses many forms: problem-based, case-based, action, project-based, question- or issue-based learning and goal-based scenarios (Duffy & Cunningham, 1996; Jonassen, 2000). Almost 20 years ago, Shulman (1986) advocated the use of cases in teacher education in order to develop pedagogical content knowledge. Merseth (1996) has documented the trends of case-based pedagogy in teacher education programs. In pre-service teacher preparation, cases have been used to teach pre-service teachers a variety of skills from adapting instruction for limited English proficient students with disabilities (Andrews, 2002); to reflecting on instructional practices through multi-media cases (Hewitt, Pedretti, Bencze, Vaillancourt & Yoon, 2003); to exploring biases and beliefs related to race, gender and culture (Shulman, 1992); to developing formal and practical knowledge (Lundeberg & Scheurman, 1997).

Guiding Question
How does analyzing cases affect pedagogical technology integration content knowledge?

Alternative Teacher Preparation, Course Designs and Use of Cases

Researchers (Darling-Hammond, Chung, and Frelow, 2002) have found that teachers' sense of preparedness and sense of self-efficacy are related to their feelings about teaching and their plans to stay in teaching past the critical induction phase. Teacher efficacy has been linked to teachers' enthusiasm for teaching (Allinder, 1994; Guskey, 1984) and their commitment to teaching (Coladarci, 1992; Evans & Tribble, 1986). Teachers' sense of their ability to influence student learning appears related to their stress levels (Parkay, Greenwood, Olejnik, & Proller, 1988) and retention in the teaching profession (Glickman & Tamashiro, 1982). In addition, teachers' sense of self-efficacy is related to perceptions about how well they were prepared (Raudenbush, Rowen, & Cheong, 1992), and that views of self-efficacy are formed early in the career, and are relatively difficult to change thereafter.

Therefore, it is important to develop teachers' knowledge and skills early on.

As the United States is faced with a teacher shortage, alternative pathways to certification have come to the forefront. Alternative Certification Programs (ACPs), so named because they offer a path to certification other than that of the traditional 4-year undergraduate education program. More that 40 states have alternatives in place for candidates who already have a bachelor's degree (Feistritzer, 1998). These programs range from a short summer session that place candidates into teaching positions with full responsibilities, sometimes without supervision, to full on-to-two year post baccalaureate programs with close supervision, mentoring, and integrated coursework.

Alternative paths to initial certification have been in place for many years at Georgia State University. Originally developed in the math and science content fields, these alternative preparation programs are still referred to by an acronym of their original name, *Teacher Education Environments in Math and Science*, or TEEMS. At GSU, the TEEMS programs at the middle childhood/secondary education level are 45 credit hour, full-time enrollment programs that result in the award of a master of education degree and recommendation for initial teacher certification in the state of Georgia. Students entering the program must already have an undergraduate degree in their content field, and must pass a rigorous selection and interview process for admission. Admission occurs only

one time per year (in the summer) and students move through the program in a cohort. Enrollment is limited to 50 students or less each year in each of the content fields. Currently, students may complete the alternative preparation program in Language & Literacy, Mathematics, Science, Social Studies, or Middle Childhood Education. Additional alternative preparation programs in Reading Education and Teaching English as a Second Language are currently under review at the state level.

While in the past, the TEEMS program of study integrated technology throughout the students' program of study, pressure from within the College of Education, and from state and national professional organizations and accrediting agencies urged the program faculty to consider a more standards-driven, assessment-oriented path. All five TEEMS programs of study include a revised version of the IT 7360, *Technology for Educators,* course. The course addresses the National Educational Technology Performance Profiles for Teachers as well as support all six of the National Educational Technology Standards for Teachers (NETS-T) and contributes to student understanding of the INTASC Standards. In addition, the course makes use of assessments that have been directly mapped to the NETS-T standards. The effectiveness of the IT 7360 courses has been empirically documented in a number of studies (see Dias & Shoffner, 2003; Shoffner & Dias, 2003; Shoffner, Dias, & Thomas, 2001; Shoffner & Dias, 2001; Shoffner, 2000). As TEEMs students are initial preparation graduate students, it was necessary to adapt the in-service course, IT 7360, Technology for Educators, to meet their pre-service and content needs. The course and its related resource laden WWW site, incorporates a problem-centered, activity-based approach where the technology is anchored in authentic and familiar contexts in which teaching and learning occurs (Cognition and Technology Group at Vanderbilt, 1991; Vygotsky, 1978). The online learning environment can be accessed at http://msit.gsu.edu/IT/Teachers

While introducing and reinforcing technology integration skills, the focus of the course is teaching and planning methods for the k-12 technology–enhanced learning environment. In the *Technology for Educators* course, the technology is immersed in learning about what being an educator entails –planning, learning theory, instructional strategies, classroom management, and assessment. Throughout the course, pre-service teachers demonstrate their technology integration skills in a variety of activities which focus simultaneously on both what they can do with the technology, personally, and their ability to plan for their students to meet curriculum requirements while making use of a variety of technologies. Case studies were added to the course in fall 2004 in an effort to develop pedagogical content knowledge and PTICK for the alternative teacher preparation students.

Methods

This research used mixed-methods within the context of an exploratory multi-case study. As suggested by Yin (2003), the case study design is an appropriate way to investigate the causal links and the context relating to an intervention. It is also useful when there is little or no control over the behavioral events. The units of analysis are each of the three sections of IT 7360, *Technology for Educators.*

Participant Selection and Context

The participants in this study were enrolled in IT 7360, a required 3-credit course for the pre-service secondary education alternative teacher preparation programs at a large urban southeastern university. Three different instructors taught the three sections used in this study; there were two English Education cohorts (n = 31) and one Science Education cohort (n= 19). This was their first semester in their respective programs. The 3 credit hour course met twice per week. Both sections of IT 7360 for the English Education cohort were offered on the same days and time. Students self selected into sections. The Science Education section was offered on alternate days and times. There were more female participants (n = 36) than male (n=14) in the study. Their ages ranged from 23 to 48. Although all the participants had a first degree in a content area, only four had provisional teaching certificates and had completed one year as a classroom teacher at the secondary level. The remaining students had little (substitute teaching or volunteering) to no formal classroom teaching experience.

Data Collection

Data collection occurred throughout the six-week summer course. A variety of data sources were gathered for the larger study including reflection papers, problem-based or case-based analyses, pre and post skill surveys, three Technology Integration Planning and Skill samples (TIPS) (concept maps, webpage creation, and databases) and course-end electronic portfolios.   For this portion of the study, the researchers examined the case-based analyses and the reflection papers of two of the three class sections.

One section of English Education students and the section of Science Education students analyzed cases from *Educational Technology in Action: Problem-based Exercises for Technology Integration* (Roblyer, 2004). Expectations for case discussions were provided and modeled prior to commencement of data collection as follows:

first, participants reviewed assigned cases and individually responded to specific questions at the end of each case set. Next, they met online in teams of four to five to discuss the assigned cases. Each team then submitted a group report based on their discussions. Finally, each student submitted an individual reflection on each case based on initial responses and group output. In addition to one practice case, participants analyzed three more case sets during the course. Except for the practice case (only formative feedback was provided), all others including the reflections were scored and returned to the students.

As a control, the remaining English Education section analyzed the problem-based exercises from the same text. Like the other sections, students were guided through a practice set of problem-based exercises. These were not scored but feedback was provided. They were required to complete selected exercises from each chapter; however, they did not discuss these in groups nor reflect on the experience. On a few occasions, the instructor led short (15-20 minute) in-class discussions about the assignments after they were graded.

Course reflection papers were collected and scored at the beginning, mid-point, and end of the course for all sections. These reflection papers differed from the case analysis reflections. They contained five or six guiding questions about course expectations, preparedness to use and integrate technology, beliefs about technology integration and perceived learning gains.

Data Analysis

Data analysis for this paper included case-based analysis and reflection papers from students in one English Education section and the Science Education section. Additional data analysis on remaining data sets is in process. Researchers met bi-weekly and weekly to discuss analysis and to develop a common codebook. Survey data was collected and analyzed in order to provide a snapshot of participants' characteristics. The researchers used content analysis (Merriam, 1988) to categorize concepts and ideas which students presented in their case analyses as well as their reflection papers. With-in case analysis is currently underway. Once completed, the researchers will employ cross-case analysis. Inter-rater reliability is being established and a common codebook has been developed thus far for the case-based analysis and reflection papers. Additional codes will be added as the remaining data sets are analyzed. Multiple data analysis strategies have been considered. Initially, the researchers considered analyzing data chronologically in order of submissions throughout the course to determine participant trends. This strategy was put aside when the researchers, in a weekly meeting, determined that some assignments sought different affects and/or different cognitive tasks. The second analysis strategy was to focus on the case-based sections only at first, and to analyze by artifact; namely all of the cases, then all of the reflection plans, then all of the lesson plans, then all of the portfolios, still with-in case, by researcher, constantly updating the codebook via a database. TIPS samples (technology-related products and technology integrated lesson plans) will be evaluated for technical skills aligned with the National Educational Technology Standards for Teachers (NETS-T). Researchers scored course-end e-portfolios, which contain unit and lesson plans, using a rubric based on NETS-T and will analyze them for evidence of PTICK via content analysis (Merriam, 1988).

During each analysis phase, the researchers are examining for discrepant evidence and rival themes in order to assure the rigor of the analysis. Member checking (Lincoln & Guba, 1985) is being used in order to verify the data and validate the findings. Triangulation within and between data sources provide a holistic picture of the phenomenon and provide corroborating evidence (Creswell, 1998) as findings emerge.

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Preliminary Results

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Several trends have emerged from data analysis thus far that address the question of how analyzing cases affects pedagogical technology content knowledge. We have organized the preliminary results into three sections: the two, which are called, TEEMS Science and TEEMS English, are derived from case analysis data; the third, which is called Course Reflections, is derived from the three reflection papers (initial, mid-term, and final). Predominate themes in each section are discussed in the following analysis.

TEEMS Science

Technology Integration in Future Practice

Initial data analysis reveals that preservice science teachers were beginning to think about and make connections to current and future applications of technology integrated into instruction from the cases readings as revealed by statements they made in their case reflections. JG's comment is typical:

> I think I would like to incorporate this type of inquiry-based learning into my future classroom. I
> think it is important for students to apply what they learn and connect it to real world problems
> (PR).

The preservice teachers' statements were also embedded with personal opinions, views and varied reactions to the

cases as students began to see themselves in the position of the case study characters as illustrated by one preservice teacher's reaction:

> I think Leroy is right to adopt the new [project-based science simulation] software. I did not think it made much sense for Leroy to take the software to his district coordinator for her opinions. Were I in Leroy's position, I would only present my new software to an administrator if I expected the school to pay for it (JG).

Initially, some participants were not able to make connections with the cases. For instance, DM indicated the following:

> The process of this case analysis did not help me develop my knowledge about teaching and technology integration. It did not because I found the case very boring and terms were used that I was not familiar with.

Merits and Limitations of Using Technology

There was a general agreement among the preservice science teachers that technology is beneficial for student learning. As noted in the following reflection:

> To help integrate technology into my classroom I will have online quizzes. Furthermore, I would like for my kids to participate in Global Classroom [projects]. Global Classroom is [a website where] classes form all around the world are brought together on the Internet. This will allow my students to see how other students are learning the same information (DM).

However, they also recognized the limitations that technology and technology integration may present:

> Potential problems that could arise might include that the software will be too difficult for my students to use; I couldn't get the resources that I need to use; [I wouldn't have access to] the software as frequently as I wanted to, or that the software wasn't reliable. Also, the students could get caught up in having fun with the program and loose sight of the academic purpose (SM).

In addition to the situations presented in the cases, the preservice teachers had personal experiences with technology during their group discusses in chat rooms in which they expressed frustration with the technology and noted the technology's limitations for their own learning:

> The chat function was difficult with 4 people. It was hard for people to respond to the question and then respond to each other. If there was a pause, people thought that the discussion was over and tried to move on while someone was writing something. Despite that, we did have a good discussion (LE).

Impact of Group Discussions

Ironically, while some preservice science teachers did not think that the individual case analysis process was helpful and made comments in class that they thought that this assignment was "busy work", most participants indicated in their case reflections that analyzing and discussing the cases in *groups* was beneficial. For example PR wrote:

> Overall, I feel that our group chat went very well. We each came to the session with different ideas and backgrounds, and listening to other people's points of view was very informative. I found that everyone in my group thought about at least one aspect of the scenarios in a way that had not occurred to me. I think that bouncing ideas off one another is a great way to increase our own learning.

The discussions fostered a learning community that enabled the preservice teachers to confirm and challenge their ideas and beliefs about teaching and technology.

PTICK Development

In the case responses, preservice science teachers displayed some aspects of PTICK, especially with regard to content knowledge, pedagogical knowledge, and pedagogical content knowledge. However, integration of all three concepts was not seamlessly evident in their responses. For example PD writes:

> In model building, the students may gain a good idea of the physical descriptions of the plants they're studying, but this interactive software would help them to learn not only what the planets look like, but what substances they are made of and what kinds of climates they have.

In this response, the participant directly addresses science related content with some understanding of model building, which falls under pedagogical knowledge. LE also demonstrates the same when she writes:

> Leroy sees that this [problem-based simulation] software will help his students learn scientific inquiry by engaging them in an exciting, imaginary story. They will learn to solve problems and apply the skills rather than learning a step by step method to approaching science problems…. Based on this scenario, I would try to integrate technology particularly into areas that are difficult to teach, or in areas where students don't seem to be getting much out of the traditional methods.

The case analyses suggest that the preservice science teachers' knowledge of using the software, pedagogical

approaches, as well pedagogical content knowledge is developing into PTICK.

TEEMS English
Technology Integration in Future Practice
      The case analyses and case reflections enabled the preservice English teachers to imagine how they might integrate technology and various instructional strategies into their lessons for future implementation as suggested in the following reflection:

> This scenario… was a perfect example of collaborative teaching across the curriculum. I would love to tie in a unit plan with a history or social studies class; I think it would enhance the students' learning. Utilizing the Internet to help students to experience the country and the language is the most logical way to layer the learning for students (MS).

Their commentary also revealed concern about keeping students and the lesson focused on subject matter content and not allowing the technology to overshadow the curriculum objectives. While reflecting on case 3, LG discussed plans to have her future students use the Internet for communication and research while creating writing artifacts with publishing software. She stated:

> "If I [were to] see that the daily work that students are doing continue to support my objectives, then my technology integration is probably working. If I see that they are spending too much time trying to lay out a brochure or build a website, then they are most likely not thinking too much about what I am wanting them to really learn—the content of the lesson" (LG).

Merits and Limitations of Using Technology
      As MS's comments above about using the Internet and its resources "to layer the learning for students" reveal, the participants generally thought that technology could be beneficial for student learning. This was also a topic in their group discussions:

> The group discussion regarding Mort and Chloe's problem with publishing a literary magazine brought up [the following question]…will [the publishing software] cause the students to like poetry more? …One point we agreed on was that if the actual task of publishing the magazine is fun, more students will want to be involved. As part of the assignment, students had to create their own page using PageMaker. Again if this is fun and exciting for students, they will want to read more poetry to find the "perfect poem." As a result, the students may read more poetry overall than they did in the past. We decided that although PageMaker directly can't make students enjoy poetry, it indirectly may have an impact (MS).

Although the preservice English teachers noted the merits of the technologies presented in their case studies, some included cautionary comments such as those by EJ:

> The solution [to use PageMaker to create the eighth-grade literacy magazine] certainly solves the problem of ease and man-hours. It does not, however, guarantee that the students will like and appreciate poetry. Technology is not going to do that. A good teacher will.

Reflecting on the case analysis further she added,

> I think the teachers have to be careful not to get trapped into thinking that their uninterested students are going to suddenly become literary geniuses because of a little technology (EJ).

Other issues such as access and students' technology skills also surfaced:

> My problems that I foresee [when integrating technology] come from the students' fluency with the technology and the readily availability of the technology so that students can get the most out of the technology (CB).

These preservice teachers made plans for future technology integrated lessons; nevertheless, while weighing the pros and cons of technology integration presented in the cases, they demonstrated more concerns about technology and its use as the semester progressed and the main case story developed.

Impact of Group Discussions
The preservice English teachers did not always find the individual case analysis process helpful for developing understanding about technology integration. They did, however, believe that the group discussions were invaluable. For example:

> The discussions are so beneficial because I honestly don't understand the scenarios until I talk to my group….The group always impacts my perspective on the problem in the case study (GdW).

The chat discussions allowed students to model problem-solving processes for each other. SJ wrote:

> I found [my peers'] input very insightful and it very much changed the ways in which I was viewing the problem. …I found that I wasn't looking at the situation as holistically or analytically

as I might have because I had sort of placed these characters in rather rigid roles which weren't conducive to exploring all the facets of the problem. Certainly in the area of solution building, [the chat discussion] was extremely beneficial.

The chat discussions not only served to foster professional interactions, but also provided an avenue for reflection and refinement of ideas as suggested in CB's thoughts:

I think it has been this [Case 3] discussion and only this discussion that has broadened my mind to the problems and advantages to technology integration. Just discussing these problems allowed me to see flaws in my own ideas. I think one of the best ways to learn about technology integration is talking with current and preservice teachers about their ideas. Not one of us should go at this alone.

PTICK Development

Perhaps the most important aspect of instructional technology at the preservice level is the connections that students are able to make between the use of technology tools, instructional strategies, content and community building for the purpose of enriching the learning environment. Evidence typical of this early PTICK development is seen in the following preservice English teacher's case analysis reflection:

I really like the idea of integrating a pen pal into my classroom. I think the idea of teaching a foreign experience along with the literature is a great idea. For example, in my [course-end electronic portfolio], I am teaching *The House on Mango Street* and this pen pal creative activity [described in the case study] could enhance my students' learning experience because they can learn about the Mexican community through students living in Mexico. Even though I can do a webpage lesson on Mexican culture, I believe that students will be able to better understand their heritage, culture, and ideals through a live interaction with students from that country (SG).

In this response, the preservice teacher demonstrates her PTICK development as documented in her growing pedagogical content knowledge to teach literature, reflective knowledge as seen her application of ideas from the cases to her own curriculum development, and community knowledge through developing information exchanges between her students and those from a Mexican community.

Course Reflections

The reflection paper questions were intended to reveal preservice teachers' beliefs about technology integration and their ability to integrate technology into their content areas as well as issues related to the course itself. Consistent with the questions that the preservice teachers answered, their responses reflected the following themes: increase in self-efficacy and technology access concerns

Increase in Self-Efficacy

As the course progressed, the reflection papers indicated that most of the science and English preservice teachers became more confident in their abilities to use and integrate technology as well as problem solve. AR, a science education TEEMS student, demonstrated this transition between the initial and final reflection papers in the following comments:

I came into this class with a low level of technical skills, having only used word, excel and publisher…. As it is, I do not feel that I have mastered any of these technologies, and will still need to spend a lot of time to develop my skills and increase my knowledge.

By the end of the semester he wrote:

I definitely feel more prepared to enter the classroom and use these technologies than I did previously… (AR).

Some of the English preservice teachers also indicated that they were becoming more self-directed:

Because of this course, I am finding myself experimenting with software on my own to learn more. This course has taught me to be self-sufficient and adapt my lessons around what is available, and that is an essential tool (SG).

Technology Access Concerns

Some preservice teachers voiced concerns about both teacher and student access to technology in their future classrooms and often cited this as a possible barrier to their technology integration. One English preservice teacher wrote:

What would really help me would be the physical technology. I'm still not sold that all of the technology is going to be available to me in the classroom, and I really think that my students'

access is going to be limited….I have to go with my past experiences and I'd say that it is unlikely that I will be able to implement even half of what I've learned (AM).

Thus, some participants tended towards an external locus of control as it related to having access to technology. On the other hand, a couple of preservice teachers suggested that they would seek out positions where technology was more plentiful:

It is difficult to predict what technology a school will have available. I think that this will be a factor in my job search. In other words, all things being equal, I will choose a school with greater technological resources available over one with less (LE).

Discussion

Early results suggest that as the participants are alternative teacher education preparation students, and already possess a four-year degree in their content field, their content knowledge was high, as would be expected. This led to falsely high self-efficacy in other areas, including technology knowledge, at least at first. However, the initial reflection papers indicated that they did not feel capable of integrating technology. Evidence of reflective knowledge was seen early on, as the use of cases was initially well received, but soon was viewed as busy work, as students' sense of self-efficacy diminished as they realized how much they didn't know about PCK and PTICK at mid-course. In particular, students resented that they had to analyze the cases individually prior to meeting for group analysis, either due to lack of time due to a heavy course load, or due to lack of confidence in their responses. However, post-group reflection indicates students felt they gained greatly from the group analysis of cases (community knowledge). Their final reflection paper comments also documented growth in self-efficacy for integrating technology and problem-solving. Preservice teachers' perceptions of barriers to technology integration such as access to technology and students' technical skills was an unexpected finding in the course reflection papers and case reflection commentaries. These concerns did not surface until later in the semester after the students had engaged in the second of four case exercises. We attributed this to the implementation of cases. Anecdotal evidence from students' reflection papers in previous courses did not indicate this trend. The following elements of PTICK, pedagogical content knowledge, reflective knowledge, and community knowledge, were evident in the preservice teachers' case analyses and reflections and thus demonstrate growth in these areas. The remaining PTICK elements, technical procedural knowledge and technology integration conceptual knowledge, should be more evident in the course-end portfolio, TIPS samples and their corresponding lesson planning documentation.

Suggestions for Case Implementation

Integrating case analysis and discussions into an already full curriculum during a condensed six-week summer session was particularly challenging. It posed management problems for both the students and the instructors. We learned the following key lessons:

- Cases should be robust and specific to the content area and vary the technology tools. Although the cases we used from the text was lengthy, it was fragmented across many chapters and lost continuity from one week's assignment to the next. Nevertheless, the cases had a great deal of impact on the students. In the end, we felt that the students would have benefited from more, detailed cases.
- While individual and group work with reflection is necessary, caution must be taken to keep workload from decreasing motivation and eclipsing outcomes.
- Students must be trained in case analysis. A practice case analysis offers students a chance for formative feedback prior to an evaluated assignment.
- Give students questions to guide their reflections on case analyses. In addition, it might be helpful for students to have some training in reflection.
- The course was offered during a compressed six-week summer session. The researchers recommend a longer period so that students have greater time to accomplish goals and reflect.
- Using synchronous environments, such as chat sessions, allows students to discuss case analysis outside of class time. This promoted community and allowed all students to have a voice in the analysis process. This type of peer sharing confirmed and challenged their ideas of teaching in a safe, somewhat anonymous environment.

Despite the challenge of implementing and managing case analyses exercises, our initial findings seem to suggest that preservice teachers are developing PTICK. The cases along with peer-to-peer asynchronous discussions provided opportunities for these preservice teachers to make explicit their beliefs as well as test out assumptions about teaching, lesson design and technology integration. Given the varied nature of our findings and the divergent

student reactions generated from the case analyses, PTICK development is a necessary component of teacher preparation and a research focus worthy of increased attention.

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Effect of Training Method on Performance and Computer-Self Efficacy

Lynette Brown
Tristan Johnson
Debra O'Connor
Mohammed Khalil
Xiaoxia Huang
Youngmin Lee
Miyoung Lee
Florida State University

Computer-based technology is rapidly becoming a part of the change that is taking place in the organizational setting. According to Simon (2000), many companies have reported difficulty upgrading their company's technology because of employee computer literacy problems. An important question for employers, trainers and instructional designers is what interventions will effectively support learners as they adopt these innovations in the performance of their jobs?

The success of end-user computing has been facilitated by factors such as commitment and regular use of the computer. In this context, end user computing refers to the use of personal computers to perform tasks such as word-processing in contrast to computer programming or design. According to Kay (1990), cognitive attitude, awareness, and knowledge of application software were found to be the best predictors of commitment to the use of computers. Regular use of computers could be influenced by the availability of hardware, software, and training; however, personal willingness was a priority factor that related to a person using the computer effectively (Kay, 1990).

Explanations for the effective use of computers have also been drawn from Social Learning Theory (Bandura, 1986). Social Learning Theory posits that self-efficacy, a belief in one's capability to perform certain actions, is a major determinant of choice of activities, degree of effort, period of persistence, and level of performance. Bandura (1986) emphasizes that individuals' self-efficacy should be examined in light of specific targets of accomplishment such as driving a car on a freeway, referred to as driving self-efficacy or in this instance using the computer to perform tasks, referred to as computer self-efficacy (Compeau & Higgins, 1995).

Recent studies examining the integration of computer-based technology in the workplace (Cheney, Mann, & Amoroso, 1986; Cronan & Douglas, 1990; Grover & Teng, 1994) identified training as a critical factor to the success of end-user computing. Preparing the workforce to use computer technologies is a high-priority training objective within organizations; yet, little evidence is available on the effectiveness of various approaches to computer training (Gist, Schwoerer & Rosen, 1989). Simon (2000) indicates that the availability of a wide range of training options and the lack of reliable indicators that predict trainee success compounds the computer literacy problems. Training methods that provide good conceptual models have been identified as variables that could affect the success or failure of end-user computing (Cheney, Mann & Amoroso, 1986; Santhanam & Sein, 1994).

A limited number of researchers have examined the effects of alternative training methods (Chou, 2001; Simon, 2000; Mitchell, Hopper, Daniels, George-Falvy, & James, 1994; Gist, Rosen & Schwoerer, 1989) on end-user computing. In a study examining self-efficacy and mastery of a computer software program, Gist, et al., (1989) used the modeling method and a tutorial method to examine alternative training methods on self-efficacy and mastery of a computer software program in the context of a field experiment involving 108 university managers. The researchers used video modeling as the principle means of instruction in one group and tutorial training which used a one-on-one interactive tutorial diskette (visual instruction on the computer monitor) that presented the same concepts with very similar examples to those presented in the modeling group. The dependent variables were self-efficacy and mastery of a computer software program. Although the participants in the tutorial were told what to do, there was no modeling. At the end of the training, both groups were stopped and given the identical timed, objective performance test. The behavior- modeling training participants performed better than the tutorial participants as hypothesized; however, the training condition effect on computer self-efficacy was not significant across the groups as was expected.

In another study examining the relationship of learning style and training method to end-user computer satisfaction and computer use, Simon (2000) examined three training methods: 1) instruction, 2) exploration, and 3) behavior modeling. Simon (2000) focused on determining the optimum method of training novice computer users.

The study involved four hundred members of the U. S. Navy. The results indicated that trainees whose learning style matched training methodology were more successful in training outcomes, had higher computer satisfaction and had higher levels of computer use. Participants in the behavior-modeling training method had the highest levels of satisfaction and computer use. In yet another study, Chou (2001) compared the effects of training method and computer anxiety on learner's computer self-efficacy and learning performance. Participants were 101 high school students in 10th grade. Behavior-modeling and the instruction-based method were used. The instructor and content was the same for both methods, providing continuity throughout all training sessions. The training was held in the same room. Students were free to take notes and were encouraged to ask questions at any time during the presentation. In the instruction-based condition, a lecture format was employed. In the behavior- modeling group students watched the instructor demonstrating examples and executing corresponding step-by-step procedures on the computer from their computer monitors. The computer-driven demonstration was the principal instructional media. Several tasks were used to measure performance and the five-point Likert-type measure of computer self-efficacy was employed in the study. The scale was administered before and after the experiment. The results confirmed with earlier research on behavior-modeling, which found it superior to the instruction-based approaches on computer learning performance and self-efficacy (Compeau and Higgins, 1995; Simon, & Werner, 1996).

Compeau and Higgins (1995) also used the modeling technique in a study aimed at understanding the impact of a motivational construct, self-efficacy on individual reactions to computing technology. Self-efficacy was found to play an important role in shaping individual's feelings and behaviors. Bandura (1986) indicates that self-efficacy is derived from four information sources: guided mastery, behavior modeling, social persuasion, and physiological states. The strongest source of information is guided mastery--actual experiences of success in dealing with the behavior. The more successful interactions those individuals have with computers, the more likely they are to develop high self-efficacy. Hands-on practice is a key component of training, so that people can build their confidence along with their skill.

Behavior-modeling is a task-focused method that involves visual observation of the behaviors of a model performing tasks. The learners then imitate and extend the model's behavior in guided practice and exploration. The behavior-modeling method employs a hands-on demonstration approach to introduce new information or techniques followed by complimentary lecture (Chou, 2001; Simon, 2000;Simon and Werner, 1996; Gist, Schwoerer, & Rosen, 1989). Although behavior-modeling has been lauded as a successful training technique in several domains, e.g., supervisory skills training, interpersonal skill development and recently, computer related skills, researchers have raised several concerns. Baldwin (1992) notes the paucity of recent research to improve or enhance the behavior modeling components. Further, inconclusive results in attempts to assess outcomes (McGehee & Tullar, 1978; Russell, Wexley, & Hunter, 1984) with respect to trainees ability to generalize modeled skills to settings outside the training context, warrant further empirical research (Baldwin, 1992). Other instructional methods have also been found to contribute to computer related learning.

The instruction-based method is widely accepted and understood and is commonly used in training and educational settings. The method has also been referred to in the literature as traditional-instruction (Chou, 2001). The method has been found to be effective for all types of learning outcomes and is distinguished by its lecture format (Simon and Werner, 1996). Another instructional method that might be effective for computer-related skill development is the direct instruction method. Direct instruction has its theoretical origins in the behavioral family, particularly in the thinking of training and behavioral psychologist. Direct instruction is highly structured, teacher directed and controlled and places highest priority on the assignment and completion of academic tasks. The teacher explains a new concept or skill having the learner test their understanding by practicing under teacher guidance, referred to as guided practice (Joyce & Weil, 1996; Rosenshine, 1995).

As noted earlier, several researchers have examined training methods with factors such as learning style, self-efficacy, computer self-efficacy, computer anxiety, group-member modeling behavior and performance in computer software training and suggest that further research is needed (Chou, 2001; Simon, 2000; Compeau & Higgins, 1995; Gist, Schwoerer & Rosen, 1989). Computer self-efficacy, a motivational construct has been found to be associated with attitudes and computer performance. Computer self-efficacy is a judgment of one's capability to use computers in the accomplishment of a task (i.e., using a software package for data analysis) rather than component skills such as formatting a diskettes or using a software feature to format a paragraph (Compeau & Higgins, 1995). Positive results have been found in an examination of attitudes toward computer technology (Delcourt & Kinzie, 1993), the early adoption of computer technology (Burkhardt & Brass, 1990), and enrollment in a computer course (Hill, Smith & Mann, 1987). Positive results were also found in a study that examined training performance in a computer course (Webster and Martocchio, 1992).

Several researchers have examined the predictor role of computer self-efficacy and found positive results. Gist, Schwoerer & Rosen (1989) note that trainees with low self-efficacy might be expected to perform better in a

modeling training setting than in settings that constrain external attributions for training failures. For example, in behavior- modeling learners may attribute their difficulties to the model's rapid pace or the model's failure to provide sufficient explanation for each behavior. The varied approaches and results of the aforementioned research highlights the relevance of the need for further research examining factors affecting end-user computing in order to overcome computer literacy problems.

The purpose of the current study was to conduct an examination that focused on training methods, performance and computer self-efficacy. Rather than focusing on implementation of a computer system as in the Simon (2000) study, the current research examined the effect of training method on performance and computer self-efficacy, utilizing software designed for the performance of specific job-related tasks for law enforcement officers. Drawing from the results of the prior studies using the behavior-modeling method and the widespread use of the instruction-based method formed the basis for selecting the behavior-modeling method and the instruction-based method for examination in the current study. As in the Chou (2001) study, the materials were the same for both groups with appropriate adjustments to allow for the modeling aspect in the behavior-modeling methods' group.

The instruction-based method consisted primarily of lectures. Using PowerPoint slides, the instructor described key features of the software and its functionality. For example, the instructor described how the drop-down screen feature of the software could be used to select a motor vehicle type (i.e., truck vs. minivan). The behavior-modeling method concentrated on the idea of observing and doing. It consisted of modeling, instruction (lecture format for key learning points augmented with computer-visuals and handouts), exploring and feedback. Exploring allowed the learner greater control during practice which supplemented the step-by step modeled behavior of the trainer, which was then imitated step-by-step by the learner. The trainer provided learner feedback during learner practice and exploration (Simon, 2000; Chou, 2001).

Performance was measured by scoring the results of a completed law enforcement report. At the end of training, each trainee was given a written scenario describing a vehicle crash. The scenario was the same for all trainees. Using the computer software, participants entered the details of the vehicle crash. The output data referred to as a crash report was used to measure performance. Measures of computer self-efficacy were obtained at the beginning and at the end of the training. To measure computer self-efficacy, trainees completed a questionnaire, the Computer Self-Efficacy Scale (Murphy, Coover, & Owen, 1989).

Two primary outcomes were expected in this study. Similar to findings from Chou (2001), it was expected that trainees' in the behavior-modeling method group of this study would perform better than the trainees in the instruction-based method group would. Trainees in the behavior-modeling method group were expected to have a greater change in their computer self-efficacy than the instruction-based group.

Method

Participants

Participants in the study were 20 law enforcement officers from several police agencies. All participants were males, average age 38. The participants' work schedule dictated which workshop they participated in. Some were instructed by the supervisor to attend one of the two sessions, which resulted in some attending a session on their scheduled day off, others attended voluntarily. Participants were asked to agree to use the software subsequent to the training to complete their law enforcement reports and provide feedback to the software development team regarding any problems experienced using the software. Additionally, the participants were asked to give suggestions that would improve the utility of the software for law enforcement officers. Lastly, participants agreed to complete a confidential pre and post-test questionnaire to measure computer self-efficacy and a scenario performance test using the software at the end of the training.

Independent Variable

The independent variable in this study was the training method. Two training methods were employed; behavior-modeling and instruction-based. In the behavior-modeling session, participants watched the trainer model how to complete specific sections of the law enforcement report using the software on a laptop computer. The trainer used a scenario of an incident that would require completion of each of the seven sections of the report and require the use of the key features of the software. The trainer emphasized key learning points during the demonstration of the steps necessary to complete each section of the report. After each section was demonstrated, participants were allowed time to execute the steps. Each participant was provided an identical scenario of an incident requiring the completion of the report section covered. Upon request, the trainer provided feedback to individual participants at their laptop station. The trainer provided group feedback by projecting on a screen the correct response for that section. The trainer then proceeded to the next section using the same format until all seven sections were covered. After all sections were completed, participants were given time to explore (unguided

practice) the software features.

In the instruction-based method, the trainer used PowerPoint slides to display each section of the report and to discuss the features of the software applicable to completing each section. Unlike the behavior-modeling method where the instructor entered data in each section of the form to demonstrate how to use the features of the software to complete that section, the PowerPoint slides contained pre-entered data in each section of the form. After the lecture on each section, each participant was provided a scenario of an incident requiring the completion of the report section covered. The participants were allowed time to execute the steps necessary to complete the given section using their laptops. Upon request, the trainer provided feedback to individual participants at their laptop station. The trainer provided group feedback by projecting a PowerPoint slide of the correct response for that section. As in the behavior-modeling sessions, the participants were allowed time to practice using the software to complete any section of the report presented during the lecture.

Dependent Variables

Two dependent variables were examined in this study, performance and computer self-efficacy. To measure performance, the participants were given a written scenario of a vehicle crash that required completion of an entire law enforcement report. Both groups were given the same scenario. The results of the completed report were used to measure performance. To complete the report, participants were required to enter data such as vehicle identification number, vehicle type, drivers' license number, and cause of crash. Various features of the software were used to complete the information. For example, the software allowed the participant to select the vehicle type from a drop down menu. Participants in both groups completed the report using their laptops. The report consisted of 177 items. Each item was assigned equal weight with a value of one. A perfect score was 177. The performance test was given during the last hour of the session, thereby allowing the participants one-hour to complete the report. The participants were instructed to enter their ID numbers on the report and save the completed report on their thumb drive. Each participant's report was saved from the thumb drive to the trainer's computer.

Computer self-efficacy was measured prior to and upon completion of the training in both the instruction-based and behavior-modeling training classes. To measure computer self-efficacy, a 32-item, 5-point Likert scale computer self-efficacy questionnaire (Murphy, Coover, & Owen, 1989) which has been used by other researchers (Chou, 2001) was used without modification for both the pre and post computer self -efficacy measure. Participants were not differentiated on the dimension of their pre-training computer self-efficacy.

At the beginning of training in both sessions, participants were allowed approximately 15 minutes to complete the pre-training computer self-efficacy questionnaire. At the end of the session, participants were not timed when completing the post-training computer self-efficacy measure. The questionnaire consisted of such statements preceded by "I feel confident": adding and deleting information from a data file; explaining why a program (software) will or will not run on a given computer; troubleshooting computer problems; moving the cursor. The highest attainable score of computer self-efficacy was 160 (32 items on the 5-point Likert scale per item). A higher score indicated a higher computer self-efficacy rating. Efficacy levels were statistically analyzed for each group as well as for each individual.

Procedure

Training sessions were offered on two separate days. One session employed the behavior-modeling method and one session employed the instruction-based method. The trainer was the same for both sessions. The software was installed on each participant's laptop computer prior to the start of each session. To maintain confidentiality, participants were assigned an ID number to be used instead of their name.

At the beginning of both the behavior- modeling and the instruction -based sessions, participants completed a demographic survey and a computer self-efficacy pretest. At the end of each session, participants completed the computer self-efficacy posttest questionnaire and a performance test. Participants were assured that their performance would only be used for research purposes and not reported to their employer.

The performance test was given during the last hour of the class, thereby allowing the participants one-hour to complete the report. The participants were instructed to enter their ID numbers on the report and save the competed report on their thumb drive. Each participant's report was saved from the thumb drive to the trainer's computer. The reports were used later to measure their performance. Both groups were given training that was identical in terms of the content but with variation in the training method used. Each of the sessions averaged 8 hours in duration.

Results

The data were analyzed using a one-way analysis of variance (ANOVA). Alpha was set at 0.5. The group

size was 10 participants per group; the probability of detecting a small difference between means was 0.1756.

Performance

Table 1 presents the means and standard deviations for each group on the performance test. Although the behavior-modeling group performed slightly better than the instruction-based group, the results of the one-way ANOVA revealed there was no significant difference in performance between the groups.

Table 1   Means and Standard Deviation of Performance Test Scores Across Groups

Training Method	Mean	SD	N
Instruction-based	122.80	15.33	10
Behavior-modeling	129.50	14.07	10
Total			20

Note: Maximum score = 177

Computer Self-efficacy

The change in Computer self-efficacy for the behavior modeling and the instruction-based group was examined. Paired scores for the pretest and posttest were used to compute the difference between the individuals' pre- and post-training computer self-efficacy. The descriptive statistics presented in Table 2 indicate a pretest and posttest change of 5.10 for the instruction-based group and 12.30 for the behavior-modeling group. The Analysis of variance results test was performed to test the hypothesis that change in Computer self-efficacy will be greater for participants in behavior modeling than in the instruction-based group. The ANOVA results yielded the F-value of 1.18, which corresponds to the p-value of 0.293. The results indicate no significant difference at $\alpha=0.05$.

Table 2   Pre-and Post-Test Means and Standard Deviation of Computer Self-Efficacy

Pre-training Computer Self-Efficacy

Training Method	Mean	SD	N
Instruction-based	115.7	19.7	10
Behavior-modeling	134.6	25.3	10

Post training Computer Self-Efficacy

Instruction-based	128.0	18.8	10
Behavior-modeling	139.7	19.5	10

Note: Score Range 0-160.

Discussion

The main purpose of the current study was to examine the effect of training method on performance and computer self-efficacy. The most important finding from the present study is the finding of no significant difference. Participants in the behavior-modeling method did not perform better than the instruction-based group. Therefore, hypothesis 1 that participants in the behavior-modeling group would perform better than the instruction-based group was not supported. This finding is not consistent with previous studies (Gist, Schwoerer & Rosen, 1989; Simon, 2000; Chou, 2001) that have indicated the behavior-modeling method results in better performance in computer related training.

One important feature of the behavior-modeling method is that the learner is involved extensively during the training with practical applications that are modeled. Also, extensive hands-on practice and feedback are provided throughout with an emphasis on key learning points. The finding of no significant difference may be due to homogeneity of the participants, participant's lack of interest in the training due to high prior computer experience and the length of time of the training workshop. A review of the demographic data of the 20 participants revealed that 13 of the participants when asked to rate their level of computer experience as either beginner, moderate or advanced rated themselves as advanced computer users. Both groups performed at less than an 80% accuracy level on the performance test. The low performance may be a function of the "ceiling effect," referring to participants not feeling challenged to perform a task with which they were already proficient. Further, the measurement of performance was limited to one task in contrast to measuring a range of performance over time as in the study conducted by Chou (2001). Further research with experienced computer users might include the performance of a variety of tasks with varied levels of complexity.

The second hypothesis in the current study was that participants in the behavior-modeling group would have a greater change in their computer self-efficacy. Several researchers have examined the predictor role of computer self-efficacy and found positive results. Gist, Schwoerer & Rosen (1989) noted that trainees with low self-efficacy might be expected to perform better in a modeling training setting than in settings that constrain external attributions for training failures. For example, in behavior modeling learners may attribute their difficulties to the model's rapid pace or the model's failure to provide sufficient explanation for each behavior. Computer self-efficacy has been examined as an independent variable in several studies and found to be a precursor to computer use (Chou, 2001, Gist, et al., 1989, Compeau and Higgins, 1995). The current study however, examined computer self-efficacy as a dependent variable. Measures were taken at the beginning and end of training. Further research should examine computer self-efficacy subsequent to completion of training at various intervals in the job performance setting.

The length of the training workshop might not have been sufficient, too short for some, or too long for others to effect a significant change in computer self-efficacy. For example, participants might not have had sufficient successful interactions or hands-on practice, which is a key component of training, so that people can build their confidence along with their skill. Further, extending to computer self-efficacy from Bandura's (1986) assertion that self-efficacy is derived from four information sources: guided mastery, behavior modeling, social persuasion, and physiological states, the current examination omitted substantive considerations which should be included in future research in this area.

One specific weakness of the present study includes the use of a small sample size (20). Further, multiple measures of performance were not obtained and participants were not differentiated on the dimension of their pre-training computer self-efficacy or prior computer experience. Additionally, only males participated in the current study, both genders should be included in future research.

Several practical implications arise from the findings. Prior research has indicated that performance and computer self-efficacy vary with training method (Chou, 2001; Simon, 2000). Further research is needed to determine the most effective training method. For example, would comparisons of the performance of two groups of trainees in two behavior modeling sessions, one that uses video-taped models and the other using live model display vary? To what extent does variations within a method affect performance? For example, Gist, Schwoerer & Rosen, (1989) used video models and Chou (2001) used live models. Positive performance results were achieved in both studies, however, a deeper level examination of the method and its component parts would help researchers determine whether the method is robust under different conditions. Additionally, examining other methods such as direct instruction would offer further insights into the effectiveness of alternative instructional methods to address computer literacy problems.

Lastly, in light of the growing use of teams in education, business and government settings, another fruitful consideration is to examine the effects of learning as a team (Simon, 2000) and team performance. Teams are using computer-related technology in multiple aspects of team dynamics.

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Sense of Community in the Multicultural Online Learning Environments

Saniye Tugba Bulu

Sanser Bulu
Texas A&M University

Abstract

Building a sense of community among learners is necessary condition for both face-to-face and online learning. With the increasing number of online courses in higher education, international students are sometimes excluded from face-to-face interaction and they need to participate in online. The purpose of this study is to explore how international students develop a sense of community in the multicultural online learning environments.

Introduction

With the development in the Internet and communication technologies, trend for distance learning in higher education has been incredibly increasing. Distance learning is evolving from being a special form of education using nontraditional delivery systems to providing an important conceptual framework for mainstream education (McIsaac & Gunawardena, 1996). Recently, much of the attention has been paid to the use of computer-mediated communication (CMC) to facilitate teaching and learning in the online courses. As well as supporting individualized learning, CMC, especially asynchronous communication technologies such as discussion forums, email, and bulletin boards, have potential to support teamwork among distance learners (Benbunan-Fich & Hiltz, 1999; Harasim, Hiltz, Teles, & Turoff, 1995). Because of their flexible and independent feature, they are important medium for creating collaborative and cooperative online learning environments (McIsacc & Gunawardena, 1996).

Interaction between a social environment and an individual has always been emphasized as a critical factor to facilitate meaningful learning (Dewey, 1916; Vygotsky, 1978). Building a sense of community among learners is necessary condition for both face-to-face and online learning. Recently, a sense of community in online learning and dynamics of online communities have become important topics. McMillan and Chavis (1986) defined a sense of community as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9).

Statement of the problem

Some theories about the effects of CMC suggested that use of CMC result in antisocial impersonal communication (Culnan & Markus, 1987; Short, Williams, & Christie, 1976; Sproull & Kiesler, 1986). Therefore, online courses are often characterized by disconnectedness, feelings of isolation, which result in low sense of community level.

An important challenge is to what extend the sense of community can be developed in the online environment similar to the face-to-face environment. Some researchers have found no significance difference in the overall sense of community between those two settings (McDonald, 1998; Rovai, 2002). Moreover, Rovai (2002) proposed that feeling of disconnectedness and isolation is related to course design, pedagogy, and instructors' experience.

Number of international students in higher education in U.S. has been increasing every year. According to report of Institute of International Education, 572 509 international students enrolled in the U.S. in 2003/2004. In addition, distance courses in higher education have been increasing. Therefore, international students are excluded from face-to-face interaction and they need to participate in those online courses.

There has been a body of research about international students in the face-to-face settings. However, exactly how sense of community develops in multicultural online learning environment is not still clear. Most of the studies focused on the homogeneous groups rather than cross-cultural groups. Moreover, vast amount of researches used quantitative research methods in their examination of the sense of community, and little qualitative research methods have been done. Therefore, there is a need for understanding how international students develop the sense of community in multicultural online learning environments. It is significant to understand how to foster the sense of community among international students for making learning process more successful.

Purpose of the study

  This study is designed to explore the sense of community in multicultural online learning environment. This study aims to examine how international students develop the sense of community in online learning environment by addressing the following question:

How do international students develop sense of community in multicultural online learning environment?

<div align="center">Review of the Literature</div>

Computer Mediated Communication

  Asynchronous interaction and text-based communication are the important features of CMC (Harasim, 1990). Asynchronous communication technologies gives students both time to think about a problem and the opportunity to discuss possible solutions in a group, independent time and space (McIsaac & Gunawardena, 1996). Consequently, quality of decision making increases in discussions. Individuals can freely and more interactively share their ideas in the text-based CMC.

  The media richness theory (Daft & Lengel, 1984), the social presence theory (Short et al., 1976), and lack of social context cues hypothesis (Sproull & Kiesler, 1986) assert that text-based communication and lack of communication cues affects the development of relationships in online environment. On the other hand, according to Walther's (1992, 1993) social information processing theory, CMC users adopt their linguistic and textual behaviors to presentation of socially revealing behavior to reduce uncertainty.

  Another problem that text-based communication creates is the language problems. Individuals who are not good writers or whose language is not English may find difficult to participate the online discussions (Gunawardena et al. 2001).

Sense of Community and Online Learning Environment

  Sense of community has been studied in a variety of different contexts. McMillan and Chavis (1986) presented four elements of the sense of community as membership (spirit), influence (trust), shared events that create emotional connection, and fulfillment of individual needs. One of the contexts in which the sense of community has been studied is the education. Parallel to the components of McMillan and Chavis (1986), Rovai (2002) offered four essential components for the sense of community in classroom setting as spirit, trust, interaction, and learning.

  Spirit emphasizes the recognition of membership in a community and the feelings of friendship, cohesion, and bonding that develop among learners (Rovai, 2002). McMillan and Chavis (1986) pointed out that members use boundaries to determine who belong and who do not belong to the community which provide members emotional safety. Moreover, they mentioned that paying dues and making contributions is important for the spirit of the community. Wegerif (1998) findings indicated that several factors makes students feel excluded from the community including course design, the role of instructor, interaction styles of course participants, and features of the technological medium used.

  Trust is the feeling safe in the community and believing that other members will respond in supportive way (Rovai, 2002). Crisp and Jarvenpaa (2000) found that initial communication was crucial to trust formation and regular and predictable communication is necessary to sustain trust in online teams.

  Interaction can be either on the completion of assigned task, task-oriented or social-oriented (Rovai, 2002). McMillan (1996) proposed that emotional bonding depends on frequency of interaction, high quality of interaction, sharedness of events, and amount of honor given to members. Stacey (1999) examined effects of the use of the CMC on the group interaction. Feedback giving & getting, providing technical and task related help, commitment to the group's expectation, flexible structure of the group roles, posting supportive comments, and sharing personal anecdotes are found as the factors that help students develop online social presence and make collaborative group process more successful. Moreover, active participation, sharing ideas, providing feedback, maintaining social climate, and promotive interaction were stated as important characteristics of effective online collaboration (Salmon, 2000; Soller, 2001). Vrasidas and McIsaac (1999) also found that structure of the course, class size, feedback, and prior experience with computer-mediated communication influenced interaction in the online courses.

  Learning is the commitment of members to a common educational goal and expectation that group will provide worth learning (Rovai, 2002). If members integrate and fulfill their needs and resources in the community, they begin to discover ways that they can benefit from one another which build cohesiveness (McMillan, 1996).

Cultural issues affecting the sense of community

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Face-to-face setting sInternational students have both academic and social challenges in the face-to-face settings which consequently make them unable to think about themselves and affect development of their sense of community.

Adjusting to different values is one of the main challenges that affect international students. Hofsteded (1997) outlined five dimensions on that national cultures vary. These are individualism vs. collectivism, femininity vs. masculinity, long-term vs. short-term orientation in life, power distance, and uncertainty avoidance. Robinson (1992) pointed out some values generally attributed to American academic culture including individualism and competition, equality and informality, pragmatism and reasoning style, philosophy of knowledge and knowledge ownership. Similar values also emerged as the findings of Parker's study with Taiwanese students (1999). He found that most of the students were not used to have critical thinking skills and they were more task oriented. Additionally, he found that many of the students who come from cultures where it is not appropriate to develop relationship with faculty were uncomfortable to ask repeated question even if they don't understand. He finally stated that many international students faced with culture shock because of their different academic and social expectations.

Another challenge that affects international students is the language. It is found that many international students have difficulty when listening and following the extended lectures (McKnight, 1994; Parker, 1999). Moreover, even they understand the spoken English; they still have difficulty asking questions because of their language limitations.

Online settings There has been body of research that shows advantages of cross-cultural group process in the online settings. Gunawardena et al. (2001) examined the online group process differences between Mexico and American participants. Language, forms of language used, power distance in communication between teachers and students, collectivist and individualistic tendencies are found as factors that affect online group process. Moreover, she found that Mexican participants feel that CMC equalized statuses differences, American participants were more concerned about the lack of verbal cues. Ziegahn (2001) also examined how the online nature of course influenced students' reflection in multicultural settings. Because of the asynchronous communication, both students and instructors had access to written intellectual and emotional connections and students gave response to others, shared their experiences, and expressed new ideas. Warschauer (1996) studied differences between international students' face-to-face and online discussions. He found that there is more equal participation among foreign language students in the online settings than the face-to-face discussions.

There are also studies that show disadvantages of online cross-cultural group process. Wilson (2001) found that worldview, culturally specific vocabulary and concepts, linguistic characteristics of learner, and learner motivation are the main obstacles that students face in multicultural online learning. Ku and Lohr (2003) also found that international students have challenges in online settings because of their cultural differences in values, language barriers, and learning format preferences. It is suggested that courses should be designed in such a way that provide support from the instructor, offer appropriate strategies to assist international students, give resources and support for their language problems, assist their participation.

Methodology

Aim of the researchers was to have clear understanding of how individuals build the sense of community in the multicultural online learning environments. Therefore, in this study, qualitative research methods were employed to collect and analyze the data as qualitative studies support that meanings of participants' action can be only grasped in relation to context in which they are involved (Merriam, 1998). The researchers conducted semi-structured interviews with participants from different cultures about their experiences in the online courses.

Participants

The study looks at the sense of community from the perceptions of three international doctoral students at a large South American University: Chinese, Mexican, and Indian. When selecting participants, purposive sampling method was employed. All participants were pretty much experienced in online learning. Mexican participant has taken 3, Chinese participant has taken 6, and Indian participant has taken 7 online courses.

Instrumentation

The main data collection instrument was the semi-structured interview protocol. As stated in literature review section, Rovai (2002) offered four essential components for the sense of community in classroom setting as spirit, trust, interaction, and learning. The interview questions were organized according to these components. The interview protocol began with the background questions including participant's demographics and previous online

learning experiences. Other sections of the protocol included the questions about spirit, trust, interaction, and learning.

Data collection and analysis

Each semi-structured interview sessions were tape recorded and transcribed. Because interview protocol was intended to be semi-structured, sessions were not dependent on the questions. However, interviews generally followed the four main components of the sense of community: spirit, trust, interaction, and learning.

After transcribing interviews, the researchers put line numbers. Afterwards, they started to analyze interview transcripts of three participants for themes and categories. First they coded transcripts by looking similarities and differences across the cultures. Then they chunked the codes and grouped them to create categories. Afterwards, they created themes by grouping categories. Three major themes emerged from this study: Cultural differences resulting in cultural challenges, dealing with challenges in multicultural face-to-face and online settings, and the other factors influencing the sense of community in the online settings.

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Research Findings

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Three findings emerged from this study (Figure 1). First, cultural differences resulted in cultural challenges which make difficult to build the sense of community in both multicultural face-to-face and online learning settings. Second, international students faced more cultural challenges in the face-to-face than the online settings which made more difficult to build the sense of community. International students were able to solve their problems easier in the online settings through attributes of CMC including flexibility of time and written communication. Third, in addition to the attributes of CMC, some other factors such as peer behaviors, instructor behaviors, and contextual characteristics in online learning also affected their sense of community level.

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Theme 1: Cultural differences resulting in cultural challenges

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All participants mentioned that there are cultural differences between their own cultures and the other cultures in both face-to-face and online courses they participated in. The differences stated by the participants focused on their learning perspectives, learning styles, telling styles, individual or group working preferences, commitments, goals, and values.

Learning perspectives and styles

All cultures mentioned about their different learning perspectives and styles. Indian participant said, "We have so many things grounded….. for example, in my culture we never really ask question, why do we have to do that? Why not do it this way? I have never looked critically everything; it was something new." She felt a little bit challenged and outside of the community, and this affected her learning in the courses. She gave an example and continued to say:

In India, what happens, if it is something written, it means you have to know, accept, no matter you like it or not….For one of my courses, we have a course pack. I have never thought about in a critical way. When I went to classroom, and say something very positive and amazing, someone like oh no, it is not working in the real world, it is not true whatever you said. It was really difficult for me to accept that because you know how something can get in to the paper when it is not true.

Mexican participant stated that she was willing to debate and expecting some kind of different views in the online discussions. She said, "I think, sometimes in the online environment, we are afraid of telling another person that we don't agree. If you see the discussion, you always agree, Oh, that is a great point. There is nobody saying no." Contrary to Mexican participant, Chinese participant was not used to criticism and debate. She stated that in the online settings, they need to be encouraged enough to post their own ideas and for criticism.

Telling styles

All participants expressed that there are differences between their cultures and American culture in terms of their telling styles. Indian participant stated that different telling style affected her interaction with others in the community. She expressed that she was not comfortable and confident when communicating with Americans because she is culturally different. She said, "It is very easy for them [Americans] to say no or yes, but for me, coming from different culture, I hesitate to say yes or no." And she added,

In my country whenever you say anything no to any person, you think you are offending him and you are being rude if you say no. But I learned that Americans, they really don't care about those touchy things. Most of them are very clear about what they want to do.

Chinese participant also told about her telling style and said,

Usually, I don't want to have complaint with my peers, and most of time, I am pretty easy going, maybe that would be affecting my online course. I don't attack any people's idea, really I won't criticize people's posting. If I really want, I would use very polite way.

Contrary to other participants, Mexican participant saw her telling style more directed than Americans. She stated, "as Mexican, that is not rude. I think Americans start something like 'ok, it is a great piece of paper, but I think you should do…' Even if they don't think it is a good piece of paper."

Individual or group working preferences

Both Mexican and Chinese participants mentioned about their differences from others in terms of their individual and group working preferences. Mexican participant told that American culture is more individualistic and she saw her culture more collectivist. She stated, "We do care a lot as Mexican, I think that it is Hispanic culture, we like to work in groups, and we like to be supportive. Americans have more used to work alone". She expressed that not getting support from others makes her feel isolated at the beginning when she was working online. However, Chinese participant said that she was not used to work in groups in her country. She mentioned that she needs more support and resources to be successful in working groups.

Different commitments and goals

Mexican participant taught that Americans have different expectations from international students. Sometimes, this made her feel overwhelmed and isolated. She said,

Sometimes people think international students will have more time, may be that is true, we have more time for school and some of us have scholarships and some work. We have external pressure. So we are eager to do all the work. Sometimes I feel Americans think ok, she has more time since she is international student she has a scholarship so she can not fail the course, she needs to do the work. And we are left.

Mexican and Chinese participants agreed that, as international students, they had different commitments and educational goals from Americans. They expressed that international students are full time students and they only come to school. Moreover, they are aware of their weaknesses, and therefore they are so more serious than Americans. Participants said that they are more comfortable to interact with international students and trust them more. Mexican participant said, "International students are different [from Americans], what are they living, and what are they committed…. I trust anybody, but I would choose international. Chinese participant said, "I found some international classmates are more serious than Americans, because they know their weaknesses, if they want to do better in this course, they have to be more serious than Americans. So I trust them even better than Americans."

Different values

Indian and Mexican participants stated that having different values in their cultures affected their interaction in the face-to-face and the online settings. Indian participant stated,

For example, in a face-to-face course, we were talking about homosexuality and all that thing which we are not really discussed much in India. So it was my culture, that never talking about these things really inhibits me talking about this thing. They are kind of taboo in my country, so nobody really talk about gays and lesbians all like that, it was all new to me. In United States, people like open to different things. That was kind of experience that I feel uncomfortable to contribute.

Mexican participant said,

Sometimes you don't agree, and because my culture is different, I don't agree with what American things. I don't tell. I hold myself, I don't want to talk. Or sometimes, if I know the people, I can express an opinion, but if only I know whom I talking to.

Theme 2: Dealing with challenges in multicultural face-to-face and online settings

International students faced more cultural challenges in the face-to-face than the online settings including expressing their ideas, communication and interaction with others, participation to the community because of the language problems. Moreover, because of the limited time in the face-to-face settings, they faced difficulties when interacting with others and socializing within the community. They also had problems to trust others in the face-to-face because of the unplanned, less structure, and oral communication characteristics of those settings.

Language Problems

Language was one of the main factors that affected participants' interaction and participation in the face-to-face settings. Indian participant stated, "Coming from different culture and all that, I had my own inhibition to talk in front of many Americans [in face-to-face courses], I was so conscious about my language, make some mistakes,

so I am not very confident."

Participants also found difficult to express their ideas in the face-to-face settings because they don't think in advance. They also stated that Americans are more active and dominant in the face-to-face classrooms; therefore they don't feel confident in such situation. Mexican participant said, "Sometimes in a face-to-face class, you cannot speak. There is a whole session that maybe you don't speak, because even if you have an idea, it is very hard to express that idea." However, in online environment, because of the written and asynchronous communication, they could participate more and felt included. Chinese participant expressed,

I participate more in online course than face-to-face. Because I have more chance to express my own idea. But face-to-face course, American students are more active, and they can think about their idea and express it faster than me, so sometimes when I get ready to express my idea, the instructor has already finished the discussion. There is no way for me to go back to the discussion. But in online setting, I can go back to discussion whenever alone, and read my friends classmates posting again and again, and express my idea.

Moreover, Mexican participant stated, "Online courses, all the content is written, so it is easier. I can read it, look at the dictionary, or engage more. If you are not English speaker, it is easier." Indian participant said, "When you speak, you don't really have much time to think but when you write [in online learning] you really think since you have time and reword it and all that. I think that really helps a lot."

Moreover, requirement for expressing ideas in online learning also made them more active in the online settings. Because everybody had to say their opinions and post their ideas, they stated that not only one person is dominant. Chinese participant said, "If we did face-to-face setting, sometimes the American students would be dominant the whole group study. But in online environment everybody has to say their opinion, and everybody has to post their ideas."

Moreover, Mexican participant stated, "When you discuss, you have to post some numbers of message. In discussion your names appear there. And sometimes, you need to answer some people, answer following the people, pick one and answer, and you answer whoever you want."

Language problems also made communication difficult and created misunderstandings among international students in the face-to-face settings. Mexican participant said,

Sometimes I was not able to understand Korean girl, because my English was not very good, and neither was her. So when we were talking, sometimes it was harder to understand each other. But when you write, it was easier. So, there is no accent.

Language problems also affected their friendship and interaction. Indian participant expressed that making friendship with Americans were difficult at first because of the terms and jargons that they use. This made her not interact with others and feel left out from the community. In addition, Chinese participant stated that Americans, including both classmates and instructor, make more jokes in the face-to-face settings than the online settings. This makes her feel isolated and not belong to the community. However, she didn't feel this isolation in the online settings. She said, "my classmates come from different culture; sometimes I cannot understand one hundred percent. But, online, Americans try to make their opinion easier to understand. They understand, if they make jokes, international students don't understand. So they don't make very jokes."

Participants also stated that written communication in online learning is much easier than listening in the face-to-face classes. It affected their involvement in the community and their quality of learning. Mexican participant said, "In face-to-face courses, you have to listen, and that is harder. Online courses, content is written, so it is easier. I can read, look at the dictionary, and engage more. If you are not English speaker, it is easier." Indian participant talked about her quality of learning, "[in online learning] it is not just to learn, we just have to apply them, and try to respond other people. It is like much more quality than what we should do in face-to-face." Moreover, Mexican participant said, "I always like to read other's posting, that gives you a different perspective, another understanding. More people can think more meaningful in online courses. In online discussions, you read others opinion; maybe you missed the main part of the article." In addition, Chinese participant said, "I got chance to read other peoples postings, I think that is a very good way for me to understand the subject, the reading the posting of my peers."

Time constrain

Limited time was another factor in the face-to-face settings which affected international students' interaction and participation. Participants found their interaction limited in the face-to-face settings because of the time constrains. Indian participant say,

Sometimes we have 20 students in the class, and if every student responds to it, we might all have to defense it, so it is not everybody gets chance to speak, people are willing to share information, but there are so many people who want to share the information.

However, in the online settings, they felt more freedom than limitation to express their ideas. Moreover, they participated more because of the asynchronous interaction and written communication. Therefore, they did not feel their interaction limited in the online settings.

Participants stated that limited time in the face-to-face courses also affected their detail of discussions and socialization. Indian participant found easy to communicate in detail, exchange information, and sharing experiences of different cultures in the online courses that made her connected to the community. Moreover, she felt that dealing with course content in a limited time in the face-to-face courses hinder to make friendship. However, in the online settings, she felt more flexible to make friendship and involved in the community. She said,

Usually in our college, we have class in the night, so everybody is in a hurry to leave as soon as the class is over. You don't have time to socialize or spend sometime, or then just go around or anything. But here it is up to us, in online courses, there is not something like a time constrain.

Opposing to Indian participant, Chinese participant expressed that they didn't talk much about culture in both face-to-face and online settings, therefore she found socialization limited.

Mexican and Indian participants found hard to get to know people in the face-to-face settings which affected their socialization. However, in the online settings, they could be able to understand individuals' point of view better because of the written communication and description of people. This built more strong social relationships among them, makes them feel safe and not hinder them to communicate with others. Mexican participant said, "I think it [social relationship] is easier in [online] some way because you get to know the people because of that they are writing. Sometimes for example, if I need to answer someone, I know who I choose to answer. Because I know more or less how they think." Moreover, Indian participant stated "With the kind of and the way of the responses that given on, you'll get to know what kind of a personality that someone has."

Structure of the face-to-face courses

Indian participant found the face-to-face courses less structured, less planned, and less systematic than the online courses. However, in the online settings, because they needed to follow some guidelines and stick to the timeline, she felt more comfortable and safe. She expressed that signing group contract and written promises in online learning makes them more planned as they think of problems that they might be facing in advance.

Oral communication in the face-to-face courses also made participants not feel safe in the community. They said that they don't trust others in the face-to-face courses, because no written promises exist. However, because everything is written in the online settings, they felt much more obliged to do when they say something. Mexican participant said,

Something that was not appropriate can be proven in online. So, I think in this sense, it is very safe. In face-to-face classes, I have not have a bad thing telling to me because I am Mexican. I think, even they think, they won't tell.

Moreover, Indian participant said,

It is very easy for us to break the rules or guidelines or break your promises or something in the face-to-face environment because it is not well documented. But in online environment you have a proof for everything whatever you do, for whatever you say, it is like evident in whole world so you can't just keep changing. So that makes you trust anybody, because you know like ok somebody doesn't say what you have already promised you to do.

Theme 3: Other factors influencing the sense of community in online settings

Other factors including peer behaviors, instructor behaviors, and contextual characteristics in online learning also affected participants' sense of community level.

Peer behaviors Support from other peers. All participants agreed in that support from peers makes them more confident and feel cared in the online settings. When they felt difficulty to understand something and had problems, peer support made them encouraged and felt belong to the community. Chinese participant said, "If you really want to learn, you can have a lot of interaction with classmates and classmates can help you to understand the contents of the course." Moreover, Indian participant expressed,

Sometimes when I was little lost, I used to go online, and then suddenly I see somebody else also is looking there. They say I am confused and I don't know what I am doing so. We shared a lot of information in a chat or something like that.

When explaining the best experience, Mexican participant stated that having leader in the project made her more confident in online learning. As she had not so much experience, peer support made her feel more comfortable. Indian participant also stated similar opinion in terms of helping experienced peers to novice peers. She stated, "In online environment, I have seen that, when somebody is have taken 6 courses in online environment, is willing the

help the person who is new to it. Experts are always willing to help the novice people."

Interest of Americans in their culture. When Americans showed their interest to other cultures, international participants felt more comfortable in the online settings. Americans interest made them feel close to each other. Indian participant said, "I have team in almost all my online courses, students were American, they showed some kind of interest to different culture, they were really open to learning new things and different perspectives. They have really encouraged me in several ways."

Feedback. Feedback from the peers also affected their sense of community level in the online settings and participants were encouraged more when they got positive feedback. It made them feel more self-confident and recognized from others. However, lack of feedback from others made them feel not cared. Chinese participant said, In some courses, they always really care about other people. All of my classmates were very active. I got a lot of feedback. It makes me feel like I have something, I can do better. But, in some courses, I don't get feedback, and ok I answered the questions, and I have finished the homework.

Instructor behaviors Instructor behaviors also affected participants' sense of community in online learning. Feedback. First instructor behavior was giving feedback. Participants stated that instructor feedback made them feel cared. However, lack of instructor feedback made them feel lost, confused, and overwhelmed. Mexican participant said, "I can communicate with instructor by mail, and I get immediate response, but in some courses, no body pays attention." Moreover, Indian participant said, "in one course, there was no feedback from the professor, we were lost, don't know where we were leading, it was really confusing. That was my worst experience; I understand how much professor feedback would make change in your course.' Chinese and Mexican participants also stated importance of instructor support. Mexican participant said, "I think we have a lot of support from the program, as an international, I feel a lot of support even from the teacher….I have a lot of support from the teacher, and I feel confident." Moreover, Chinese participant told,
The instructors understand the culture, diversity pretty well. I think they are very careful to contact to foreign students. They are more patient and they wanted to be easier to be understood. I think, teacher they will use easier language to communicate with me to compare American students.

Contextual characteristics Participants stated that there were some differences between the courses that they participated in the online settings. Therefore, it was obvious that, the sense of community in online learning highly depends on the structure of the course, type of activities, course content, and course requirements.

Structure of the course in online courses. Structure of the course and type of activities that instructor provided affected the sense of community a lot in the online settings. If participants felt free to bring everything to the discussion other than textbook, they engaged more in social interaction and talked about their culture. Therefore their sense of community level became high.
Only focusing on the expectations of instructor and task oriented interaction made friendship harder in the online courses. If they could not bring cultural and social stuff into their discussion, their sense of community level was low. Chinese participant gave an example for the course which only focus on task and said,
You have to be online for to spend sometime during the course. So everybody just talk about the books we have already read and the question we need to think. But you did not know personal questions. If you only talk about academic things, it is very hard to become very close friends.
Format of the discussion also affected participants' sense of community level in the online settings. Participants stated that unguided discussions and poor messages affected their learning and encouragement in the community. Indian participant said, "Sometimes, in some courses there are some participants like who just do the job just sake of doing. They just post the posting at the end of the discussion. They don't really participate in the real sense." Moreover, Mexican participant stated, "In online discussion, if I find same message in five places that really upset me. Discussion are important tools in distance education, they have to be guided. Someone should make comment, teacher or someone."

Type of activities in online courses. If types of activities in the online courses were more dynamic, participants felt more included. Chinese participant found some online courses more interacting than the face-to-face courses because of the types of activities. However, not involving interacting activities in the online settings made them feel isolated and not feel confident. Mexican participant said, "In the face-to-face, you go to class, and you write a paper. That is an individual work. But in online, [when you work individually], you are isolated also from the others."

Summary and Discussion

The purpose of the study was to examine international students' sense of community in the multicultural online learning environments. The results of the study revealed that learning perspectives, learning styles, telling styles, individual or group working preferences, commitments, goals, and values were the major cultural differences among participants. The results obviously showed that cultural differences affected participants' sense of community level in both multicultural face-to-face and online learning environment. This result showed corresponding patterns to the literature. As stated by Parker (1999), international students have difficulties because of their individualistic vs. collectivist orientations, lack of critical thinking skills and social relationships. Moreover, the result is also consistent with the findings of Gunawardena et al. (2001) who found that forms of language used, power distance in communication between teachers and students, collectivist and individualistic tendencies are main factors that affect online cross-cultural group process.

The findings of the study also showed that international students faced more cultural challenges in the face-to-face than the online settings. The results presented that language problems of international students affected their interaction, participation, expression of their ideas, communication, friendship, and quality of their learning in the face-to-face settings. This result is consistent with the findings of McKnight (1994) and Parker (1999) that language affects international students' interactions; they challenged listening extended classes, and have difficulty to ask questions, express their opinions.

However, it was evident that they were able to solve their problems easier and develop better sense of community in the online settings through the attributes of CMC including flexibility of time and written communication. The results revealed that international students interacted and participated more, and changed information in the online settings because of the time flexibility and written communication. As Gunawardena et al. (2001) and Warschauer (1996) found that, there is equal participation among international students and Americans in the online settings than the face-to-face settings. Therefore, international students feel more connected to the community in the online settings and friendship and bonding developed among them. This result is also supported by the research of Salmon (2000) and Soller (2001) who found that active participation, sharing ideas, and promotive interaction are the important characteristics of effective online collaboration and community.

Because of the limited time in the face-to-face settings, international students faced difficulties to interact with others and participate in the community. However, in the online settings, they felt more freedom than limitation to express their ideas and participate more which makes them feel included in the community. Participants also have difficulties when finding time for socialization in the face-to-face settings. However, in the online settings, they could be able to understand individuals' point of view better because of the written communication and description of people which made them socialize and develop friendship with others. This result is consistent with the findings of Ziegahn (2001) who found that asynchronous communication make students and instructors access to written intellectual and emotional connections. As McMillan (1996) proposed that emotional bonding depends on high quality of interaction and sharedness of events.

Participants also faced with problems when trusting others in the face-to-face because of the unplanned, less structure, and oral communication characteristics of those settings. However, they were more comfortable to trust others in the online settings as they were more systematic and gave written promises.

There were some contradictions in the opinions of participants about the online courses. It is evident that those differences were result from the other factors such as peer behaviors, instructor behaviors, and contextual characteristics. Support and feedback from other peers and interest of Americans in their culture made participants more comfortable in the online settings. They developed more friendship and trust others. As stated in the literature, feedback giving and getting, providing technical and task related support, and sharing personal anecdotes help students develop online social presence and successful collaborative group process (Stacey, 1999; Vrasidas & McIsaac, 1999). Instructor feedback and support were also affected participants' sense of community in online learning which made them feel cared. This result is consistent with the literature in that support from the instructor and appropriate strategies to assist international students are important (Ku & Lohr, 2003; Wegerif, 1998). Finally, it was found that the sense of community in online learning highly depends on the structure of the course, type of activities, course content, and course requirements. This result is consistent with the findings of Vrasidas and McIsaac (1999) and Wegerif (1998) who found that structure of the course and course design influence interaction and the sense of community in the online courses.

Limitations

First of all, generalizations can not be made based on the experiences of three people from three cultures. Their responses might be affected by their demographic characteristics.

Moreover, as participants were international students, researchers had sometimes difficulties to understand their accent over tape during transcribing. Therefore, to ensure the validity and reliability during data analysis, the researchers did member check when transcribing the data.

As Peshkin (1988) mentioned that subjectivity is inevitable component of the research. It is the unique contribution that makes researcher distinctive while combining personal qualities and data. Since the researchers were also international students, they were aware that they might bring their bias to the research; they might value the behaviors and ideas of people similar to their culture, and ignore the others. Researchers kept in mind these issues and they systematically seek their subjectivity during the whole research process.

Implications for Research and Practice

Since individual's personal characteristics might affect the sense of community in addition to the cultural differences, future research is encouraged to consider individual differences in cultural groups. Further research can examine more participants from each culture. Moreover, it is suggested to explore the impact of gender in such settings.

This study provides important insights for online team facilitation in cross-cultural settings. As factors affecting the sense of community in multicultural online learning were identified, successful facilitating strategies can be derived from the study. The findings of this research can also be considered and used with the design and development of multicultural online learning environments.
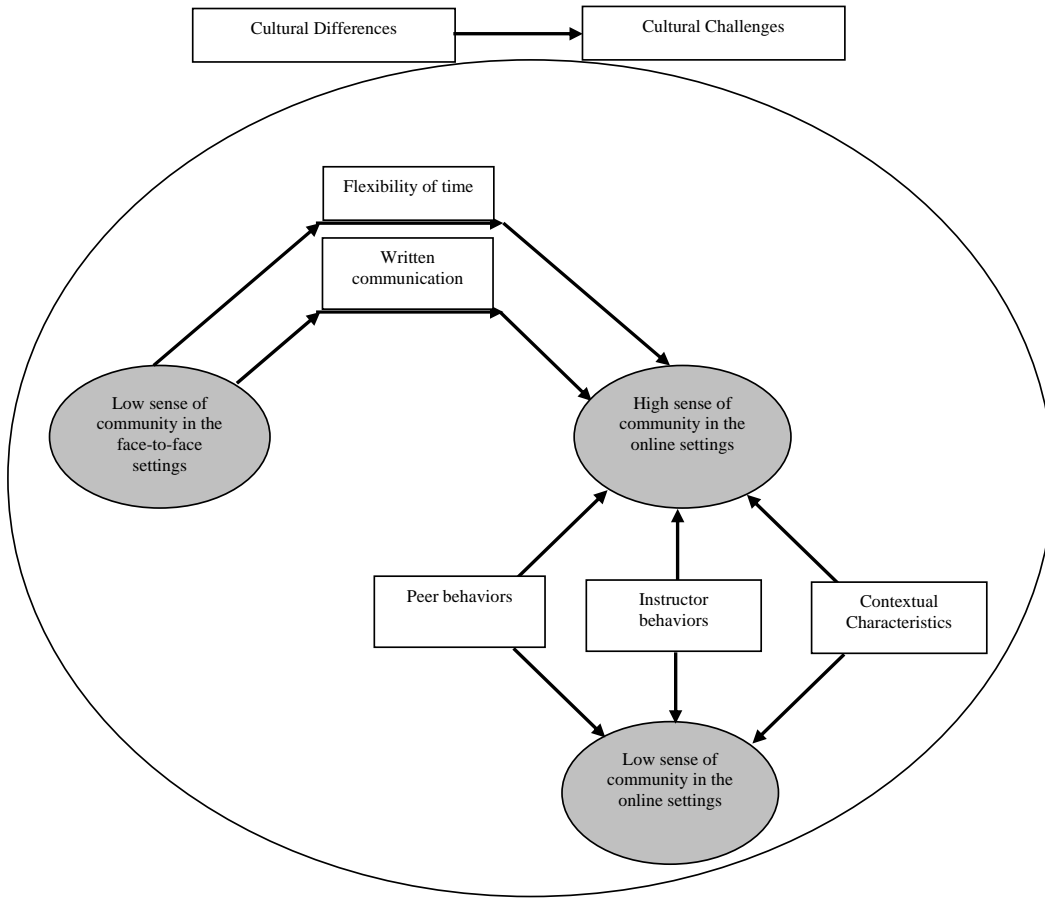
Figure 1: Findings

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Ziegahn, L. (2001). 'Talk' about culture online: The potential for transformation. Distance Education, 22(1), 144-150.Chaos Theory and the Sciences of Complexity:

Facilitators' Perception of Interactions in an Online Learning Program

Hasan Çalışkan
Anadolu University
Eskişehir, Türkiye 26470

Schools and colleges all around the world have started making use of advanced technology to provide learners effective, efficient and adequate instruction. The use of Internet and Web for learning and teaching has caused many online courses to be offered when teaching-learning activities are required for both students and faculty. The Internet has shown a rapid and important growth in the extent of online education. This has created a new paradigm for teaching and learning that is different from the traditional classroom experience and also different from earlier technology-based attempts (Kearsley, 1998).

One of the most important online course components has proven to be interaction, especially learner to learner interaction. Alexander C. lists the top ten ranking components of an optimal online environment, giving peer interaction the first place. Kearsley (1998) also states that discussions among learners are among the most important components. This is not surprising because one of the most important factors in learning appears to be interaction among learners and interaction between instructor and learners. No matter how learning takes place, interaction has always been of great importance so that an effective learning can occur. Especially when instruction is given to learners learning at a distance, this interaction component is of vital importance. Having the lack of social interaction, learners may feel alone and helpless at times they need to get help from someone, especially from their peers taking same course as in any traditional classrooms. Studies suggest that facilitators' active interactions with students have significant effects on the quality of online distance learning (Thomas, Caswell, Price & Petre, 1998).

Background

Research literature on interaction or interactivity has highlighted the importance of interaction between learners and instructors a great deal so far. According to Moore (1989) an effective online class should have three types of interaction: Learner-content, learner-instructor and learner-learner. Each type of interaction plays a role in the entire educational process. Another interaction type that some researchers imply is that the interface interaction. Interface refers to how the learner uses the computer interface to access and participate in instruction and communicate with instructors and other learners. Effective learner-interface interaction allows the learner to focus on learning and communication rather than how to access instructional content and communicate with others (Lohr, 2000).

One of the vital elements in any learning system so that interaction can take place is the support that programs offer to both students and instructors. Student support has been defined in variety of ways in the distance education literature. Simpson (2002) defines support as "all activities beyond the production and delivery of course materials that assist in the process of students in their studies." According to Carnwell & Harrington (2001) support can be defined with its components: Activities that enables students to progress satisfactorily, strategies such as cognitive, affective, meta-cognitive and motivational, and finally skills such as informing, advising, counseling, assessing, enabling and feeding back. Interaction is of most importance especially when learners and instructors/facilitators are separated by time and space.

In any distance learning setting, including online learning, extra consideration is given to interaction so that learning will be as efficient and effective as face-to-face learning. Some say, with the help of instructional technology, interaction taking place in an online learning environment could even be better than it is in a traditional setting. This of course depends on whether the programs have well designed interaction mechanisms in their activities.

Information Management (IM) Associated Degree Program of Anadolu University is the first completely online undergraduate level program in Turkey. It started in October 2001 and gave its first graduates in June 2003. The program aims to help students gain the necessary skills to use required business software effectively and efficiently, acquire the concepts and experience of the Information Management in business, attain the collaborative working experience and institutional communication on the Internet environment, and get hold of necessary experience for the enterprise and management of the Internet environment.

The program offers various types of interaction via different technologies. Synchronous and asynchronous online tools such as listserv, email and chat enable students to interact with each other, instructors, and facilitators. This support is provided and directed by the "Academic Advisors", or facilitators. There are 55 facilitators primarily for providing instructional support to the students. Each facilitator is considered as an expert in one course content. For each course there are 5-10 facilitators. These facilitators mainly provide guidance to the students when they are working on their assignments, answer their questions regarding the assignments and the topics, assess the assignment and inform the students and the course coordinators of the results, try to solve their organizational and/or technical problems, direct the students to the related support service and inform the service representatives about the students' problems, and have social interaction with the students.

In order for better interaction can take place in the program, it is important to know how facilitators and learners think about the interaction. Learner mails to the program and requests have shown that students are satisfied to some degree about the support provided. On the other hand, it is as much important to know how facilitators perceive supported interaction facilities so that it can be more efficient and effective. Studies on those attempts have shown that facilitators' active interactions with students have significant effects on the quality of online distance learning (Thomas, Caswell, Price & Petre, 1998).

This paper reveals the results of a study that examined the facilitators' perceptions on interaction (learner to learner, to facilitators, to content, and to interface as well as facilitators to learners, to facilitators, to content, and to interface) during an online course called Information Management Associate Degree Program at Anadolu University.

The Purpose and Research Questions

The main purpose of this study is to reveal the facilitators' satisfaction from interaction provided to the learners during the implementation of the Information Management Associate Degree Program of Anadolu University. The research questions of the study have been formulated as:

1. Are the facilitators overall satisfied with the interaction taking place in the program?
2. Do the facilitators' characteristics (gender, computer experience, and teaching experience) have any effect on their satisfaction?
3. Is there any difference between how facilitators perceive their own interaction (with learners, facilitators, content, and interface) and learners' interaction (with learners, content, facilitators, and interface)?

Methodology

A survey in this study has been selected as the data collection method to seek input from the facilitators. The survey instrument included 24 items related to learner, facilitator, content, and interface interaction. Three items for each interaction type examined the facilitators' levels of agreement on the interaction taking place. The items listed in Table 1. Table 2, on the other hand, shows the design of the study.

Table 1: Items used to assess the facilitators' satisfaction levels for the interaction

Items
1   Learners' communication with us (facilitators) was satisfactory.   *(Learner to Facilitator)*
2   Learners did not hesitate to ask questions to us.   *(Learner to Facilitator)*
3   Learners communicated to us almost on any subject.   *(Learner to Facilitator)*
4   As a facilitator I did not hesitate communicating to the learners.   *(Facilitator to Learner)*

5   As a facilitator, I encouraged learners to ask questions.
    (Facilitator to Learner)

6   As a facilitator my communication to learners was satisfactory.
    (Facilitator to Learner)

7   Interaction among learners was satisfactory.
    (Learner to Learner)

8   Learners did not hesitate to interact with each other on problems they encountered.
    (Learner to Learner)

9   Learners interacted to each other on many other subjects other than content and
    assignments.   *(Learner to Learner)*

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10 When I had a problem I got help from another facilitator.
    (Facilitator to Facilitator)

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11 As a facilitator, I interacted to other facilitators on many other issues other than program
    content and assignments.   *(Facilitator to Facilitator)*

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12 As facilitators our interaction among ourselves was satisfactory.
    (Facilitator to Facilitator)

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13 Content was designed to require active learner participation.
    (Learner to Content)

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14 Materials provided to learners with clear directions and feedback.
    (Learner to Content)

---

15 Learner activities were suitable to the presented content.
    (Learner to Content)

---

16 Learners did not have difficulty as they surf web sites or watch videos.
    (Learner to Interface)

---

17 Materials (Web sites, Videos in Cds, Textbooks) presented to learners had a supportive and
    appealing design.   *(Learner to Interface)*

---

18 Learners reached to any content, activity or tool easily.
    (Learner to Interface)

---

19 Content was designed to support active facilitator participation.
    (Facilitator to Content)

---

20 I got enough direction and help from materials when I needed.
    (Facilitator to Content)

---

21 Facilitator responsibilities were suitable to the presented content.
    (Facilitator to Content)

---

22 I did not have any difficulty as I surf the web or watch videos.
    (Facilitator to Interface)

---

23 Materials (Web sites, Videos in Cds, Textbooks) had a supportive and appealing design for
    me.   *(Facilitator to Interface)*

---

24 I reached to any content, activity or tool easily.
    (Facilitator to Interface)

Table 2: Design of the Study

Groups	Interaction Type			
	Facilitators	*Learners*	*Content*	*Interface*
Learners	Items 1,2,3	Items 7,8,9	Items 13,14,15	Items 16, 17, 18
Facilitators	Items 10, 11, 12	Items 4, 5, 6	Items 19, 20, 21	Items 22, 23, 24

  The survey instrument was designed as a 5-point Likert-scale ranging from 1=strongly disagree to 5=strongly agree. The 3.41 mean score identified as the expected level of satisfaction with the item while other responses enables the facilitators to show higher or lower levels of satisfaction. The 3.41 mean average was determined after identifying the critical level: 4 intervals/5 categories = 0.8.

  The 55 facilitators have taken part in the study. Almost all of these facilitators were graduate assistants at varying colleges of Anadolu University. A big majority of these facilitators (45.5%) were majoring in the science fields like computer engineering, physic, and mathematics. Others were in the social sciences. Only 8 (14.5%) of them were in the education field and 1 facilitator was in medical sciences. Of the facilitators 11 (20%) were female (Table 3) and most of them (49%) were between 25-29 years old. Besides, majority of the participant facilitators (78.2%) have reported that they had good and professional levels of computer experience while 12 (21.8 percent) indicated they had intermediate level experience (Table 4). Moreover, only 13 (23. 6 percent) of the participants indicated that they were experienced in teaching prior the program, while majority (58.2%) of them had prior experience by assisting someone else either short term or for a whole semester (Table 5).

  The study was conducted at the end of the spring 2003 semester (in June 2003). After distributing the paper-pencil version of the instrument to the facilitators, the researchers allowed them to return in a week. All facilitators responded the survey in the allocated time limit except three. Those late three were given extra time and their data collected later on.

Table 3: Gender

Gender	Frequency	Percent
Male	44	80.0
Female	11	20.0
TOTAL	*55*	*100*

Table 4: The facilitators' computer experience prior the program

Computer Experience	Frequency	Percent
Intermediate	12	21.8
Good	25	45.5
Professional	18	32.7
TOTAL	*55*	*100*

Table 5: The facilitators' teaching experience prior the program

Teaching Experience	Frequency	Percent
No experience	6	10.9

Short term assistance to a course	9	16.4
Assisting for a whole semester	23	41.8
Just began to teach	4	7.3
Experienced	13	23.6
TOTAL	*55*	*100*

The mean scores, standard deviations, t-tests and ANOVA analyses were used to interpret the data gathered via the survey instrument. According to Cronbach's Alpha analysis, the reliability of instrument was overall found as 0.8769.

Results and Discussions

Are the facilitators overall satisfied with the interaction taking place in the program?

The first research question was about what the participant facilitators' satisfaction with the overall interaction taking place in the program. Table 6 demonstrates overall mean score of the facilitators' responses to each item. According to the findings, facilitators are satisfied with the interaction taking place in each group overall except the learner to facilitator interaction. The scored for this type of interaction below the expected level of satisfaction (M=3.23 < M_{els} =3.41). From this finding, it can be said that facilitators do not think that learners in the online learning program do not interact to the facilitators as effective and efficient as they expect. On the other hand, facilitators think that they communicate effective and efficient enough to the learners (M=4.04 > M=3.41). The reason for this may be the learners' unawareness of the requirements of an online program and also their traditional learning habits that they usually expect from instructors preferring to remain passive. It is interesting to note that facilitators think that learners better interact among themselves comparing to facilitators interaction among themselves (M=3.75 < M =3.46). While they perceive their interaction with learners satisfactory, they feel their interaction with other facilitators is not that much satisfactory. They also think that their interaction with both content and interface (M=3.94 and M=4.27) are more satisfactory than that of the learners' (M=3.76 and M=3.88). Again this may be because of the learners' lack of experience in the online environments.

Table 6: Mean and standard deviation scores of interaction types

Interaction	N	M	SD
Learner to Facilitator	55	3.23	1.06
Facilitator to Learner	55	4.04	.69
Learner to Learner	55	3.75	.71
Facilitator to Facilitator	55	3.46	.85
Learner to Content	55	3.76	.68
Learner to Interface	55	3.88	.58
Facilitator to Content	55	3.94	.59
Facilitator to Interface	55	4.27	.55

Do the facilitators' characteristics (gender, computer experience, and teaching experience) have any effect on their satisfaction?

The second question of the study examined the *differences* occur in the facilitators' overall satisfaction score for any of the interaction types due to *their characteristics* such as gender, computer and teaching experiences. An independent sample t-test analysis has been conducted to see of *gender* makes any difference in the facilitators' satisfaction. The results of the analysis summarized in Table 7.

According to the results, the female facilitators scored higher than male counterparts overall. However, only in "*learner to content*" (t=2.195, df=53, p=.03) and "*facilitator to content*" (t=2.406, df=53, p=.02) interaction type the difference was significant. The female facilitators (M_f=4.15) found the "learner

to content" interaction more satisfactory than the males (M=3.67). Also, they found "facilitator to content" interaction more satisfactory (M=4.30) than male facilitators (M=3.85). For other interaction types the differences between females and males were not significant.

Table 7: t-test results for gender effect

Support	Gender	N	M	SD	Df	Sig. (2-Tailed)
Learner to Facilitator	Female	11	3.70	1.07	53	.104
	Male	44	3.11	1.04		
Facilitator to Learner	Female	11	4.12	.72	53	.651
	Male	44	4.02	.69		
Learner to Learner	Female	11	4.00	.78	53	.189
	Male	44	3.68	.69		
Facilitator to Facilitator	Female	11	3.67	.56	53	.371
	Male	44	3.41	.90		
Learner to Content	*Female*	*11*	*4.15*	*.67*	*53*	*.03**
	Male	*44*	*3.67*	*.65*		
Learner to Interface	Female	11	4.12	.81	53	.124
	Male	44	3.82	.51		
Facilitator to Content	Female	11	4.30	.69	53	.02*
	Male	44	3.85	.53		
Facilitator to Interface	*Female*	*11*	*4.30*	*.72*	*53*	*.809*
	Male	*44*	*4.26*	*.51*		

In addition, a series of one-way between-groups analyses of variance (ANOVA) were performed to observe if the overall satisfaction level of the facilitators differ according to their computer and teaching experiences. There was no significant effect of the computer and teaching experiences on the overall satisfaction levels of the facilitators.

Is there any difference between how facilitators perceive their own interaction with learners, other facilitators, content, and interface and how learners' interaction with learners, content, facilitators, and interface?

Findings were also analyzed to see if there is a difference between facilitators' perception of satisfaction between themselves and learners' interactions on any of the types. Content, interface and in-group interaction variables were analyzed to see whether facilitators perceive the interaction in these differently. For this, paired sample t-test was conducted. Table 8 shows the results. According to the results, there is a significant difference between facilitators' perception of interaction with the learners among themselves and learners with facilitators (p=.005). Facilitators believe that they better interact with learners (M=4.04) than their peers (M=3.75). Also, there is a significant difference between facilitators' perception of interaction between themselves and learners on the content (p=007). They believe that facilitators' interaction with the content is more satisfactory (M=3.94) than the learners' (M=3.76). Another

significant difference between learners and facilitators is that the facilitators' perception of interaction with interface (p=.001). They think, they better interact with the interface (M=4.27) than the learners (M=3.88). The last paired t-test analysis was conducted to see whether facilitators perceive their own interaction better or more satisfactory than the learners with other learners. The difference was significant (p=.040). But contrary of the other types, Facilitators perceive their own interactions less satisfactory (M=3.46) than those of learners (M=3.75). Although this finding may seem surprising, it should be noted that the facilitators need less help and guidance among themselves and thus communicate less comparing to the learners.

Table 8: Paired sample t-test results for interaction pairs effect

Pairs	N	M	SD	Df	Sig. (2-Tailed)
Learner to Learner	55	3.75	.71	54	.005*
Facilitator to Learner		4.04	.69	54	
Learner to Content	55	3.76	.68	54	.007*
Facilitator to Content		3.94	.59	54	
Learner to Interface	55	3.88	.58	54	.001*
Facilitator to Interface		4.27	.55	54	
Learner to Learner	55	3.75	.71	54	.040*
Facilitator to Facilitator		3.46	.85	54	

Conclusions

This descriptive study reveals that the facilitators in the Information Management (IM) Program of Anadolu University are satisfied with the interaction taking place in the program overall. However, findings reveal that facilitators do not seem to be satisfied with the learner-facilitator interaction. While they scored higher on the "learner to learner interaction" items and believed that learners better interacted with each other, they did not believe that the same applied to learners' interaction with facilitators themselves. This implies the possibility that the learners might be getting better support from their peers. Also, it might be inferred that the learner-facilitator interaction mechanisms may be in need of slight revisions. According to the findings, there are significant differences on some points between female and male facilitators. Females perceived the interaction with content more satisfactory than males. This might be caused by females' preferences on content related issues rather than technology related issues. When interaction types were paired, facilitators generally felt that they did better than learners in terms of communication. Computer and teaching experience did not have any significant differences on facilitators' perception of interaction in any types.

The results of this study can be more interesting when compared to students' perception of interactions on the same or similar issues. Further research on the qualitative sides of the issue may reveal deeper perspectives on the interaction. There is no doubt that such research studies will provide better interaction and support facilities to the IM Program of Anadolu University.

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Faculty Perspectives at Anadolu University on the Use of Internet for Educational Purposes

Hasan Cahskan
Nebiye Ozaydemir
Anadolu Univerisity
Eskisehir, Turkiye

Online learning has gained much importance in parallel to the development of Internet and web technologies and their use in education. In an online learning environment, teaching-learning activities and services are delivered to the learners with the support of computer networks. Researches show that when designed carefully and systematically, online learning environments support effective, efficient and appealing learning.

Instructor and learner roles in online learning differ from traditional learning environments. Passive receivers in traditional learning are now active learners and take responsibility for their own learning as they construct meanings in real life examples in online environments. This requires instructors as well as learners to act differently and take new roles. Instructors are now facilitators, directing discussions, coaching and advising learners other than being only content deliverers in classrooms. These new roles stand up against instructors as new challenges they should adapt systematically. Also, taking such new roles requires them to adapt new competencies and design considerations. Adapting to these new roles and competencies is of much importance for instructors so that effective online learning can take place.

Background

In an online learning environment, both the roles of instructors and learners have changed comparing to traditional educational settings. Learners, instead of being passive receivers, are much more active and take the responsibility of their own learning showing participatory behaviors in the learning settings (Estep, 2003). This gives an important responsibility to the instructors (Calışkan, 2001). Instead of being the only source of information in the classroom, instructors now direct debates and discussions in the classrooms, provide resources to the learners, and provide guidance as they need. Such roles require instructors to open up discussion subjects, promote participation, and direct discussions and activities so that they could be on task.

Online learning has often been analyzed and researched. While some researchers focus on learners in online environments, some others focus on instructors. Those who research on instructors point out a wide range of research findings. While some reflect a general point of view, some others try to reflect on some specific characteristics such as instructors' efforts for online learning, their preferences, collaboration and interaction. Additionally, instructors' reasons for Internet use and their current competencies on the use of some specific platforms in online learning have recently been researched at Anadolu University, Turkey. Besides the general perspectives on Internet use, its educational use, peoples' perspectives, and instructors/learners readiness for online courses should be of much consideration.

This study examines the faculty perspectives at Anadolu University on the instructional use of internet. Recently courses have begun to be offered online on the campus and naturally both instructors and learners have encountered new situations in terms of teaching and learning. It is clear that leaving old traditions and methods aside or trying to change them is not that easy especially when people are grown up having accustomed to do things in some certain ways. This study examines the faculty perspectives at Anadolu University on online learning. Problems in online courses offered, instructor roles, designing teaching-learning activities, extending both undergraduate and graduate online courses are the different dimensions of this study. Examining the faculty perspectives will enlighten the current and future problems and their solutions.

The Purpose and Research Questions

The main purpose of this study is to examine the perspectives of faculty at Anadolu University on the use of Internet for educational purposes. The research questions of the study have been formulated as:

1. How do the faculty evaluate their computer proficiency and their Internet access facilities?

2. For what reasons do the faculty use computer and Internet?
3. What experiences do the faculty have on using Internet for educational?
4. What are faculties' preferences of education on online learning?

Methodology

The design of the study was based upon the general survey method. The data were gathered through literature review and questionnaire techniques. A questionnaire, consisted of information about the faculty and 17 five scale questions, was prepared to examine the perspectives of faculty on the use of Internet for educational purposes. This questionnaire was applied to 190 faculty members at the 8 different schools. Descriptive statistics, variance analysis and t-test were used in analyzing data.

Schools that participated to the study and academic status of the participants from these schools is given in Table 1 and Table 2 respectively.

Table 1: Schools Participated to the Study

Schools Participated	Frequency	Percent
Faculty of Pharmacy	15	7.9
Faculty of Education	43	22.6
Eskişehir Vocational School	9	4.7
School of Communication	22	11.6
Faculty of Engineering and Architecture	28	14.7
School of Civil Aviation	17	8.9
School of Tourism and Hotel Management	11	5.8
School of Foreign Languages	45	23.7
TOTAL	*190*	*100*

Table 2: Academic Status of the Participants

Status	Frequency	Percent
Professor	23	12.1
Associate Professor	18	9.5
Assistant Professor	66	34.7
Research Assistant	48	25.3
Lecturer	35	18.4
TOTAL	*190*	*100*

Results and Discussions

How do the faculty evaluate their computer proficiency and their Internet access facilities?

The first research question was about how the participants evaluate themselves on computer proficiency and Internet use. Table 3 summarizes the faculty evaluations of themselves on computer use. According to the results, 50% of the faculty evaluated themselves as advance users. Findings show that among the faculty, assistant professors are more capable of using computers effectively. Majority of the faculty owns computer and have access to Internet at their homes (60%), the ratio of those who have computers at their homes is 80%.

Table 3: Faculty perceptions on Computer Use

	Computer Proficiency				
Status	**Beginner**	**Intermediate**	**Good**	**Advanced**	**Total**
Professor	3 (1.6%)	8 (4.2%)	7 (3.7%)	5 ((2.6%)	23 (12.1%)
Associate Professor	0	9 (4.7%)	6 (3.2%)	3 (1.6%)	18 (9.5%)
Assistant Professor	1 (0.5%)	24 (12.6%)	35 (18.4%)	6 (3.2%)	66 (34.7%)
Research Assistant	3 (1.6 %)	24 (12.6%)	14 (7.4%)	7 (3.7%)	48 (25.3%)
Lecturer	1 (0.5%)	22 11.6%)	9 (4.7%)	3 (1.6%)	35 (18.4%)
TOTAL	*8 (4.2%)*	*87 (45.8%)*	*71 (37.4%)*	*24 (12.6%)*	*190 (100%)*

Table 4: Faculty's Computer and Internet Access at Their Homes

Computer and Internet Access	**Frequency**	**Percent**
Both Computer and Internet	114	60
Only Computer	42	22.1
Neither Computer nor Internet	34	17.9
TOTAL	*190*	*100*

For what reasons do the faculty use computer and Internet?

Results show that majority of the faculty use computers and Internet for research purposes. The other areas of their purpose of computer and Internet use are communication, instruction, and entertainment respectively. Table 5 summarizes the results. These findings are consistent with a similar study Küçük conducted (2002).

Table 5: The Reasons Faculty Use Computers and Internet

		Never	*Rarely*	*Sometimes*	*Often*	*Always*	*Total*
Communication	f	-	3	37	72	78	190
	%	-	1.6	19.5	37.9	41.1	190
Instruction	f	7	10	41	81	51	190
	%	3.7	5.3	21.6	42.6	26.8	190
Research	f	1	2	25	81	81	190
	%	0.5	1.1	13.2	42.6	42.6	190
Entertainment	f	55	72	45	12	5	190
	%	28.9	37.9	23.7	6.3	2.6	190

What experiences do the faculty have on using Internet for educational?

According to the results, majority of the participants are not experienced on the use of Internet in education. Most of them neither reviewed the resources related to the field nor did they do any research on the use of Internet for educational purposes. On the other hand, when their future related perceptions on Internet is examined, almost half of the participants think about doing Internet related activities in education to some degree. These findings are consistent with the results of other studies (Ulukan&Çekerol, 2003). Almost half of the participants do not have experience for conducting online courses and thus they prefer to be outside of the activities that are preparing and conducting online courses. This result is similar to findings of Allen and Seaman (2003). At this point, faculty generally thinks about using Internet as a complementary instructional tool for their face to face classes. One way to do this according to them is to use Internet to publish course materials on the net and communicate to the learners via Internet tools such as e-mail, chat, discussion boards, etc. Table 6 summarizes faculty experiences on the use of internet for educational purposes.

Another analysis was done to see how experience effect what faculty think for the future and results change according to the activity. Those who have experience on their current courses and those who support someone else are not effected for their future plans on the Internet. According to the results, experienced faculty somehow do not prefer to have Internet related activities in their future plans. One reason for this can be the fact that online learning activities take time and great effort to realize. Those who have done it before now hesitate to engage in the same activities. Another reason might be that faculty think they do not gain anything in return in terms of promotion.

Table 6: Faculty Experiences on the Use of Internet For Educational Purposes

		Frequency	**Percent**
Doing research on Internet and reviewing it Theoretically	Did in the past	39	20.5
	Still doing	40	21.1
	Did in the past and still doing	56	29.5
	I will do it in the future	77	40.5
	-	77	40.5
Communication to students using Internet	Did in the past	34	17.9
	Still doing	61	32.1
	Did in the past and still doing	71	37.4
	I will do it in the future	100	52.6
	-	50	26.3
Publish course materials and assignments and on the net	Did in the past	33	17.4
	Still doing	44	23.2
	Did in the past and still doing	53	27.9
	I will do it in the future	112	58.9

		48	25.3
Supporting others' online classes	Did in the past	12	6.3
	Still doing	20	10.5
	Did in the past and still doing	24	12.6
	I will do it in the future	81	42.6
	-	90	47.4
I did some classes completely online	Did in the past	10	6.3
	Still doing	7	3.7
	Did in the past and still doing	14	7.4
	I will do it in the future	76	40
	-	102	53.7
Producing content for the use of Internet for educational purposes	Did in the past	13	6.8
	Still doing	17	8.9
	Did in the past and still doing	21	11.1
	I will do it in the future	89	46.8
	-	94	49.5

What are faculties' preferences of education on online learning?

Research findings indicate that the majority of the faculty (86%) demand for insturction on online learning. When their preferences on media are analyzed, they prefer online and face-to-face settings together. Remembering that thier computer and Internet proficiencies are good, it can be said that those faculty demand information behind the basic skills on computer and Internet. Those who do not ask for any instruction on the subject are the ones who evaluate themselves as advanced users. Hence, it can be inferred that they have confidence for realizing online activities because their computer and Internet skills. On the other hand, experts in the field emphasize that faculty needs wider perspectives and approaches for doing online learning activities. (Williams, 2003). Table 7 shows faculty preferences of education on online learning.

Table 7: Faculty preferences of education on online learning

Types of Education	Preferences						Total	
	First place		Second place		Third place			
	f	%	f	%	f	%	f	%
Face to face	54	28.4	41	21.6	27	14.2	122	64.2
Internet	28	14.7	27	14.2	47	24.7	102	53.7
Both	94	49.5	51	26.8	18	9.5	163	85.8
Support desk	8	4.2	46	24.2	39	20.5	93	48.9
Textbook/Cd	4	2.1	19	10	52	27.4	75	39.5

Conclusions

This descriptive study reveals that faculty use computers and Internet and they perceive themselves as advanced users. Majority of them have access to Internet. But on the other hand, they have low expectations for online courses. Those who have experience on the use of Internet for educational purposes hesitate to do such activities in the future. This must be taken into consideration prior to implementing such courses. In order for doing this they also should be supported with the necessary infrastructure and financially. Another point is that faculty's teaching and learning habits should be reviewed and they should be presented with teamwork related activities in their everyday teaching/learning activities since online teaching activities require people to work with others collaboratively. Faculty can be taken into plan and design processes and thus they can get accustomed to the environment and its requirements. On the other hand, further research should be done on the learners' perspectives related to online learning so that

better teaching learning activities can be planned and conducted.

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Supporting the Introduction of New Testament Interpretation Methods in a Survey Course with a Constructivist Learning Environment - An Exploratory Study

Dan Cernusca
David Jonassen
Gelu Ioan Ionas
University of Missouri Columbia

Steve Friesen
University of Texas at Austin

Abstract

The purpose of the study was to explore how the implementation of the hypertext-learning environment affected students' ability to extract the main points of gospel texts. A quasi-experimental two-way factorial ANOVA with repeated measures design was used to analyze the impact of the prior knowledge and major on student's performance over time. The results indicate a significant negative impact of the instructional treatment over time for students with high entry-level scores and a ceiling effect of the treatment for students in the social-studies group.

Introduction

Religions are extremely complex phenomena and consequently the study of religion deals with different individual, group and cultural beliefs systems. Traditionally, New Testament courses expose students to one method of interpretation, historical criticism, for its focus on "objectivity in discovering and reporting what really happened in the past" (Miller, 1993, p.12). Contemporary research has supplemented this methodological approach with insights offered by methods coming, among others, from the field of literature (e.g. Gunn, 1993) and the feminist theory of justice (e.g. Schussler Fiorenza, 2001). This development created challenging critical debate topics for biblical scholars and an even more challenging task of exposing undergraduate students to a significant sample of critical debate in the field of New Testament.

Technological advances during early 1990's generated several streams of research focusing on the evident gap between the structured and explicit learning that takes place in classroom and learning as part of doing real-world activities, and how educational technology can address this gap. Brown, Collins and Duguid (1989) analyzed the main characteristics of activity-driven learning and knowing and proposed a socio-cultural theoretical framework known as Situated Cognition or Situated Learning. While engaged in the context of the activity students learn to use culture-specific tools that mediate their immersion in the culture of that community. Following the situated learning approach, a hypertext-based learning environment called Cinema Hermeneutica was developed and implemented in a large survey Intro to New Testament class. Four jobs associated with four biblical criticism methods were modeled in the environment. Each student had to choose one method/job and engage in a series of tasks that started with applications of specific criticism steps to current-day materials (movies, music, newspapers) and ended with application of the method to gospel texts.

Purpose of the Study

The purpose of the study was to explore how the implementation of the hypertext-learning environment affected students' ability to extract the main points of gospel texts. Research on hypertext-assisted learning (Shapiro & Niederhauser, 2004) indicated prior knowledge and learning styles as two main learner-related variables with a significant impact on achievement. Prior knowledge measured with a pretest short essay was chose as one of the independent variable. The nature of the educational tasks specific to various majors (e.g. humanities, social sciences or engineering sciences) shape to a high degree the students' learning styles (Jonassen & Grabowski, 1993, p.255), then students' major was selected as the second independent variables.

Rationale for the Study

Religious studies field is continuously searching for methods and tools to address the complexity of religion education. Cognitive science is one of the fields that informed lately the religious education (Brelsford, 2005) through theoretical support such as social developmental perspective (Riley Estep, 2002), cognitive complexity (Box Price, 2004), or post-modernity epistemic paradigm (Martin & Martinez de Pison, 2005). This research has as focus an additional step in this endeavor that is the analysis of the impact of online constructivist learning environments on students' learning of religious criticism methods.

Description of the Environment

According to Situated Learning framework, an effective way to introduce students to biblical criticism is to engage them in a series of simulated activities derived from the practice and expertise of biblical critics. One methodological approach to address the complexity of biblical criticism in learning environments is represented by the Cognitive Flexibility Theory (CFT) that evolved as a theory for advanced knowledge acquisition in ill-structured domains (e.g. Spiro, & Jeng, 1990; Jacobson, & Spiro, 1995). The metaphor of CFT is the crisscrossing of a complex domain of knowledge represented through cases to discover different perspectives of the same problem. The tool used to operationalize the complexity of the problem domain and the crossing of perspectives is the hypertext-based learning environment (Spiro, & Jeng, 1990). Following this approach, a hypertext-based learning environment called Cinema Hermeneutica was developed and implemented in an Introduction to New Testament survey course. The main goal of the environment was to guide students in crisscrossing the Biblical Gospels from four major perspectives that are historical criticism, narrative criticism, redaction criticism, and feminist criticism (Soulen & Soulen, 2001).

The main metaphor used to simulate the series of activities within the learning environment was a temporary job as movie reviewer. After a short introduction to the basics of all four methods through job training for four magazines each representing one method, students choose one newspaper to work for (see Figure 1). Once the job selected, the sequence of activities follows a scaffolding structure based on three main steps grouped in two stages.

A first scaffolding stage immerses students in two non-gospel activities that follow a simple to complex learning trajectory. The initial step introduces students to a series of expert-developed questions that guide them through the specific requirements of the selected interpretation method. Following a worked example structure, the expert-developed questions applied to a series of pre-selected movies guide students' answers by offering instant expert feedback to each question (see Figure 2).

The second scaffolding step in the non-gospel activities stage is a near transfer task that requires students to apply the questioning structure practiced during the initial stage to a new movie at their choice (see Figure 3). The assignment for this stage requires students to work in teams, view a new movie at their choice, and synthesize their answers to major method-related questions in a short essay.

The final scaffolding stage follows the same structure as the initial one including worked examples followed by near transfer tasks, but this time the focus is on the interpretation of gospel texts. However, the near transfer task in this second stage requires students to produce a major graded essay serving also as the main feedback on their preparation stage for the midterm exam.

Research Methods and Procedures

Research in the hypertext assisted learning field (Shapiro & Niederhauser, 2004) indicated that prior knowledge and learning styles as two main variables with a significant impact on learners' achievement. If students' prior knowledge can be determined with specific pretreatment instruments (e.g. quiz, test, or essay), the complexity associated with learning style makes the task of choosing a significant measure for this variable more difficult (Shapiro & Niederhauser, 2004). The research in individual differences field indicates that in school settings the structure of the educational process and the nature of the educational tasks associated with various majors (e.g. humanities, social sciences) shape to a high degree students' learning style (Jonassen & Grabowski, 1993, p.255). Accordingly, for the exploratory purpose of this study, major served as proxy for students' learning style.

Participants

The research team discovered a large heterogeneous student body of about 150 students, most of them freshmen and sophomores, coming from diverse backgrounds: humanistic, art, engineering, business,

natural, health and social sciences. This is a typical population for a survey class having a topic of general interest and targeting a large spectrum of students. We used a convenience sample resulted through voluntary participation in the study. The incentive to participate was the possibility to obtain extra points for the completion of two short essays. A number of 105 students answering both essays were retained for this study.

Out of the 105 cases, during the data screening process one case identified as univariate outlier was dropped from the analysis. After dropping the univariate outlier, the analysis of multivariate outliers using Mahalanobis distance (Tabachnick & Fidell, 2001, p.93) indicated one multivariate outlier (Chi Square $_{max}$ = 56.27 < 32.91 = Critical Value of Chi Square), leaving 103 cases for the final analysis.

The student body was relatively balanced with respect of gender distribution (female 56% and male 44%) but quite unbalanced with respect of age (82% of the students being 20 years old or younger) and year in school (80% of students being freshman or sophomore).

Procedure

The analysis of the gospel texts covers about first third of the course and has as main goal to scaffold the main cognitive skills needed in academic interpretation of biblical texts with a long term goal of preparing students for more complex, real-life ill structured problem solving they will face both in academic and professional life.

To operationalize students' prior knowledge the research team administered a set of pretest-posttest essays outside the course activity. Students' participation was voluntary and rewarded with extra points counting toward their final grade. Because gospel analysis is the entry point in the course, the research team measured the entry -level skills during the first week of the class students' by administering a gospel passage and asking students to indicate the main point of the passage in a short essay. Starting with the second week of the course, students fully engaged in one method of biblical criticism using Camp Heremenutica following the two scaffolding stages as described in the presentation of the environment above. The culminant activity within the learning environment was to submit a formal essay associated with a gospel text interpretation using the chosen perspective. A mid-term examination that included the interpretation of a gospel passage similar to the final task in Camp Hermeneutica concluded the gospel part of the course. In the week following the mid-term exam, the research team administered a second short gospel passage similar in length and complexity to the pretest one to determine the posttest scores.

Data Collection and Instruments

All data were collected online using short questionnaires that presented students with the task, the text passage to analyze, and several demographic data questions (see Table 1).

Table 1 *Pretest questionnaire structure*

Pretest Essay	
Task	Please write 50-100 words on what you think is the main idea of the following story. I am not looking for a right or wrong answer. I just want some examples of how students interpret texts at the beginning of the course. You will receive 5 points for your efforts. Here's the story:
Text	The land of a rich man produced abundantly. And he thought to himself, 'What should I do, for I have no place to store my crops?' Then he said, 'I will do this: I will pull down my barns and build larger ones, and there I will store all my grain and my goods. And I will say to my soul, Soul, you have ample goods laid up for many years; relax, eat, drink, be merry.' But God said to him, 'You fool! This very night your life is being demanded of you. And the things you have prepared, whose will they be?'
Demographic Data	
Gender: 1-Female; 2-Male Age: Major:	
You currently are: 1-Freshman; 2-Sophomore; 3-Junior; 4-Senior; 5-Post-baccalaureate; 6-Graduate; 7-Other	

The pretreatment and post-treatment essays were similar in complexity and length, and scored for content (max. 6 points) and argument quality (max. 5 points) with two customized scoring rubrics. The

composed essay scores varied within a maximum range of 2 to 11.

To address scoring reliability, the research team placed students' essays in random order and deleted the identification information so that the graders had no link between essay and respondent. When scoring the posttest essays, five randomly selected pretest essays inserted in the grading pool were re-scored to analyze the variance between the first and the second round of scoring. The analysis indicated no significant difference between first round and second round of scoring

Analysis

Prior knowledge was first categorical variable considered for this exploratory study. Three levels of prior knowledge resulted from the composed pretreatment scores by considering a spread of one standard deviation from the mean for medium prior knowledge level, and the two remaining tails of the distribution as the low and respectively the high prior knowledge level. For the student sample that participated in this study the three prior knowledge levels were relatively well balanced with 30% Low (composed scores less than 5), 44 % Medium (composed scores from 5 to 7), and 26% High (composed scores of 7 and higher) prior knowledge.

For major, the second categorical variable used in this study, the participants indicated about 25 different types of majors. They were recoded for the purpose of this study in four generic categories of which 16% were soft-sciences (e.g. humanities, art, and fine art), 36% social-sciences (e.g. including education), 35 % hard-sciences (e.g. engineering, natural sciences, business, and finance), and 13 % undecided.

A series of two-way factorial ANOVA with repeated measures and two quasi-experimental between-groups factors was used to analyze the impact of the treatment on students' achievement in interpreting gospel texts. More specific, the study focused on the overall impact of the treatment was well as on the specific impact of prior knowledge (3 levels) and respectively major (4 levels) on students' essay scores from pretest to posttest as result of the use of Cinema Hermeneutica online learning environment in conjunction with the regular class-based instruction.

Independence of observations was presumed that is the subjects' response to the posttest essay was not influenced by their answers to the pretest essay. Kolmogorov-Smirnov Test for pretest (K-S $Z=0.87$, $p > 0.4$) and posttest scores (K-S $Z=0.71$, $p > 0.7$), as well as the P-P plots diagrams for these two variables indicated that normality is a robust assumption for this data set.

Research Results
Prior Knowledge

Results were analyzed using a two-way ANOVA with repeated measures on one factor. The Prior Knowledge X Time interaction was significant, $F(2,100)=35.46$, $p < .001$ (see Table 2).

Table 2 *Analysis of Variance for Prior Knowledge as between-subjects effect*

Source	df	F	η^2	p
Between subjects				
Prior knowledge (A)	2	50.19**	.98	.99
Residual between	100	(1.70)		
Within subjects				
Time (B)	1	10.45*	.10	.89
B X A	2	35.46**	.45	.99
Residual within	100	(1.56)		

Note. Values enclosed in parentheses represent mean square errors.
*$p < .01$, **$p < .001$

The graphical representation of the estimated marginal means across time for the three prior knowledge groups suggested that students with low and medium prior knowledge levels benefited from the treatment while students with high prior knowledge levels did not benefited from the treatment (See Figure 4).

Tests for simple effects showed that all three prior knowledge groups displayed a significant difference across time. The low and medium prior knowledge displayed a significant increase across time, $F(1,30)=60.54$, $p < .001$, respectively $F(1,44)=8.25$, $p < .05$. On the other hand, the high prior knowledge group displayed a significant decrease from pretest to posttest, $F(1,26)=16.81$, $p < .001$. Post-hoc contrast showed that at posttest, the three groups do not significantly differ among them in terms of essay scores, $F(2,100)=.58$, $p > .55$.
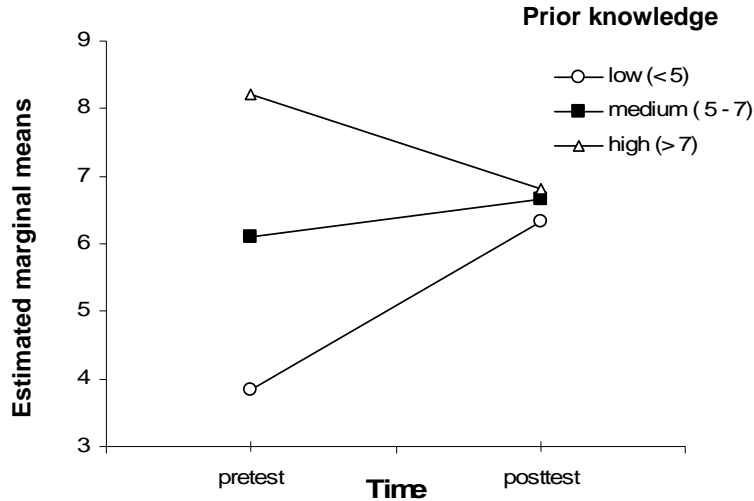
Figure 4. Significant TIME x PRIOR KNOWLEDGE interaction for the analysis of short-essay scores

Major

Results were analyzed using a two-way ANOVA with repeated measures on one factor. The Major X Time interaction was significant, $F(3,99)=4.92$, $p < .01$ (see Table 3).

Table 3 *Analysis of Variance for Major as between-subjects effect*

Source	df	F	H²	p
		Between subjects		
Major (A)	3	.25	.01	.10
Residual between	99	(3.42)		
		Within subjects		
Time (B)	1	9.31*	.09	.86
B X A	3	4.62*	.13	.90
Residual within	99	(2.34)		

Note. Values enclosed in parentheses represent mean square errors.
*$p < .01$

The graphical representation of the estimated marginal means across time for the four major groups suggested that students coming form soft-sciences (e.g. humanities, arts, fine arts) and hard-sciences (e.g. engineering, natural sciences, business, and finance) benefited from the treatment. On the other hand, students coming from social-sciences (e.g. including education) and respectively undecided students faced a ceiling effect or slight decrease (See Figure 5).
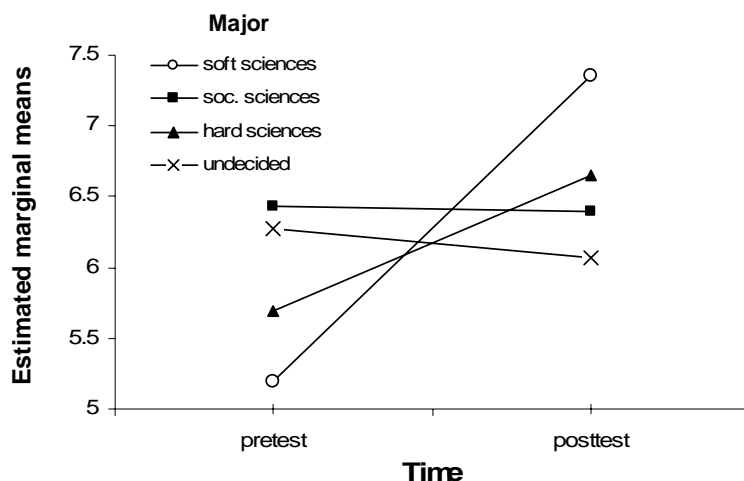
Figure 5. Significant TIME x MAJOR interaction obtained in the analysis of short-essay scores

Tests for simple effects showed that two out of four major groups displayed a significant difference across time. Soft-sciences group (e.g. humanities, arts, fine arts) and hard-sciences group (e.g. engineering, natural sciences, business, and finance) displayed a significant increase across time, $F(1,16)=39.72$, $p < .01$, respectively $F(1,35)=16.53$, $p < .01$. Social-sciences group (e.g. including education) and respectively undecided group displayed no significant difference across time, $F(1,36)=.006$, $p > .94$, respectively $F(1,12)=.11$, $p > .74$. Post-hoc contrast showed that at posttest, the four groups do not significantly differ among them in terms of essay scores, $F(3,99)=1.93$, $p > .13$.

Discussions and Conclusions

Two intriguing findings resulted from this exploratory research. The first one was the significant negative impact of the instructional treatment over time for students with high prior knowledge levels. Even if a certain ceiling effect is to be expected for high entry-level groups in most instructional treatments, the significant negative impact found in this research suggests that the treatment could qualify as a super-treatment targeting students with low or medium prior knowledge levels (Jonassen & Grabowski, 1993, p.27). Possible explanations for this result stem from the research in the hypertext and respectively individual differences fields. On one hand, in their review of the research in hypertext-assisted learning Shapiro &Niederhauser (2004) suggest that highly structured learning environments are well suited for the low entry-level learners but detrimental for high entry-level learners. On the other hand, a high degree of instructional support proved beneficial for low prior knowledge but neutral or detrimental for high prior knowledge (Jonassen & Grabowski, 1993, p.426). These two possible causes can drive the redesign stage of the Cinema Hermeneutica with the overall goal of expanding the support for students with high level of prior knowledge enrolling in the gospel interpretation survey course.

The second intriguing finding was the ceiling effect for students in the social studies group. A ceiling effect would not be surprising for hard sciences group due to the overall more structured instruction process specific for this group. However, for social sciences both the type of topic, social impact, and the nature of task, text interpretation, should be part of the instruction process.

A crosstab analysis of Major and Prior Knowledge indicated that social-sciences group has significantly higher percentage of high prior knowledge subjects as compared to both soft-sciences and hard-sciences groups (43% compared to 12% and respectively 19%), $\chi^2(6, N=103) = 12.73$, $p=.05$.

After controlling for prior knowledge the means (with standard deviation in parentheses) for pre and post essays score for social-studies group were 5.87 (.11) and respectively 6.31 (.27) showing a positive impact of the treatment across time. Then the social-studies group followed a similar path with soft-sciences group showing a favorable impact of the treatment over time once controlled for prior knowledge levels.

To conclude, instructional technology has the potential to provide higher flexibility in addressing a

large range of students' individual needs. The findings from this exploratory research suggest some potential factors to consider in the design and redesign of the structure and content of activities for the online learning environment developed to sustain biblical criticism methods in a large survey course.

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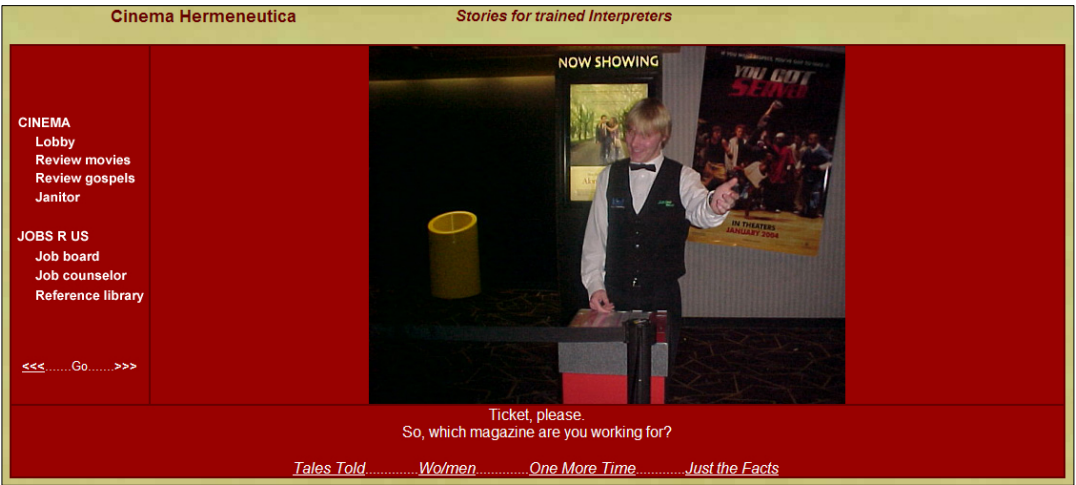
Figure 1. Cinema Hermeneutica: job selection screen for those students that completed the counseling step

Figure 2. Cinema Hermeneutica: expert-developed questions screen for feminist interpretation
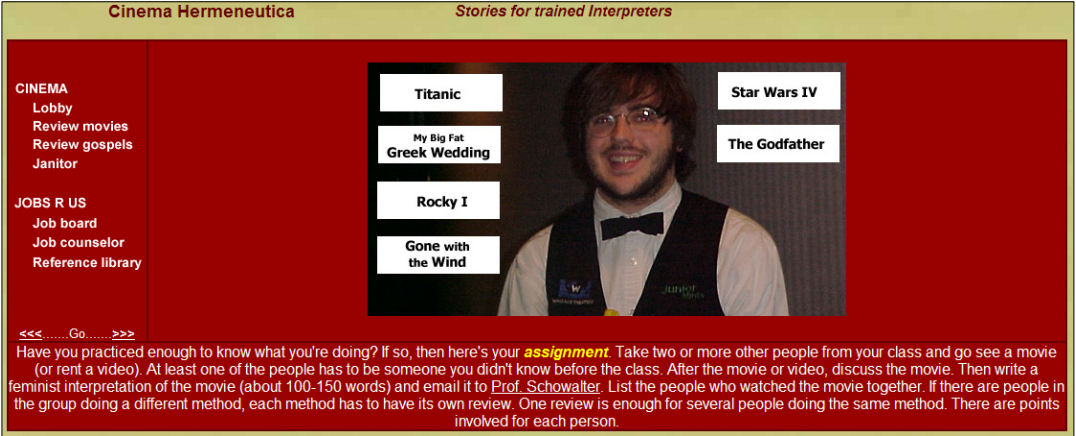

Figure 3. Cinema Hermeneutica: non-gospel activities screen with the final assignment for first scaffolding stage

Promoting Theory Application through Cognitive Structuring in Online Learning

Shujen L. Chang
University of Houston-Clear Lake

ABSTRACT

This study proposed an easy-to-implement instructional strategy, cognitive structuring assignments (CSA), for developing students' ability of learning theory application in an online learning environment. The effect of CSA on learning theory application was empirically investigated and found that the CSA group significantly outperformed the control group in terms of applying learning theory into various settings. This finding suggests that CSA may be an effective instructional strategy and online instructional designers and instructors may incorporate more CSA to advance students' ability in applying learning theory into teaching and working situations.

Introduction

Learning theory application has been a focus of learning and instruction especially in teacher education (Driscoll 2005; Gagne & Medsker, 1996). The common instructional strategies that enabled cognitive structuring for theory application were concept mapping, semantic relationship tests, and worked examples (DeSimone et al., 2001; Jonassen & Wang, 1993; Ward & Sweller, 1990). It was found that, although there were various advantages associated with these instructional strategies, several inherent weaknesses of these instructional strategies made it difficult to implement these instructional strategies in online learning environment. Thus, this study proposed an instructional strategy - cognitive structuring assignment (CSA), which was built upon these common instructional strategies and their advantages but meanwhile alleviated their weaknesses, to facilitate learning theory application in the online learning environment.

Purpose

The purpose of this study was to investigate the effect of cognitive structuring assignments (CSA) as an instructional strategy in learning theory application in an online learning environment. It was hypothesized that the use of CSA would facilitate the processes of cognitive restructuring for achieving better learning theory application.

Method

Research participants were 104 graduate students, 88 females and 16 males, of a southwest public university. The course was delivered entirely online with a required textbook. Online courses material included overview, outline, activities, assignments, and quizzes. Bulletin board and email were used for class discussion and telecommunication through the course website.

This study used a two-group quasi-experimental design. The control and treatment groups consisted of 58 and 46 participants, respectively. The control group received no CSA and the treatment group received two CSAs, one at the beginning and the other one at the end of semester.

THE INSTRUMENT AND VARIABLES

The instrument, CSA, was developed on the foundation of concept mapping, semantic relationship tests, and worked examples, and aimed to assess a student's cognitive structure of (after studying) learning theories (DeSimone et al., 2001; Jonassen & Wang, 1993; Ward & Sweller, 1990). Students were asked to describe the relationship between a given learning theory and a case of its application. Alpha Cronbach tests for the reliability coefficient on the two CSAs were .72 and .67.

The two dependent variables observed in this study were the cognitive restructuring and learning theory application. Cognitive restructuring referred to students' improvement from the 1st to the 2nd CSA. CSA was assessed on two criteria: 1) clear and accurate identification of the relationship, and 2) clear and logical explanation of the identified relationship. Learning theory application referred to students' performance on the application of learning theories from which students designed instructional strategies. It was assessed on two criteria: 1) appropriate instructional methods for the given learning theory, and 2) explicit description of the relationships between the instructional methods and the given learning theory.

Data Analysis

Nonparametric data analyses were employed because intact classes, or non-random treatment assignment, were used in this study. The significance level of .05 was used for all statistical tests. Learners' age, gender, prior experience in online courses, and English as native language were not significantly correlated with any dependant variables and were dropped in subsequent analyses.

Results

Overall, the means of cognitive restructuring and learning theory application were 20.92 (SD=31.96) and 84.30 (SD=11.31) respectively on a 100-point scale. The control group consisted of 58 students, 51 females and 7 males, while the treatment (CSA) group consisted of 46 students, 37 females and 9 males.

A Wilcoxon Signed Ranks test for two related samples showed that cognitive restructuring was significantly correlated to learning theory application (Z=-5.90, p = .00, mean rank=24.00, sum of ranks=1080.00). Further, a Mann-Whitney test for two independent samples indicated that the CSA group significantly outperformed the control group on learning theory application (Mann-Whitney U= 631.50, Z=-4.61, p = .00).

Discussion and Conclusion

This study found a significant correlation between cognitive restructuring and learning theory application. It also found that the CSA group significantly outperformed the control group on learning theory application. These findings clearly support the hypothesis that CSA may effectively facilitate the processes of cognitive restructuring for achieving better learning theory application. They suggest that online instructional designers and instructors may incorporate CSA for developing students' ability in applying learning theories into their teaching or working situations. Furthermore, these findings suggest that CSA with appropriate modification may be applicable to other domains where theory application is critical, such as corporate training.

Though the findings are positive, there remain a few limitations worthy of consideration. Alpha Cronbach tests for the reliability coefficient of the two CSAs were .72 and .67, which are considered at the lower limit (Hair, Anderson, Tatham, & Black, 1998). Modification of CSA to increase its internal reliability may be needed. Also, the use of CSA is limited to the domain of learning theory and may not be suitable for other domains without proper modification.

These limitations call for further research in two specific areas. First, redesign the questions of CSA for higher reliability coefficient. Second, explore the effects of CSA in various domains; especially those domains require application of theories. For example, CSA may be an effective instructional strategy for learning how to apply economics theories in business decisions, physics theories in engineering, psychology theories in educational psychometrics, etc.

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How Can We Facilitate Students' In-depth Thinking and Interaction In An Asynchronous Online Discussion Environment? A Case Study

Wing Sum Cheung
Nanyang Technological University
Khe Foon Hew
Indiana University

Abstract

In the last few years, there has been a proliferation of asynchronous online discussion forums, which have opened up the possibilities for people to exchange ideas at any place and time. The literature has documented that asynchronous online discussion has the following desirable characteristics: 1) it may help enhance the participation of student who might be less willing to participate in traditional face-to-face classroom settings due to shyness; and 2) it has the potential to encourage more thoughtful responses since participants can take their own time in composing their thoughts. Nonetheless, despite the promise of asynchronous online discussion to promote rich learning experiences, students do not always make use of its potential. The purpose of this study is to examine how a group of Singapore students interacted with one another, as well as the types of thinking skills (critical or creative thinking) and levels of information processing they exhibited during an asynchronous online discussion, in an attempt to draw out certain guidelines that could help facilitate students' in-depth thinking and promote student-to-student interaction in an online discussion environment.

Introduction

Asynchronous online discussion generally refers to the exchange of messages via computer networks where participants need not be online simultaneously. Since asynchronous online discussion allows records of a participant's written messages to be kept in the virtual electronic 'space' for long periods of time (Ganeva, 1999), participants can respond to the messages posted at any time they prefer and view the messages many times and long after the messages have been posted. In this way, asynchronous online discussion can resemble written communication (Ganeva, 1999). Most of the current asynchronous online discussion forums are hypertext-based, which make them dynamic environments, i.e., users can manipulate the display of the content of the conference, and view the record of messages in sequenced or 'threaded' formats (sorted according to time of contribution, grouped by author, or clustered according to topical links) (Ganeva, 1999). Asynchronous online discussion has the potential to improve the teaching and learning experiences in traditional classroom settings. As Groeling (1999, p. 1) wrote, "With it, scholars and educators have the potential to vastly expand the opportunities for students to interact outside the classroom." In brief, the literature has argued that asynchronous online discussion has the following desirable characteristics (Groeling, 1999): 1) Asynchronous online discussion increases accessibility and opportunities for interaction since it is available 24 hours a day and 7 days a week; 2) Asynchronous online discussion can help enhance the participation of student who might be less willing to participate in traditional face-to-face classroom settings due to shyness, language problems or gender; and 3) Asynchronous online discussion has the potential to encourage more thoughtful and reflective responses since participants can take their own time ordering and composing their thoughts.

Nonetheless, despite the promise of asynchronous online discussion to promote rich learning experiences, students do not always make use of its potential (Fishman & Gomez, 1997; Guzdial, 1997). As noted by Land & Dornisch (2002, p. 366): "Only a few students may contribute, discussions may be controlled by a small number of authors, and interactive dialogue in which students present and respond to views may be absent. Such problems might be related to student focus on completion of a task". Additionally, students may remain "lurkers" in asynchronous online discussion environments, due to the lack of critical and creative thinking skills to make interesting postings. Therefore, in order to foster productive dialogue, several methods have been suggested in the literature. These include the role of the online moderator, the role of the participants, and the types of activity used during the online discussion (Ahern, Peck & Laycock, 1992; Bodzin & Park, 2000; Rohfeld & Hiemstra, 1995). We argue that, besides the aforementioned methods, certain practical guidelines could help facilitate students' in-depth thinking and promote student-to-student interaction in an asynchronous online discussion environment.

The purpose of this study is to examine how a group of Singapore students interacted with one another, as well as the types of thinking skills (critical or creative thinking) and levels of information processing they exhibited during an asynchronous online discussion, in an attempt to draw out certain guidelines that could help facilitate students' in-depth thinking and promote student-to-student interaction in an online discussion environment.

Methodology

Participants

Thirty-eight student teachers (henceforth referred to as students) in Singapore participated in the study. The participants were enrolled in a hypermedia design and development course at the National Institute of Education (NIE), Singapore. The participants were enrolled in a hypermedia design course where they were required to design and develop instructional hypermedia materials to be used in actual classroom settings. During the course, two asynchronous online discussion sessions were held; each lasted four weeks. These discussions were done using BlackBoard, a Web-based course management software. The overall objectives of the online discussions were: 1) to provide each student an opportunity to identify design problems of their classmates' hypermedia materials and give suggestions to solve the problems; and 2) to allow students to comment about their classmates' ideas and suggestions.

Instrumentation

An interaction and thinking framework was developed to analyze the computer transcripts of the students' discussions. We defined interaction as the extent of information exchange among students. The exchange of information can be conceptualized as having two levels: true interaction and quasi-interaction. True interaction involves a three-step process: Person A communicates with B; a response from B; and person A's reply to B's response. Quasi-interaction involves only two actions: person A communicates with person B and a response from person B.

We also studied two types of thinking skills: critical thinking and creative thinking. Critical thinking is the ability to assess the reasonableness of ideas (Swartz & Parks, 1994), while creative thinking is the skill to generate ideas or solutions (Jonassen, 1997). Next, we differentiate between 'surface' and 'in-depth' levels of information processing in order to analyze the level at which these thinking skills occur. The levels of information processing in this study were drawn from Henri (1992b), Swartz & Parks (1994), Newman, Johnson, Webb, & Cochrane (1997). Elements of 'surface' information processing for creative thinking would include: 1) proposing ideas or solutions without offering any explanations, 2) merely repeating what has been said, and 3) squashing new ideas, while 'in-depth' level of creative thinking refers to: 1) proposing solutions with clear explanations, 2) adding new information to previous comments, and 3) generating novel ideas or solutions.

To evaluate the level of critical thinking skills, we used the following 'surface' and 'in-depth' levels of information processing. 'Surface' level includes: 1) making conclusions or judgments without offering justification, 2) sticking to prejudices or assumptions, 3) stating that one shares the conclusions or judgments made by others without taking these further, and 4) failure to state the advantages or disadvantages of a suggestion, conclusion or judgment. "In-depth' level, on the other hand, involves: 1) making conclusions or judgments supported by justification, 2) setting out the advantages or disadvantages of a suggestion, conclusion or judgment, 3) stating that one shares the conclusions or judgments made by others and supporting them with relevant facts, experience or personal comments, and 4) making valid assumptions based on the available indicators. Table 1 provides a summary of the definitions and indicators of our framework.

Students were also asked to keep reflection logs to describe their feelings, experiences and things they had learnt during the asynchronous online discussion. In addition, focus group interviews were conducted to elicit in-depth information about students' perceptions and experiences in using asynchronous online discussion.

Thinking Skills	Definitions	Indicators

Creative thinking	Generate possible problem solutions *(*J)*	*Surface*: - Suggestions proposed are unclear and with little or no details or examples. - Repeating someone else's suggestions without adding in new information or personal comments. *(*N)* - Squashing, putting down new suggestions. *(*N)* *In-depth*: + Suggestions proposed are clear and supported with appropriate details or relevant examples. + Adding on to someone else's suggestions with new information, personal experiences or relevant literature. *(*N)* + Generating unusual suggestions that nobody has thought of. *(*SP, N)*
Critical thinking	Assess the viability of the alternative solutions *(*SP)*	*Surface*: - Does not justify conclusions or judgments made - Stating that one shares the conclusions or judgments made by others without taking these further *(*H)* - Does not spell out the advantages or disadvantages of a suggestion, conclusion or judgment. (*H)* - Sticking to prejudices or assumptions *(*N)* *In-depth*: + Justifies conclusions or judgments made + Stating that one shares the conclusions or judgments made by others and supporting them with relevant facts, experience or personal comments *(*H)* + Identifying the advantages or disadvantages of a suggestion, conclusion or judgment. (*H)* + Making valid assumptions based on the available indicators.

Table 1. Framework for evaluating thinking skills and levels of information processing
* Adapted from the following sources: J – Jonassen (1997), H – Henri (1992b), SP - Swartz & Parks (1994), N - Newman et al (1997)

Procedure and data analysis

Prior to the commencement of the asynchronous online discussion session, all the students were first briefed in a face-to-face session, about the task they were to do as well as the objectives of the online discussion and reflection log. In addition, the criteria on which the students' participation in the asynchronous online discussion would be judged, which were ten percent of their final grade in the course, were discussed in class, prior to the commencement of the actual discussion. The criteria were as follows: post at least one comment, suggestion, or question about someone else's hypermedia project, incorporate ideas or concepts gathered from the face-to-face tutorials and assigned readings, and well-reasoned positions. In addition, the instructor in the study only participated in the following manner: answered any students' questions that were specifically directed to the tutor, and posted instructions at the very onset of the online discussion to help the students remember the specific tasks they had to do. Hence, the entire online discussion was very much controlled by the students. Questions, prompts, comments, and suggestions were generated freely by the students.

At the end of the whole course, some of the students were interviewed. The focus group interviews were about forty-five minutes long and with the permission of the students, these interviews were audio taped to assist in accurately capturing all responses. All online discussion transcripts and reflection logs were collected for analysis at the conclusion of the course.

The analysis of all the students' online transcripts was carried out in two parts. In the first part, the transcripts were read and divided into message units. A message unit in this study refers to a single idea conveyed by the participants. Generally, each paragraph in a message posting is assumed to correspond to a new idea since the students, being pre-service teachers, should be able to break their messages into appropriate paragraphs. The choice of a message unit being a single idea or theme was consistent with the

suggestion by Lincoln and Guba (1985) that the unit of analysis be heuristic and able to stand by itself. This selection is also consistent with Merriam's (1998) recommendation that "communication of meaning" (p. 160) be the main focus. Therefore, in this study, each message paragraph was analyzed and if two continuous paragraphs dealt with the same idea, they were counted as one message unit. If, on the other hand, one paragraph contained two ideas, it was counted as two separate message units. Once the message units were identified, the analysis then moved into the second part where the interaction and thinking model was used to identify the various types of interactions, thinking skills and levels of information processing evident in the students' online transcripts logs.

Results and Discussion

How did the students interact with one another in the asynchronous online discussion?

Altogether there were 67 counts of student-to-student interactions, which generated 245 message units, in the asynchronous online discussion. Out of these 67 interactions, 50 were quasi-interactions, while 17 were true-interactions. This indicates that 74.6% of the interactions were only 2-step, i.e. person A communicates with person B and a response from person B. To study the nature of the student-to-student interactions further, we analysed the 245 message units and categorized them into one of the following five phases (adapted from Gunawardena, Lowe, & Anderson, 1997):

1. *Phase 1*, which refers to the giving of information in response to a question.
2. *Phase 2*, which refers to the exploration of inconsistency among the ideas advanced by different participants. Examples might include: Identifying and stating areas of disagreement, and asking and answering questions to clarify the source and extent of the disagreement.
3. *Phase 3*, which refers to the negotiation of meaning. Examples include the following: Negotiation or clarification of the meaning of terms, identification of areas of agreement or overlap among conflicting ideas, and the proposal and negotiation of new statements embodying compromise.
4. *Phase 4*, which refers to the testing and modification of proposed synthesis or co-construction. Examples include: Testing the proposed synthesis against personal experience, testing against formal data collected, and testing against contradictory information from the literature.
5. *Phase 5*, which refers to the agreement statement(s) or applications of newly constructed meaning. Examples might consist of: Summarizing of agreement, and students' self-reflective statements that illustrate their knowledge or ways of thinking have changed as a result of the online discussion interaction.

It was found that out of the 245 message units, 242 were at *Phase 1*: giving of information in response to a question, and only three were at *Phase 2*: exploration of inconsistency among the ideas advanced by different participants. The aforementioned results thus reveal that the majority of students were contented to simply answer their classmates' online queries rather than fully address other people's different opinions about the issues on hand. There was little sense of heated discussions or debate of ideas with the students taking sides on issues, negotiating or arriving at a compromise; hence many of the interactions were only 2-step. In an attempt to discover why there was a lack of dialectical exchange of opinions among the students, we analysed the students' reflection logs and interview transcripts, and found the following two reasons: difficulty in keeping track of discussion threads, procrastination or failure in responding to the message postings.

Students found it difficult to keep track of the multiple threads of discussion in the asynchronous online environment. This resulted in disorientation of discussion among the students, thus impeding the development of more intense interaction. As one student wrote in her reflection log, "As directed, we were supposed to give our comments about the hypermedia projects. However, I did not know if the participants were sure of the threads they were supposed to respond to. I found that they would often launch into writing something that was not in the thread or wrote it in the wrong thread. This was often frustrating when I wished to respond to that statement and yet knowing that I too would be replying to something that was not supposed to be there".

Delay between message postings in an asynchronous online discussion. These delays, either due to procrastination or failure to respond at all, can cause great frustrations for students who are waiting for someone to respond to their opinions or queries; causing some of them to give up altogether trying to communicate. 13.9 % of the students complained about having to wait for responses on some ideas they wished to clarify urgently. One student recounted how she had to wait for a few days before someone actually commented on her suggestions, while another said, "some classmates never respond to the message posted, as a result, the flow of communication was not good".

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What types of thinking skills (critical or creative thinking) and levels of information processing did the students exhibit during the online discussion?

Table 2 shows the frequency count of the different types of thinking skills and levels of information processing. Examples from the data for the different types of thinking skills and levels of information processing are summarized in Table 3.

Category of thinking skills	Frequency count
Creative thinking	73 (Surface level: 34 In-depth level: 39)
Critical thinking	134 (Surface level: 58 In-depth level: 76)

Table 2. Frequencies of thinking skills and their levels of information processing

Thinking skill & Level of information processing	Examples from the data
Creative thinking – surface	• "More graphics should be added to make it more interesting. You may have thought of adding more graphics and media to it." (*The above statement was classified as creative thinking - surface level because the author posed a solution, i.e. adding more graphics, but stopped short of offering any suggestion or elaboration as to the type of graphics to be used*.)
Creative thinking – in-depth	• "I noticed that there are no buttons to allow learners to move from slides to slides. Just a suggestion…you might want to include a panel for these buttons. For example, a 'help' button is essential since this is a difficult topic." (*The above statement was categorized as creative thinking – in-depth because the suggestion given is clear and supported with an appropriate example*.)
Critical thinking – surface	• " I find that there are too many empty (white) spaces on the presentation slides." (*This was classified as critical thinking - surface level of information processing since the author made his conclusion without giving any justification as to why it was not good to have too many empty spaces on a presentation slide*.)
Critical thinking – in-depth	• "I feel that the choice of your illustrations are quite well chosen, except for the birds. I feel that the birds are distracting because of their movements and they don't blend well with the other illustrations." (*The above statement was coded as critical thinking – in-depth level of information processing because the author expressed a judgement and provided a plausible argument as to why his judgement was valid*.)

Table 3. Examples of thinking skills and the varied levels of information processing

From Table 2, it can be seen that critical thinking formed the bulk of the students' thinking skills. This result reflects the way that the students tended to use the asynchronous online discussion forum to

judge the quality of their classmates' hypermedia projects, rather than suggest possible solutions to help improve the projects. Overall, 44.4% of all the thinking skills exhibited by the students were of surface level information processing. Most of the surface level thinking was due to the fact that the students failed to justify their judgments or comments, or proposing a solution with little details or explanations. Students appeared to regard knowing "how to do" as more important than knowing "why they are doing it", a finding that supports Lim and Tan (2001) conclusion that student teachers in Singapore tended to prefer instrumental understanding: knowing what to do without knowing the reasons. The message ideas in this study, as the discussion progressed, also began to "sound along the same lines". There was not much new insight or "new twist" in the students' responses.

In summary, the analysis of the students' asynchronous online transcripts has revealed the following problems of thinking and interaction: Difficulty in keeping track of discussion threads, procrastination or failure in responding to the message postings, failure in justifying the conclusions or judgments made, proposing solutions with no details or explanations, and repeating ideas that have been previously made without giving additional information or insight.

Implications

To alleviate the aforementioned problems of thinking and interaction, we propose the following seven guidelines. With regards to thinking, we first propose that students be reminded not to merely repeat a previously mentioned idea in the online discussion. Additional information (such as insights based on personal experiences or knowledge) is to be provided. Second, students are to justify all conclusions or judgments made. By doing so, the students will progressively deepened their understanding as they reflect on their statements and refine their initial conceptions. Third, students are to clarify all suggestions made with the appropriate details or relevant examples, when others query them. This will make their suggestions easily understood by others. And fourth, students are encouraged to use good questioning techniques, for example a taxonomy of Socratic questions, to help them generate critical and creative postings. According to Thoms and Junaid (1997, p. 2), these questions include:

1. Questions of clarification. These ask for verification or additional information of one point or main idea.
2. Questions that probe assumptions. These questions ask the student for explanation or reliability of an assumption.
3. Questions that probe reasons and evidence. This category of questions ask for additional examples, reasons for making statements or process that lead the student to his or her belief.
4. Questions about viewpoints. These ask the student whether there are alternatives to his viewpoint or a comparison of similarities and differences between viewpoints.
5. Questions that probe implications and consequences. Finally, this category of questions helps the student to describe the implication of what is being done, or the cause-and-effect of an action.

With regard to the facilitation of interaction, we propose the following rules. First, students have to exercise caution when replying to any message in the online discussion. They have to make sure that they reply to the correct thread in order to avoid any disorientation in the discussion. Second, students are reminded to put forth only one idea in one message posting. This would give the online participants a clear view of all the ideas under discussion and avoid responding to the wrong thread or idea. And third, students are encouraged to reply to their classmates' online enquiries within 48 hours, so as to avoid the problem of delay between message postings. We summarize these seven rules in Table 4.

Conclusion and Educational Importance of Study

In this study, we examined problems of thinking and interaction found in online transcripts in an attempt to draw out some practical guidelines that can help facilitate in-depth thinking and interaction among students in an asynchronous online discussion environment. Seven guidelines were subsequently provided. The main contribution of the present study lies in its advancing the knowledge of online facilitation technique, an increasingly important skill in online discussion environments, based on empirical research. Moreover, the study reported on guidelines situated and grounded in an Asian context, making the findings particularly useful to educators and researchers interested in cross-cultural online learning contexts.

Thinking	Interaction
1) Do not simply repeat someone's ideas in the online discussion. Please provide additional information or insight (e.g. based on personal experiences). 2) Please justify all conclusions or judgments made. 3) Clarify all suggestions made with the appropriate details or relevant examples. 4) Use a taxonomy of Socratic questions to help generate critical and creative postings. Such questions include: • Questions of clarification • Questions that probe assumptions • Questions that probe reasons and evidence • Questions about viewpoints • Questions that probe implications and consequences	1) Please reply to the appropriate thread. 2) Put only idea in one message posting. Avoid putting forth more than one idea in a message posting. 3) Do not procrastinate in replying to someone's enquires. Please reply within 48 hours.

Table 4. Guidelines to facilitate students' in-depth thinking and interaction in an asynchronous online discussion environment

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A Novice Online Instructor's Online Teaching Experience: A Case Study

Hee Jun Choi
Ji-Hye Park
University of Illinois at Urbana-Champaign

Teaching is one of the major responsibilities that faculty members perform at a university. However, a large portion of candidates might get faculty jobs without specific knowledge of or experience related to teaching. Teaching is often not an easy job for such faculty members. Moreover, the advent of online educational environments might provide faculty members with even more challenges (Palloff & Pratt, 1999). In an online environment, faculty members are required to develop competencies in teaching online in addition to cultivate knowledge and skills for teaching in a traditional face-to-face classroom. For successful online teaching, it is important to train faculty not only in the use of technology but also in the art of teaching online (Palloff & Pratt, 2001).

Palloff and Pratt (2001) assert that "teaching in the cyberspace classroom requires that we move beyond traditional models of pedagogy" (p.20). Online instructors need to apply a unique pedagogical approach to the analysis, design, development, implementation, and evaluation stages in order to engender an effective and efficient online learning environment. In other words, online instructors need to devise the appropriate teaching and learning methods for this new environment in order to make the learning experience of invisible learners effective. If online instructors try to apply the teaching approach used in a traditional face-to-face teaching environment to the online environment, it would not be as effective. This implies that the online learning environment requires a specific and unique educational approach in order to make both the teaching and learning efficient and effective.

According to Moore and Kearsley (2005), online teaching is different from traditional classroom teaching in terms of the following: not being able to see students' reaction to the instruction; reliance on technology for effective teaching; little peer support; little physical routine in attending classes; and the presence of collaborative work (i.e., collaboration with the technical assistant, computer program support staff, program coordinator, and so on). The peculiarity of the additional requisite competencies for an online environment might be a kind of stress to many faculty members who have never experienced online teaching.

Issue Questions

Previous studies regarding online learning have focused on learner perspectives, such as student learning outcomes, their perception of or satisfaction with online learning, and so forth. Only a few studies have addressed the faculty perspective, which is one of major factors in the success of online learning. The few studies that claim that online teaching might be a burden to the faculty members are based mainly on the researchers' intuitions and reflections, without empirical evidences. Accordingly, this study intends to explore whether online teaching is actually a burden to faculty members through the first online teaching experience of a professor at a large university in the Midwestern United States. Consequently, this study aims to help readers understand the online teaching environment by providing them with opportunities to vicariously experience the challenges faced by a novice online instructor. It also may serve as an initial step toward the more effective preparation of a new online instructor. To attain the purposes of this study, the following questions are addressed:

1. What are the challenges that a novice online instructor faces when teaching her first online course?
2. Are such challenges in online teaching a burden to faculty members?

Background Information of the Online Program

The online degree program studied in this study culminates in a Master of Education degree. The program includes nine courses. These courses are similar in content to courses taught on-campus. A new cohort of students begins courses every year. Students take one course per term, including summer. The nine courses are delivered in a combined synchronous and asynchronous form.

The design for the courses could be characterized as modular, but they are not just courses broken into a series of units. The structure is comprised of course sections that are divided into modules. Modules are divided into learning cycles. A learning cycle includes the following elements: presentation of content, application of content (activity), and assessment/feedback. This design builds on the concepts of social learning, metacognition, mental processing capacity, and systems thinking.

The program uses asynchronous delivery, where students can watch a streamed PowerPoint supported lecture—students hear the instructor giving a lecture while seeing PowerPoint slides. These lectures are usually fifteen to twenty-five minutes in length. Additionally, students are provided with learning activities, to be completed either independently or as a team activity, depending on what the professor requires. Students submit their work electronically in a variety of forms (i.e., email, Webboard, etc.), according to the professor's preference.

Synchronous instruction is also provided once per week, in a session lasting approximately one hour. All students are expected to log onto a text chat system and communicate or interact with each other and the professor. The professor uses live, streamed audio to talk to the students and to lead discussions. For the purpose of saving faculty time, instructors are provided with a development assistant who is responsible for the technical aspects of the course transformation. A team of graduate assistants, who have technology experience, provides this assistance. It is estimated that development assistance averages fifteen hours per week for sixteen weeks in each course. During the semester that faculty actually teach or deliver a course, they are provided with a teaching assistant for ten hours per week.

Description of the Case

The case for this study is Michelle (an alias) who taught an online course for the first time. This female faculty member had never experienced online teaching until Spring 2004, even though she has substantial offline teaching experience at the university level. The spring semester of 2004 was the second semester for her to teach on-campus students and the first semester to teach online students at the university. In particular, she taught the same subject matter in two different settings during the same semester: one as an online course using the online education system, and the other as a conventional face-to-face course in a traditional classroom setting. This unique situation allowed her to compare the two teaching experiences, to discover the distinguishing traits of online teaching, and finally, to adjust to the new online environment. This course had originally been developed and taught by another professor in the department. She was assigned to teach the course because he was on sabbatical during the semester. This situation did not allow her to change the course content in order to fit her teaching style.

In terms of the ability to use the technology, which makes distance teaching a challenge for most instructors (Moore & Kearsley, 2005), she was not good at computer technology but was enthusiastic to learn. She progressed through the tutorial for new online instructors and teaching assistants and came to the online office to ask questions of both the coordinator and the development assistants quite often. In spite of these efforts, she seemed to have a hard time to adapt herself to the new environment at the beginning. Moreover, she experienced a small conflict with the students in the online course during the first month of teaching.

The case was observed for five synchronous hours in Spring 2004. The observation could capture a few challenges or difficulties that the instructor might have faced while she was preparing the synchronous session by herself. To find the detailed challenges she faced during the synchronous and asynchronous session, she was interviewed twice. In the interest of multiple realities, her teaching assistant, a student, and a peer who was a development assistant for the online courses were also interviewed. In addition, all email communications through the teaching assistant's account and students' postings on the WebBoard were reviewed. Initial interviews with the instructor and the teaching assistant were performed in mid-April and follow-up interviews were conducted in mid-May after reviewing the first interviews.

Findings

The online class started officially precisely at 7 p.m. and ended around 8 p.m. The one-hour synchronous session was usually spent on housekeeping issues, reminding students of upcoming assignments and discussing proposed questions. In each session, students were provided with questions drawn from reading materials and case studies, were broken into four teams, and were encouraged to discuss those issues. After the group discussion, the class reconvened in the main chat space and shared their discussions with the other teams.

During the five weeks of observations, the instructor always came to the chat space for the

synchronous session much earlier than the scheduled time and greeted each student by name as they entered the chat space. She usually carried on conversations with students until class began. This behavior of the instructor was unusual to me. An instructor with whom I have experience did not enter into the chat space earlier than the scheduled teaching time to communicate with students even though he arrived at the office early. He used to enter the chat space two or three minutes before the class began.

As for the individual greeting of the instructor, one student expressed that she was very glad that the instructor seemed to have affection toward her through the instant messenger. The student also said that she tried not to miss the class in order to repay the instructor's interest in her. As an example, she had a class during her husband's birthday but delayed the birthday party in order to attend the class. She confessed that she usually missed class when she had important family affairs.

Michelle's 5th online class

Michelle (the alias of the instructor) and I bumped into each other at 4: 55 P.M. in front of the Education building. She said that she was heading to her office to meet with her teaching assistant. She said to me, "I have a meeting with the TA at 5:00 P.M., two hours before the online class begins." I asked her if she had had dinner. She said to me, "I always have dinner after class." I asked her if she was not hungry. She said to me, "I used to overcome my hunger by eating chocolate. According to some doctors, chocolate is helpful in preventing heart disease." At that time, my wife arrived to pick me up. I went to a restaurant to have dinner, and Michelle went to her office.

I returned to the online office at 5:58 P.M. I started to set up the equipment for the online synchronous session. After setting up the equipment for the online class, I began to broadcast the music of Mozart in order to test the condition of the audio streaming. It was 6: 20 P.M. Michelle and Jane (the alias of the TA) came into the office ten minutes later. Michelle said that she had received a phone call from one student who had a technical problem around 5:00 P.M. Michelle asked me to solve the student's problem. I contacted the student through AOL instant messenger. The student had a problem getting into Webboard. After diagnosing her problem, I asked her to delete all the cookies on her computer and then restart her computer. Finally, she could get into Webboard.

Michelle entered the chat space at 6: 35 P.M. and then greeted each student by name as they entered the chat space. Michelle was chatting with students on her computer with a broad smile on her face. Michelle sometimes muttered something to herself with a laugh. As soon as the digital clock indicated 7:00 P.M., Michelle began the online class with an audio broadcast. After briefly reviewing the contents of the previous class, Michelle had students ask her questions related to the reading of that week. In the chat space, students did not pose any questions for a while. Michelle's legs started to twitch from an anxious state of mind. One student typed a question related to the next assignment about 3 minutes later. After reading the student's question, Michelle answered it. At that time, Michelle's legs were still jiggling.

At the end of the online class, eleven students had typed their opinions and insights after completing the team discussion. These eleven entries appeared in the chat space at nearly the same time. After reading them rapidly, Michelle began to provide students with comments about their opinions. At that time, one student typed a message to correct Michelle's misunderstanding. A teaching assistant had Michelle notice the message. Michelle corrected her error as soon as she saw it. Michelle's legs continued to tremble rapidly.

The remaining four online classes that I observed were very similar to Michelle's 5th online class. Michelle's legs were bouncing whenever she was anxious about students' apathy, had a technical problem, or made a little mistake. I asked to myself, "What can I do for Michelle's legs? What can I do to help Michelle's legs relax?"

According to interviews with Michelle and her teaching assistant, the biggest problem that Michelle had in teaching the online class was to deactivate the links on the Master Schedule, which caused frustration among the students. Each course in the online program provides a master schedule for the students. The master schedule includes the most critical information regarding the course (e.g., reading materials, major content, additional resources, assignments, and due dates) on a weekly basis. Students can go to hyperlinked pages by simply clicking on the links provided in the master schedule. Students are normally informed of the due dates and assignment instructions in several places (e.g., the master schedule,

the syllabus, the actual assignment description pages). Before the course begins, the instructor, teaching assistant, and development assistant are very cautious to make the information consistent in all locations. In this course, some changes were made before the class just began. Because the changes were not prepared in early enough and with enough caution, the changes were reflected on the master schedule but not on the syllabus. This oversight caused mass confusion among students in spite of many attempts to explain the changes in class and via emails. To eliminate the source of confusion, the instructor decided to deactivate all the links in the master schedule during the third week of the semester.

Apparently the students were not pleased with the change. One student made a comment "this course was a bit of nightmare" in a group chat space, and the instructor found it while she was reviewing transcripts of the team chats. The instructor personally approached the student and found that deactivating the links on the master schedule was the major reason why she had negative feelings about the course. The instructor expressed her feeling about the incident:

> *I think I was really kind of shocked because when I had access to the course I made an assumption again that students, when they would navigate the course materials, would actually go to the respective session for that particular week and that they would read lecture notes or they would look at the power point presentations or they would somehow work on reading the chapters. Then, they would follow all of the instructions for that particular session, module, and then complete the learning assignments... And what this feedback told me is that students probably won't even use the course materials that had been already set up for them. But they were rather just simply skipping ahead and looking at what are the cycles of assignments that are required for a particular date and launching right into that and thereby bypassing or ignoring the bulk of the materials that had been created for them. Some students appeared to be interested in only posting their assignments to pass the course rather than understanding the contents of the course.*

The TA also indicated that the master schedule incident was the greatest difficulty that the instructor had experienced.

> *The greatest difficulty that seemed apparent to me was over student frustration...knowing the syllabus was correct, we deactivated the Master Schedule to eliminate the source of confusion...However, some students seemed not to like the deactivation of the links on the master schedule. Some students expressed that the change in the master schedule was inconvenient because they were accustomed to using the links on the master schedule to have access to the assignments in the team chat. Some students wanted us to reactivate the links on the master schedule. Realizing students' dissatisfaction about the deactivation of the links on the master schedule in the third week of the semester, we decided to reactivate the master schedule.*

This incident implies that some of the students might have seen only the information related to the assignments through the links on the master schedule, without going through all the course content from the course homepage. The links on the master schedule might be very helpful for the students' convenience. However, it is questionable whether the links on the master schedule are helpful for the students' learning or not. Thus, I asked a graduate student who was a development assistant for the online courses her thoughts about this issue. Her comments are as follows.

> *If I were the instructor, I would stick to deactivating the links on the master schedule. It will induce students to navigate and read the whole materials in the course. Ultimately, deactivating the links on the master might be helpful in students' learning.*

I asked the peer development assistant a further question about this issue.

> *Me: Students would feel inconvenient if the links on the master schedule continued to be deactivated. This could affect the course evaluation at the end of the semester. Moreover, the instructor is an assistant professor, not an associate professor. Can you stick to deactivating the links on the master schedule in this situation?*

Jane (An Alias): Well…. I am not sure…. I think that the course evaluation from only students has a lot of problems. It cannot be reliable…. It might be the sorrows of an assistant professor …

The instructor reactivated the links on the master schedule, so that the students could easily access the webpage that included the information related to the assignment. As a result, the conflict between the instructor and the students surrounding the master schedule was solved. Due to this incident, the administrative staff acquired precious information on how the master schedule was actually used by some students.

Another difficulty that the instructor experienced in the online course was student apathy. According to interviews with the instructor and the teaching assistant, student apathy was one of the biggest obstacles to engaging students in deeper discussion and to making students actively participate in the class activities. The instructors noticed student apathy mainly during the synchronous sessions:

I think it is really challenging sometimes to know whether they are truly there mentally as well as physically because I would imagine that there is some degree of invisibility attached to it. Not only do I not see them and hear them, it's quite possible that their name appears on my computer screen but ultimately they might be doing housework or preparing meals or caring for children, they might be engaging in one on one instant messaging with their peers. This might be a good example… At the beginning of the class, I clarified the vague points related to the assignment and then asked students if they have any further questions. At that time, there was not any question about it. At the end of the class, a few students asked me what I already clarified…Although I saw their names on my computer screen from a few minutes before the class began, they did not seem to pay attention to my lecture. Actually, this kind of thing has happened several times so far.

The teaching assistant also indicated student apathy as a difficulty in online teaching, but saw it mainly in the asynchronous discussions and interactions during the week.

The nature of this online environment does not allow for face-to-face interaction… what led this feeling the most was the lack of interaction during the week between students and the instructor…The students rarely responded to each other's postings, even when they were posting supplemental material that might have been of interest to their fellow students.

I tried to contact some students via the instant messenger to know their position about this issue. Fortunately, one student answered my question related to this issue:

Kelly (An Alias): I am taking the class at home. This can be a cause of the problem. For example, when I was taking the online class, my children had a big fight. At that time, I had to let my children stop fighting. As a result, I missed the half of the class.

Me: What do you think about students' apathy in the asynchronous space?

Kelly: Frankly speaking, I usually used the asynchronous space when I need to post the assignments and should participate in the asynchronous team discussion. As a matter of fact, there were so many postings in the asynchronous space. Thus, it was impossible to read and answer all of them.

Me: Do you think that overload information made you apathetic?

Kelly: Yes, exactly

Me: Any other comments?

Kelly: In fact, my peer confessed that she watched her favorite TV show during the synchronous session. This is a big secret…

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Me: My lips are zipped. Between you and me, isn't the class boring?

Kelly: I think every class in the world is boring. (Smile)... Just Kidding! In my opinion, the courses are well organized, and the instructor's teaching is also great. The problem is that I am tired when I take the class. I usually get up at 6: 00 A.M. and go to work around 7:30 A.M. ... As soon as I return home around 5:00 P.M., I have to make dinner. ... After eating dinner and cleaning dishes, I head to my computer to take the online class. One day, I was so tired that I was dozing off during the class. As a matter of fact, it is not easy for me to submit the assignment by the due date. ... I should also take care of lots of family affairs. Do you know what I mean? However, I need to finish this program successfully to be promoted at the company.

The instructor and her teaching assistant perceived that students were apathetic during the synchronous work as well as the asynchronous work at the beginning of the course. In order to solve the student apathy issue and encourage active participation, the instructor started to use more realistic case studies as the topic of the synchronous session, starting in week four. The instructor believed that this method was relatively successful in getting the students to actively participate in the course:

I found that when I actually embedded some cases that I drew from different sources to highlight a reinforcer in content and get students to think more deeply about certain contents of the chapters, that worked pretty well. So, the TA and I have discussed the possibility of having the students actually use realistic cases for every week's discussion topic. I realized that I need to give the online students more stimuli or interests to encourage their active participation... In fact, my offline students actively participated in the class even though I did not provide them with such stimuli... I should have figured out the characteristics of online students in advance.

During the first three weeks of the course, the number of student responses in the synchronous chat space was 108, 119, and 110, respectively. This number increased by 20-60 in the following synchronous sessions of the semester. This supports the instructor's perception of success in overcoming student apathy.

The instructor indicated that it was also difficult to implement multi-tasks, such as rapidly reading multiple messages from students, promptly typing the key points of comments, and verbally giving feedback at the same time during the synchronous sessions. Instructors in a synchronous online environment are required to have quick reading, typing, and surfing (navigating) skills and should sometimes use such skills at nearly the same time. Michelle summarized her experience as follows:

I remembered that the very first evening, I introduced myself, reviewed the syllabus, reviewed kind of general expectations, and then got them engaged a little bit in the content of the initial chapters. And then to have them think a little bit more deeply about some of that content, I posted a few questions on the chat space and there was this kind of awkward silence for a moment and I sat there wondering if I was maybe not being effective. And then with the time delay, all of the sudden the screen was just completely full. And then that was the matter of having to be really quick visually to scan the screen full of comments that multiple students had typed in. Plus at the same time to be processing that, not only from a mental standpoint but then being able to articulate verbally almost at the same time that I was kind of trying to synthesize it mentally, and then also tying in my own commentaries. So in lots of ways it is a very highly stimulating environment, but one that requires you to be pretty fast in terms of your reading, synthesizing, and internalizing skills. In the face-to-face class, I did not need to worry about these because I could just make student ask me questions one by one. However, it was not easy to control this in the online environment.

The teaching assistant also pointed out the fact that an instructor in a synchronous online environment must be able to multi-task with rapid speed. While the instructor considered the synchronous hour as very challenging—requiring extensive multi-tasking, the teaching assistant indicated that the instructor was able to deal with it. The teaching assistant perceived that the instructor seemed to adjust to

the multi-tasking within a relatively short time:

> *She is so agile and adapts herself to her environment quite fast. This was very helpful in the online class because she was able to quickly read comments posted by students and respond to them by name. She is one of the most excellent facilitators that I have ever seen at the university. Frankly speaking, another instructor who I have experienced had to spend much more time in adapting himself to the multi-tasking environment. However, Michelle was a very fast learner.*

Learning how to use the technologies and understanding the course framework were a challenge and burden that Michelle faced as a novice online instructor. She had to understand how the online course was designed and become familiar with the technology and learning system used in the course to make her instruction more efficient and effective. As presented below, this was a challenge to her in preparing for the online class:

> *I really had to get familiar with what was this going to look like and if I were a student what would I see? What would the WebBoard be like? What would the syllabus be like? How would the course sections be broken down? What would the learning modules involve? How would the learning cycles be conducted? So that was kind of a huge project, almost literally going through week by week, section by section, module by module, learning cycle by learning cycle to print out all those materials, which created a binder, so I had a good sense of feel for the class. Consequently, the online class required me to invest additional hours in preparing it.*

The instructor learned most of prerequisite skills for the online course before the course began, mainly through a tutorial for new online instructors and teaching assistants. However, the tutorial did not provide all of the answers. She came to the office to ask questions of either the coordinator or the development assistants quite often. The exact number of her visits cannot be provided, since I was not initially involved in this study and did not count the visits at the time. In spite of these efforts, during the first synchronous session she could not remember how to go to the team chat space. In the third week of the course, however, she was able to lead the synchronous session without asking the development assistant any technical questions. Real experience seemed to be much more valuable than practice in a tutorial.

Michelle's face-to-face course met three hours each week. However, the online course met synchronously for only one hour each week. This might imply that an online class should use unique instructional approaches that are different from those in a face-to-face course. However, the instructor seems to have managed the online class with similar instructional approaches to those in her face-to-face class. In the one-hour online class, the instructor tried to cover the same content that she addressed for three hours in her face-to-face class, which was challenging to her:

> *I find it somewhat frustrating because of the one-hour session that we usually are limited to. And one issue has been desired to want to continue the dialogue in the main chat room and I often feel quite awkward in having to bring to closure usually at 10 after 8 or 8:15, we have even gone as late as 8:30. So, that can be a little bit challenging as well.*

Finally, she indicated difficulties in measuring student outcomes in the online environment. The course had two exams: a mid-term and a final. These exams were intended to evaluate how much of the content of the course students had learned. In the online environment; however, it was not easy to administer an exam since students can easily access course materials and textbooks at home. She pointed out this difficulty:

> *Exams are going to have to be open-book, open-text, open-note in an online class because I simply cannot monitor them, the students in their home environments, to ensure that they are not referring to such materials, whereas in a face-to-face format I can very easily make it a closed text exam or I can maybe make the assignments a little bit more intensive where they actually have to begin to apply and think at a slightly deeper level, because they won't have access to notes and materials which would be the case in an online format. Moreover, I did not have the privilege to change the evaluation method because I took over the course for one semester while the original instructor was on sabbatical. As a result, I had to administer exams that were not appropriate for*

an online environment.

The instructor also indicated that online teaching involved a heavy workload overall, resulting in one of the most critical challenges in teaching the course:

> *I do think that the workload is heavier in an online course because, without face-to-face contact as in a typical face-to-face lecture/discussion type of course, I found myself spending considerable time trying to make connections with students by responding to all of their individual emails and postings, even to those that went into the teaching assistant account which were forwarded to me. The online class required me to have much more asynchronous individual contact with students than those in the face-to-face class. Not seeing each other had students have much more questions. The invisible aspect of an online environment seems to yield much more questions and curiosity. The online students asked me even trivial and private questions via emails or bulletin board.*

The teaching assistant also indicated that the heavier workload in the online environment seemed to be a big burden to Michelle, as follows:

> *She had great excitement and enthusiasm after the first night but now I would say she is exhausted with it.… She told me that she was glad the semester was coming to an end… was looking forward to the burden of this class to be over, so that she could resume her writing.*

Although online learning has many benefits, Michelle, a novice online instructor, seemed to consider online teaching to be a big burden that requires a heavy workload as well as flexibility.

Reflection

This study delineates the first online teaching experience of an instructor at a large university in the Midwestern United States. According to the findings, online teaching generated some challenges for the instructor, and such challenges did indeed cause her to consider online teaching burdensome. The challenges that the new online instructor faced can be summarized as follows.

First, the instructor experienced difficulties in communicating with, interacting with, and facilitating students. Because of some miscommunication with the students, she experienced student complaints and had to modify her course management. In addition, because she experienced student apathy during the synchronous sessions, she had to create new teaching materials to facilitate students' interaction and participation. Her experiences illustrate what many scholars have contended: that interactive communication and facilitation are critical factors in accomplishing successful online teaching (e.g., Moore, 1989; Moore & Kearsley, 2005; Williams, 2003). In particular, Williams identified thirty general competencies for distance education programs in higher education institutions. Eight out of the thirty general competencies and three of the first five ranked competencies are related to communication and interaction. Therefore, an online instructor, particularly a novice instructor, should be aware of the importance of communication and interaction with students and thus prepare for enhanced facilitation during the course planning. Pairing experienced online instructors with novice online instructors would be an effective strategy to advise about what works and does not work for effective communication and interaction (Palloff & Pratt, 2001). In addition, exposing novice online instructors to a variety of case studies would be another strategy to help them to establish more effective communication and interaction.

A second challenge was becoming accustomed to the technology and to the unique necessity of multi-tasking skills during synchronous sessions. As the study subject's experience indicated, online instructors need to have certain technology-related competencies such as basic technical knowledge, technology access knowledge, software knowledge, and multimedia knowledge (Williams, 2003). Even though Michelle thoroughly completed the tutorial developed for new instructors and teaching assistants, she needed real practice (i.e., actual synchronous sessions) to get used to the technology and environment. In this vein, it is also meaningful to establish a faculty development laboratory as a place to try out and practice the technology, as Barker and Dickson (1993) suggest.

The instructor also expressed difficulties in organizing the one-hour synchronous sessions because she felt they were too short to cover the content or to measure student outcomes. To overcome these problems, the instructor needs to use different teaching strategies and to develop alternative assessments, such as portfolios, projects, and problem-solving activities. When an instructor teaches a one-hour session

as well as a three-hour session on the same topic, it is certain that the instructor will use different strategies to attain the same learning outcome. We need to pay attention to the argument that the role of instructors should shift from a sage on the stage to a guide on the side in order to design and manage an online course effectively (Moore & Kearsley, 2005; Palloff & Pratt, 2001).

Ultimately, the challenges that this new online instructor faced made her think that online teaching involved a heavy workload, and such challenges and consequent heavy workload made her exhausted with online teaching. As a result, the instructor seemed to have a more negative impression about online teaching than positive. Apparently, online teaching was a burden to this new online instructor.

If the new online instructor had had training regarding the pedagogical issues of online teaching and vicarious experiences through experienced online instructors, she could have been better prepared and had a different impression about online teaching. This implies that training for online instructors should be designed with more focus on the pedagogical issues of online teaching and on vicarious experiences with the actual practices rather than on technical issues.

Many instructors think that teaching online is merely a change of environment and apply the same methods from traditional classroom teaching to the online teaching environment, especially in the design, development, and delivery of content. As this study shows, however, it is evident that instructor roles and teaching strategies are different in online environments compared to the traditional classroom environment. Online instructors should develop not only their technical skills, but also the appropriate teaching strategies for an online environment, in order to minimize the challenges that they face. Online instructors cannot be expected to know these strategies intuitively or automatically (Palloff & Pratt, 2001). Institutions offering online courses and hiring inexperienced online instructors should provide them with appropriate training and extensive support so that the instructors can better understand the new teaching environment and design and deliver more effective online courses. This study is also an effort to help new online instructors to understand the online environment through the vicarious online experience.

This study, however, relies mainly on one instructor's experience at a university. There could be more or different kinds of challenges that new online instructors face. Further case studies with different instructors and in different institutions will be able to provide more diverse and more practical information about instructors embarking for the first time in an online course.

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How can Technology Help Improve the Quality of Blackboard Faculty Training and Encourage Faculty to Use Blackboard?

Doris Choy
Judy Xiao
John Iliff
College of Staten Island

Abstract

Since course management systems were introduced to colleges and universities many years ago, faculty members who are highly motivated and interested in the systems have adopted them into their curriculum. However, there are still many who have not utilized these tools for their courses. Some faculty members feel that course management systems do not fit their courses while others feel that there is not enough training. What could be done to motivate those faculty members to give them a try? What kind of training could provide better training to them? The purpose of the study is to ascertain information on how to encourage more faculty members to use course management systems and to improve the quality of faculty training. The results from focus groups showed that small group learning instead of large classrooms and anytime anyplace online tutorial support might be the solution.

Literature Review

Course management systems, such as Blackboard and WebCT, are defined as "software packages designed to help educators create quality online courses." These systems are increasingly popular among colleges and universities in the United States. For students, Blackboard and WebCT allow them to interact with the instructor and other students at anytime and anyplace. Students are able to access course information 24/7 when they have access to a computer and Internet connection. Therefore, students showed positive attitudes towards the course management systems (Basile & D'Aquila 2002). For faculty, the systems are helpful in many routine classroom management tasks like online grade books, sending electronic mails and announcements to students. The systems also help to promote effective communications between students and faculty members by providing synchronistic and asynchronistic interactions possibilities. The pre-developed frameworks within these systems save faculty members's time and resources since they do not need to develop their course web sites from scratch. With the increasingly diverse student population, there is an increase in variety of learning styles and preferences. Adopting new technology can better meet the learning needs of 21st century students.

Many colleges and universities enjoyed a rush of early adapters of course management systems by faculty who were termed *compassionate pioneers* (Feist 2003). However, this rush turned to a trickle quickly as a majority of faculty resisted adaptation. Bennett & Bennett (2003) claimed that 80% of public 4-year colleges make course management tools available to their faculty members, but only 20% of the faculty in those institutions adopted the systems. The reluctance is caused by a variety of factors. Faculty members reported that they do not want to take on the systems because: lack of time; training is a one-shot session that is not followed-up or does not provide ongoing support; and training is not active and does not have opportunities to practice (Feist 2003). Robinson (2004) also suggested that the main factor of low faculty usage is the lack of effective individualized training. Statistics of current course management system availability (80%) and usage (20%) showed that there is a need to investigate how to improve faculty usage rate. What are the needs of the 80% faculty members who are not utilizing the available resources.

This study was conducted at an urban public university campus. The percentage of usage is similar to the results presented by Bennett & Bennett (2003). Blackboard was introduced as the course management system since the Fall semester of 2001. In Fall 2004, about 50% of the faculty members had some form of formal training, but only about 15% of total available courses employed Blackboard. Faculty members expressed that they did not adopt Blackboard because immediate support is not available; they cannot recall what they have learned from the training; and Blackboard features are not applicable to their courses.

Methodology

The purpose of this study is to find out how to motivate the faculty members to utilize Blackboard in their courses. The faculty can be divided into two groups: current users and non users. First, the study tries to investigate the needs of non users and try to develop training that could motivate them to try to use Blackboard. Second, it is important to find out what the needs of current users are and what could be done to encourage their continuous usage of the system. Therefore, there are two main research questions in this study:

1. What could be done to motivate the faculty members who are reluctant to use Blackboard in their classes?
2. How can we provide better support to the current Blackboard users so they could explore other features in Blackboard that they have not tapped into yet?

In order to collect information from faculty members who have previous experiences in using Blackboard, e-mail invitations were sent to all faculty members who have used Blackboard in their courses. The e-mail explained the purpose of the study and invite faculty members to participate in a focus group to discuss their experience in training and using Blackboard. Among those who responded, faculty members with various experiences and backgrounds were selected to join the focus group session. The focus group session lasted for about two hours, with an additional hour of informal conversations between the participants and the researchers individually. All the conversations were recorded and transcribed for data analysis.

Based on the two main research questions, the following questions were derived as the guiding questions for the focus group session:

a. From your experience, what are the strengths and weaknesses of Blackboard?
b. What did you do when you encountered problems in using Blackboard?
c. How did you learn Blackboard? What do you think is the most effective method?
d. What would you expect from Blackboard faculty training in the future?
e. What changes would you recommend to improve the overall quality of the faculty training program?
f. What could be done to motivate more faculty members to use Blackboard?

In order to collect in-depth information from the faculty members, focus group was adopted for this study. Focus groups help to generate individual as well as small group in-depth qualitative data that is useful to understand the needs of the faculty members (Krueger and Casey 2000). All recordings from the sessions were transcribed and coded. Qualitative analysis was carried out to identify patterns (Strauss & Corbin 1998).

Participants

There were seven participants in the focus group. Faculty members came from different departments on campus including: English (2 faculty), Education (1), Computer Science (1), Business (1) and Nursing (2). The participants' experience with Blackboard and their level of competency with the system also varied. One of the English faculty members was a veteran Blackboard user who helped to choose Blackboard over other course management systems for the university when it was first introduced. While two other faculty members were first time Blackboard users. Others years of usage ranged from two to five semesters. Among the group, there were four male professors and three female professors. The rank of the faculty members were: two tenured faculty, three assistant professors, and two adjunct professors. Adjunct faculty members were also invited to the focus group because they teach about 30 percent of courses. They also have access to Blackboard and were invited to participate in training sessions. However, few adjunct faculty members choose to participate in the training session at the beginning of the semester. As a result, the average usage of Blackboard by adjuncts is lower than full time faculty. The two adjunct faculty members were from different departments. One of them has used Blackboard for three semesters while the other was a first time user. The participants in the focus group consisted of different types of faculty members in a typical college campus. Therefore, different viewpoints could be heard to yield valuable results.

Results

The focus group believed that in order to motivate those who are not using Blackboard yet, training has to be developed and conducted differently than the existing large group, 20-25 faculty

members per session, classroom setting approach. The change can be divided into two main categories: Facilitation and Support.

Most Effective Method to Learn Blackboard

As an ice breaker, the group shared their learning experiences at the beginning of the session. A common theme of "on-the-job learning" emerged. After attending the initial training, many faculty members started to explore the system on their own and get some "hands-on" experiences. When they encountered difficulties, the tech-savvy faculty chose to find answers on their own, while others chose to contact the support personnel using e-mail or telephone. However, most of the participants agreed that the best way to learn Blackboard is by "on-the-job learning". The trial-and-error process helped the faculty members to explore the system thoroughly. They were able to access and discover features and functions that were not discussed during the training session, but were applicable to their courses.

Even though most faculty members agreed that on-the-job learning is effective, an experienced faculty expressed a concern that such learning requires intrinsic motivation among the faculty members who are trying to master the system. The challenge of current Blackboard faculty training is how to motivate those who have not yet adopt the system to see the advantages of and the need to use the system. Therefore, on-the-job learning would not be effective for the first target population, the less motivated faculty who are not using Blackboard.

Expectations of Faculty Blackboard Facilitation

A first time user of the Blackboard system recalled that she had the opportunity to have an individualized faculty training session with support personnel and found it very beneficial.

"Learning Blackboard was a very positive experience for me because I have all the help that I need. I was fortunate enough to have the Blackboard instructor to work with me individually. The training is very meaningful as I can learn about the features that are most applicable to my courses. I can ask questions and get response immediately during the training."

During the discussions, the group agreed that even though providing individualized learning sessions to all faculty members is not feasible, learning groups with 3 – 4 faculty members in each training session should be able to provide comparable results. The learning groups might be even more beneficial than individual sessions as faculty members can collaborate with other colleagues. In the learning groups, the Blackboard instructor facilitates each faculty member to learn about features that are most applicable to their courses, instead of lecturing in front of the classroom. Faculty members gain hands-on experiences in the learning process. Another advantage is that faculty members, just like our students in our classrooms, feel more comfortable to ask questions and share their concerns in a small group setting. Suggestions such as gradually developing faculty support groups and mentoring programs for Blackboard also emerged.

Most Effective Blackboard Faculty Support: Online Tutorials

Faculty members also discussed the need for having support at anytime and anyplace. A good example of this was brought up by the group that faculty members would like to be able to develop their Blackboard course outside of regular office hours. They would like to be able to get assistance through online support or email. This led to a suggestion to develop online tutorials which faculty could access through the Internet. Even though the Blackboard system provides an instructional manual, faculty felt that it is difficult to search for answers. In addition, faculty thought that the text-only format of the manual is not an effective way to provide support for performing procedural tasks within Blackboard. Many agreed that the less motivated faculty members are more likely to give up instead of searching for answers from the manual.

Faculty members are extremely interested in the idea of developing online tutorials as a support tool. Further discussions included:

- Developing a list of frequently asked questions that are easily accessible: Faculty members can click on the link and view an animation of step-by-step procedures in how to complete a task on Blackboard.
- Creating a list of tutorials that are searchable by keywords and subjects: Faculty can input keywords to search for tutorials that fit their needs. Some examples of keywords are: personal information, online grade book, external links, and creating new pages.
- Utilize graphics, animations, and audio throughout the tutorials and avoid text-based answers.

- Building an online community of Blackboard users. Faculty members can post their questions and all users can discuss their experiences through online collaborations. Faculty members can also provide suggestions to develop tutorials in topics of their interests. Furthermore, they can showcase their Blackboard course website and share their ideas with colleagues.

Support current Blackboard users by special topics

Some of the experienced faculty members believed that having special topics sessions that discuss different potentials in Blackboard can be helpful for current Blackboard users. The sessions could be related to technical skills as well as pedagogical knowledge. One faculty member pointed out that while some faculty members are comfortable with the technical aspects of Blackboard, they are not familiar with the pedagogical issues such as online classroom management and instructional strategies that could enhance their students' online learning experience. In addition, a first-time user suggested organizing best practice presentations where faculty members who have more experiences in using Blackboard can show the new users some of the potential possibilities to enhance their course websites. All participants believed that continuous support and facilitation is essential to motivate both current and future users of Blackboard.

Other concerns related to the Blackboard system

Throughout the discussions, issues outside of the scope of instruction were brought up. First, some experienced faculty members pointed out that when Blackboard was introduced to the students, they expected faculty to respond to their questions immediately. Therefore, faculty perceived that adopting Blackboard increased their teaching loads. On the other hand, students perceived a decrease of quality of the course because their questions were not addressed promptly. The added convenience to the students turned into a burden to the faculty.

Second, there is a lack of incentives for the faculty's effort to learn Blackboard. The faculty members also expressed concern about a lack of institutional policy defining ownership of faculty-developed online content. One faculty member, too, lamented not having the appropriate equipment, such as laptops, to more efficiently develop courses while on the road.

Discussions

As the results of the focus group suggested, faculty members are highly interested in having better support for Blackboard after the initial training. There are many valuable tools in Blackboard that would fit different courses and settings. However, it is impossible to demonstrate all the features in one training session. It is also not feasible for faculty members to attend multiple training sessions. Therefore, online anytime anyplace tutorial becomes the main recommendation that emerged from the study.

The changes in technology have made the development of high quality online training materials significantly easier. With the help of software like Macromedia Flash, Captivate, or Camtasia; instructional designers can capture the click by click mouse action on the screen and transform it into an animated tutorial. Audio materials, text captions and narrations can be incorporated. To enhance the interactivity of the video, reflective questions could be added to prompt learners' responses. Moreover, by using the navigation bar, the learners can control the speed of the tutorial and learn at their own pace. The completed animated tutorial can be compressed into a manageable file size and be published to the Internet.

By using the software mentioned above, the researchers are looking into the possibility of developing a series of online tutorials on many of the valuable features in Blackboard. The expected result is to have an extensive collection of animated online tutorials that would show the faculty members the step-by-step procedures for each feature. Faculty members will be able to access the online tutorials at anytime, anyplace and search for specific tutorials that are applicable to their courses. They can also review the animated tutorial at their own pace and practice the features in their courses.

Conclusions

In order to motivate faculty members who are not using Blackboard, there is a need to revise the training method. By using small group facilitations and anytime anyplace online tutorial support, faculty members will be more likely to explore Blackboard. The small group facilitation setting could be tailored to the needs of specific faculty members and relevant features could be demonstrated in the session. The setting would also encourage them to interact more frequently with the trainer and the other faculty members. The online tutorial would be the next step that could be implemented to provide faculty with continued support.

Many instructional designers and trainers agree that conducting individualized trainings are not feasible to accommodate a large number of faculty members. However, this focus group study suggests small group facilitations, together with the support of online tutorials, could be effective in motivating faculty to adopt Blackboard. This study is not trying to convince every faculty member to use Blackboard, but it is important that multiple training formats be developed to engage faculty with various learning styles, and that faculty be given the opportunity to see and explore the potential benefits of adopting this technology into their curriculum.

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Trends, Issues, and Guidelines for the Quarterly Review of Distance Education (QRDE)

Daniel Eastmond
Western Governors University

Charles Schlosser
Michael Simonson
Nova Southeastern University

Introduction

The *Quarterly Review of Distance Education* (QRDE) is in its sixth year of publication. The QRDE is an official publication of the Association for Educational Communications and Technology (AECT). The *Quarterly Review of Distance Education* is a rigorously refereed journal publishing articles, research briefs, reviews, and editorials dealing with the theories, research, and practices of distance education. The QRDE publishes articles that utilize various methodologies that permit generalizable results which help guide the practice of the field of distance education in the public and private sectors. The QRDE publishes full-length manuscripts as well as research briefs, editorials, reviews of programs and scholarly works, and columns.

The QRDE defines distance education as institutionally based, formal education, where the learning group is separated and where interactive technologies are used to unite the learning group. This definition of distance education is recognized by AECT.

An analysis of the first five volumes (five years) of the QRDE has been completed and is summarized in this paper and presentation. The review of volumes 1 – 5 was conducted by QRDE editors. First, each issue of each volume was analyzed. The results of this process are reported in tables 1-5. Next, the guidelines for submission of articles are presented and a general commentary on the first five years of the QRDE is provided. Finally, the book review section of the QRDE is discussed and significant issues and trends are provided.

Part 1: Issue Analysis

Each issue of each of the first five volumes of the QRDE were analyzed by Editor Michael Simonson. Tables 1-5 give this results of this analysis

Table 1 – Volume 1

Volume 1 - 2000	Issue 1	Issue 2	Issue 3	Issue 4	Average
Number of Pages	86	98	94	106	~96
Number of Articles	5	4	5	5	~5
Number of Pages/Article	10.8	12.2	8.2	10.8	~10.5
Number of Other Articles	2	4	5	3	~3.5
Gender of Primary Author	2 F 3 M	2 F 2 M	2 F 3 M	2 F 3 M	~42 % F

Keywords

135

Culture	Systems	Professional Development
Future	Interaction	Student Support
Evaluation	Learning Environments	Technologies
Instructional Design	Motivation	Theory

Approach

Research Study = ~47 %
Foundation/Theory Paper = ~53 %

Table 2 – Volume 2 - 2001

Volume 2 - 2001	Issue 1	Issue 2	Issue 3	Issue 4	Average
Number of Pages	92	100	108	112	~103
Number of Articles	6	5	4	6	~5
Number of Pages/Article	10.8	15.2	11.5	12	~12.4
Number of Other Articles	3	1	5	0	~2.1
Gender of Primary Author	2 F 4 M	2 F 3 M	2 F 3 M	5 F 1 M	~55 % F

Keywords

Evaluation
Instructional Design
Student Support
Technologies
Theory
Learning Environments
Instruction

Approach

Research = ~38 %
Foundation/Theory = 57 %
Evaluation = ~ 5%

Table 3 – Volume 3 – 2003

Volume 3 - 2003	Issue 1	Issue 2	Issue 3	Issue 4	Average
Number of Pages	148	120	138	100	~126
Number of Articles	9	6	6	6	~6
Number of Pages/Article	12.7	14.1	11.2	11.5	~12.4
Number of Other Articles	2	2	4	1	~4.2
Gender of Primary Author	1 F 8 M	4 F 2 M	4 F 2 M	3 F 3 M	~44 % F

Keywords

Problem Solving	Interaction	Barriers
Learning Environments	Design	Student Support
Systems	Communities	Stakeholders
Technology	Effectiveness	
Virtual Schools	Participation	

Approach

Research = ~30%
Foundation/Theory = ~70 %

Table 4 – Volume 4 - 2004

Volume 4 - 2004	Issue 1	Issue 2	Issue 3	Issue 4	Average
Number of Pages	96	110	176	100	~120
Number of Articles	5	5	13	9	~8
Number of Pages/Article	11	15.6	11.3	10.2	~12
Number of Other Articles	1	1	1	0	~1
Gender of Primary Author	2 F 3 M	4 F 2 M	5 F 8 M	5 F 4 M	~50 % F

Approach

Research = ~31 %
Foundation/Theory = ~31 %
Evaluations = 18 %
Training = 2 %
Design = 18 %

Table 5 – Volume 5 - 2005

Volume 5 - 2005	Issue 1	Issue 2	Issue 3	Issue 4	Average
Number of Pages	82	88	80	92	~86
Number of Articles	6	6	5	5	~5.5
Number of Pages/Article	9.7	10.7	10.7	12	~10.8
Number of Other Articles	2	0	0	2	~1
Gender of Primary Author	3 F 3 M	4 F 2 M	3 F 2 M	3 F 2 M	~59 % F

Approach

Research = ~41 %
Foundation/Theory = ~32 %
Evaluation = ~9 %
Training = ~4 %
Design = ~14 %

Part 2: Directions for Submission and General Analysis of the QRDE
Charles Schlosser

The QRDE Directions to Contributors are straightforward and entirely ordinary. In brief, they specify that:

- Four copies of the manuscript are to be submitted
- Manuscripts should be between 10 and 30 double-spaced pages
- APA style should be observed
- Names, affiliations, and other identifying information should be on a separate page
- A brief (approximately 100 words) abstract should be included
- Graphics should be in a separate file
- The printed documents should also be submitted on a CD or PC-formatted floppy using Microsoft Word. A separate version, saved as an .rtf file, should also be included.

The Directions note that manuscripts are reviewed by at least three consulting editors, and the process usually takes 3 to 4 months. The Directions close with the name and address of the editor, Mike Simonson, to whom manuscripts are sent.

What happens next is rather more interesting: submissions are acknowledged immediately, they are sent to three reviewers within one week of receipt, and reviewers are directed to complete their review within one month. So, six to eight weeks after submission, Mike has received all the reviews, which normally break down this way: 10 percent of the articles are accepted without changes, 20 percent are rejected, and 70 percent are returned to the contributor for revision. Of those 70 percent, some are resubmitted within days, while some are resubmitted…well, never. The eventual acceptance rate is approximately 50 percent. Accepted papers are assigned to an issue that will be published in about nine months.

But, before the manuscript is ready for publication, there is much to be done, by the editorial staff. After Mike gathers the accepted manuscripts (usually five articles, two book reviews, and two columns), he puts all the files on a CD and FedExes them to me. I edit all the manuscripts, ensuring they're appropriately formatted, that spelling, grammar, and sentence structure are acceptable, reading carefully for factual errors and alert to less-than-elegant writing.

When all manuscripts have been edited, the issue is uploaded to the publisher's server and downloaded by the publisher's editor, who invariably identifies errors and omissions. This issue is then typeset, saved as .pdf files, and reposted to the server. At that point, QRDE's editorial assistant, Jack Daugherty, sends the articles (as email attachments) to their authors, with a request to carefully examine the document, address any shortcomings identified by the editor, indicate any additional changes, and return them to me. Then, I amend each of the articles, Jack and I give the issue one more read, and I again post it to the publisher's server. The publisher's editor makes all the required corrections, and the issue is printed and mailed.

Sometimes, the whole process goes without a hitch, but minor glitches are common and fall into several categories:

- Missing information. Amazingly often, manuscripts have incomplete reference lists. And, not uncommonly, contributors fail to include complete contact information.
- Incorrect information. Again, it's amazing how often reference lists lack important information such as city of publisher, page numbers, and so on.

- Incorrect format. A fair number of our contributors seem to have not consulted the APA publication manual when preparing their manuscript. This is most apparent in the citation of sources and preparation of reference lists.
- Strange styles. Use of Word styles other than "normal" can slow the editing process considerably. These styles must be undone, which tends to change the look of the document in unfortunate ways, and the process can be aggravating.

An interesting and rewarding variation in the usual process of editing the Quarterly Review is the guest-edited issue. The journal has averaged one of these special-theme issues each year, and guest editors Gary Anglin, Les Moller, Atsusi Hirumi, Ryan Watkins, and Lya Visser have helped produce some of our strongest issues. The guest editors identify the authors and the central theme to be addressed. They collect the manuscripts, conduct a first edit of each, write an introduction to the issue, and send the package to me for further editing. Working with those guest editors and all the other contributors is, for me, the most rewarding aspect of editing the *Quarterly Review*.

Part 3: Trends, Issues, & Opportunities with QRDE Book Reviews
Dan Eastmond

This section describes an analysis of trends and issues surrounding the book review section of QRDE. It explains procedures and opportunities available to those wanting to critique recent distance education books. QRDE book reviews serve two major purposes: (1) they inform readers about various aspects of the field through critique of the latest literature; and (2) they enable distance educators to make wise selection and purchase decisions for themselves and their students. Although this portion of the journal is not peer-reviewed, each article undergoes a rigorous editorial process.

Over the past six years, 58 books have been reviewed. Of those books, 20 were written by single authors, 20 were co- or multiple authored, and 18 were edited compilations of various authors' chapters. By far the distance delivery mode most described was web-based (28 books), though unsurprisingly, many texts (12) discussed various modes of delivery; and 14 examined the use of technology itself. Most books reviewed addressed higher education settings (31 books), followed by K-12 schools (7), corporate training (7), and the broader societal context (6). As for the authors of the book reviews, they have been mainly solo authors processing doctorates or graduate degrees in instructional technology or related fields, and come with distance education expertise. With only a couple of exceptions, the authors reviewed only one book.

Themes

Having read each of the reviews anew, what follows are the book review editor's observations of the type of books QRDE addressed and what they tell us about trends and issues. First, an important category of book -- the survey textbook – proclaims that distance education is an established field of practice. These books are written primarily to prepare student scholars and practitioners by outlining theory, research, definitions, and practices. To support the instructional use of these texts, the authors have prepared additional resources such as websites, videos, and PowerPoint presentations. An example of such a book review is Karen Murphy's 2000 review of Simonson, et al.'s <u>Teaching and learning at a distance,</u> which provides a foundational textbook for graduate study.

Another book category involves case studies, particularly from a single institution. In these books, pioneers report their involvement in distance education activities. Such books have been written about Temple University, the British Open University, or were developed from conference proceedings. Book reviewers often criticize these books as portraying a fragmented view of practice that is usually not generalizable to other contexts. One important exception was portrayed in Mark Hawke's 2005 review of the edited book by Duffy and Kirkley, <u>Learner-centered theory and practice in distance education</u>, where the authors intentionally brought together selected professionals through grant support to educate them about problem-based learning; afterwards the participants applied these principles to initiatives at institutions across the country and reported back the results.

A common book genre deals with roles – that of student, instructor, trainer, manager, designer, administrator, and technologist. These texts seek to inform practitioners with best practices, frameworks, guides, and resources. One such example is Byron Burham's 2002 review of <u>Managing technological change</u> by Bates. A similar type of book the Journal has reviewed falls into the "how to" category. These books cover curriculum design, e-moderating, e-learning design, learning community formation, and teaching via various distance delivery systems. Kim Dooley's 2000 review of Cyrs's (2000) <u>Teaching at a distance with merging technologies</u> presents an example; the book aims to prepare instructors to teach via interactive television.

Other books deal with specialized areas of distance education, such as those about online writing centers, blended learning, online nursing programs, libraries, copyright, assessment, and online science labs. An example

was Phil Schmit's review of Linn, et al (editors)'s <u>Internet environments for science education.</u> Similarly, there are books written about distance education in specific contexts: high schools, higher education, corporate training, consortia, and international settings. Such a review was Ross Perkin's 2004 review of Perraton's <u>Open and distance learning in the developing world.</u> This book presents the quiet host of distance initiatives worldwide as innovative responses to educational challenges at all levels.

Finally, the Journal reviews books that are not directly written about distance education but have strong implications for practitioners. An example of such a review is Charlotte Farr's 2002 critique of Brown and Druid's <u>The Social Life of Information</u> – a book which posits that information technology is only useful in social contexts. Such books explore communications, societal matters, global affairs, organizational development – usually taking a technology focus, such as the impact of the Internet on education.

Observations

I couldn't help but feel after reading these reviews that distance educators are truly renaissance people. To effectively practice their craft and keep up with the field, they must read broadly – as the range of book reviews depict. Perhaps trendy, but nonetheless a reflection of an explosion, the delivery of distance education via the Internet in US higher education and corporate training contexts predominates this literature. Missing are texts about other delivery systems, reports from other countries, and books about other contexts (e.g., military, medicine, government, etc.).

Authoring QRDE Book Reviews:

Many distance educators are interested in reviewing a book for publication in QRDE. If you already have a book in mind, contact the editor to see whether it has already been reviewed; also propose why it is a good fit for the Journal. If you don't have a title already but want to read a new book and write a review, the editor can make suggestions and perhaps arrange for a complementary copy. Plan to submit a draft manuscript four to six months from the time your book is approved for review. The "Book Review Author Guidelines," available from the editor, are meant to guide your reading and critique of the book. It takes about a month to transform a quality draft manuscript into one ready for submission. You should expect a least one iteration of comments, suggestions, and copy-edits on you work. Once you have made all revisions to the book review editor's satisfaction, he will submit your review to the Journal's editors. Depending on the number of reviews and articles being processed, it will likely be six months before the Journal will publish your review. They will send you a complementary copy, or you can check out the review at the Journal's website.

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Exemplary Technology Use: Teachers' Perceptions of Critical Factors

Peggy A. Ertmer
Anne Ottenbreit-Leftwich
Cindy S. York
Purdue University

Exemplary technology-using teachers are defined as those who employ technology in learner-centered, constructivist environments as opposed to traditional teacher-directed environments (Ertmer, Gopalakrishnan, & Ross, 2001; Newby, Stepich, Lehman, & Russell, 2000). In general, a constructivist learning environment engages students in authentic, collaborative tasks, based on their interests. Within this type of environment, technology is used as a tool to support learners' engagement with the content, ultimately prompting them to use higher-level thinking skills (Becker, 1994; Ertmer et al., 2001). According to Berg, Benz, Lasley, and Raisch (1998), this is due, in part, to technology's ability to provide students with the tools "to actively process new information, to transform it, and to 'make it their own'" (p. 120).

Barriers versus Enablers

Barriers to technology integration have been fairly well described within the educational literature (Ertmer, 1999; Ertmer, Addison, Lane, Ross, Woods, 1999). Ertmer classified these barriers into two primary categories: extrinsic (first-order) and intrinsic (second-order). While extrinsic barriers include lack of resources, adequate training, technical support, and time, intrinsic barriers include teacher beliefs, visions of technology integration, and views about teaching, learning, and knowledge. Despite an acknowledged emphasis on barriers in the literature, little research has been conducted that examines the critical factors that enable teachers to overcome these barriers.

Enablers, like barriers, can be viewed as being either intrinsic or extrinsic. For example, access to hardware, quality software, the Internet, technical support, as well as administrative and peer support might be viewed as being extrinsic whereas personal beliefs, previous success with technology, and self-efficacy might be viewed as being intrinsic enablers. Also, like barriers, it is likely that intrinsic factors may be more important to teacher technology use than extrinsic enablers. That is, even if teachers have access, support, and time, it does not necessarily mean that they will integrate technology in meaningful ways. Likewise, even though some teachers have access to only one computer, they still manage to use that one computer in an exemplary fashion. In other words, extrinsic enablers appear important, but not essential, to meaningful technology use.

Enablers and barriers may be viewed as having an inverse relationship. That is, as enabling factors increase, barriers are likely to decrease. For example 'lack of resources' may be considered a strong extrinsic barrier, whereas having ready access to hardware, software, and the Internet could be viewed as strong enablers. While an increase in enabling factors would not, *automatically,* lead to a decrease in barriers, or vice versa (the relationship is probably not a one-to-one relationship), it is likely that either a decrease in barriers or an increase in enablers would lead to greater technology use (Ertmer, 1999).

In a series of studies, Becker (1994, 2000) identified important factors that appeared to differ in the environments of exemplary computer-using teachers including peer use at the same school, staff development activities and support, smaller class size, and access to software. While Becker (1994) highlighted the potential influences of increasing extrinsic enablers, additional consideration needs to be given to intrinsic factors.

For example, research on self-efficacy, as well as teacher beliefs and visions, suggest that these are also important to successful technology integration (Becker, 2000; Ertmer, 1999; Guha, 2003; Wang, Ertmer, & Newby, 2004). In a series of technology use studies (USEiT), Russell, Bebell, O'Dwyer, and O'Connor (2003) highlighted important relationships among teachers' levels of computer use and their beliefs about, and confidence with, using technology. Surprisingly, high confidence for using technology was not a direct predictor of teachers' classroom uses. Rather, confidence appeared to be moderated by years of teaching experience. That is, while teachers who recently entered the profession (within the past 5 years) reported having more confidence using computers than teachers who had been in the profession for 6 or more years, their beliefs about the negative effects of computers on students were stronger. In addition, although the newer teachers used technology more often than experienced teachers for preparation and professional communication, they directed their students to use technology significantly less than more experienced teachers. This suggests that while new teachers may be more comfortable with the technology itself, they may lack an appreciation for the value of technology as an instructional tool. Alternately, they may lack the organization and management skills needed to use technology effectively in the classroom, skills

that develop through years of experience.

While researchers have delineated a number of important characteristics of exemplary-technology using teachers, it is unclear whether any of these characteristics are *essential* for teachers to become exemplary. For example, while 75% of the exemplary users in the Hadley and Sheingold (1993) study had extensive teaching experience (more than 13 years), only 59% of the participants in the Ertmer et al. study (2001) had this many years. Additionally, while 50% to 75% of the participants in Becker's study (1994) had accumulated a large number of credits beyond the bachelor's degree, only 35% of the participants in the Ertmer et al. study (2001), had reached this level of education. This suggests that either these "requirements" have gradually evolved as technology has become more embedded in our lives, or that these types of characteristics are not essential to exemplary technology use. It is important to determine which enablers, if any, have the potential to exert the *strongest* influence over teachers' abilities to use technology in exemplary ways so that pre- and in-service teacher educators can support the most fruitful paths to accomplished use.

Purpose of the Study

There is little information available that delineates the relative value of intrinsic enablers over extrinsic enablers, or that supports the relative importance of one intrinsic enabler over another. This study was designed to explore teachers' perceptions of the relative value of a number of intrinsic and extrinsic factors that are believed to play a key role in the success of exemplary technology-using teachers. Ultimately, we hoped to provide both teacher educators and professional developers with specific suggestions for preparing and supporting pre-service and in-service teachers in their efforts to become effective technology-using teachers. The research questions guiding this study included:

1) What are the perceptions of exemplary technology-using teachers regarding the factors that have most influenced their success?
2) To what extent do teachers perceive internal vs. external factors as being more critical?
3) Which teacher characteristics, if any, are significantly related to exemplary technology use?

Methods

An online anonymous survey was used to explore the perceptions of exemplary technology-using teachers regarding the factors that influenced their technology integration success. Participants were selected from five Midwestern technology educator award programs. The award winners were emailed an invitation to participate in the study, including a link to an online survey that was available via a secure server. Both quantitative (correlations, t-tests) and qualitative (pattern seeking) analysis methods were used to examine teachers' perceptions of the factors that influenced their technology integration success.

Procedures

The study was designed and implemented by a research team consisting of two doctoral students and one faculty member from the Educational Technology program at a large Midwestern university. All three researchers had a background in K-12 education and had taught courses related to technology integration for pre-service teachers. In addition, one of the doctoral students was a previous recipient of an exemplary technology teacher award.

The researchers collected email addresses from five award program websites and established a database of possible participants. The sample consisted of recipients of exemplary technology-using teacher awards from five different organizations within the Midwest, selected due to the researchers' familiarity with the programs and organizations. These organizations included the Michigan Consortium for Outstanding Achievements in Teaching with Technology (MCOATT), Michigan Association for Computer Users in Learning (MACUL), Ohio SchoolNet (OSN), Illinois Computer Educators (ICE), and Indiana Computer Educators (ICE). In general, participants were nominated for the award based on criteria related to their ability to use technology in innovative ways and to encourage meaningful student use. From the initial sample of 48 educators, 25 responded to the survey for a 52% return rate. Identified participants were emailed twice, once for the initial invitation and once as a reminder. Our final sample included teachers who ranged in years of teaching experience from 3 to 32 years, with an average of 16 years. The majority of educators were female (n=16) and had completed their masters degrees (n=20). About half of the participants (n=12) had been teaching 13 years or less, and all participants rated themselves as having very high (n=16) or high (n=9) computer skills.

Survey Instrument

The 18-item survey included six demographic questions, two Likert-scale items (consisting of 20

subcomponents), eight open-ended items, and one checklist item (consisting of nine subcomponents). For example, participants were asked to "describe your most memorable or most useful professional development experience," and "If you could put your finger on one thing that influenced you the most in terms of integrating technology in your classroom, what would that one thing be?" In addition, participants rated their perceptions of the importance of both intrinsic (e.g., inner drive, beliefs, attitudes) and extrinsic (e.g., professional development, resources, and support) factors on a 5-point Likert scale (from 1, not applicable; 2, not influential; to 5, extremely influential).

The survey was developed after reviewing similar surveys in the literature (Bullock, 2004; Hadley & Sheingold, 1993; Iding, Crosby, & Speitel, 2002; Lumpe & Chambers, 2001) as a means of establishing construct validity. Expert reviewers, including an Educational Technology faculty member and an elementary school principal, provided suggestions for improvement. The final survey instrument incorporated these changes, including wording and specific details to assure that the items were relevant to exemplary technology-using teachers, thus assuring some measure of face validity. The survey had a Cronbach alpha of 0.76, suggesting that the survey was moderately reliable.

Data Analysis

In order to answer our first research question regarding teachers' perceptions of the factors that most influenced their technology integration success, we calculated means and standard deviations for each of the factors included on the survey and then rank ordered them from highest to lowest.

To determine whether intrinsic or extrinsic factors were perceived as playing a more influential role, a paired samples t-test was used to compare teachers' perceptions of the importance of extrinsic factors (e.g., professional development; influential people; administrative, parental, peer, and technology support; Internet, hardware, and software access) versus intrinsic factors (e.g., inner drive, personal beliefs, commitment, confidence, and previous success with technology). Triangulation data were provided through teachers' responses to the survey question: "If you could put your finger on one thing that influenced you the most in terms of integrating technology in your classroom, what would that one thing be?"

Pearson product correlations were calculated to determine the relationships among different teacher characteristics (e.g., gender, highest degree earned, years of teaching experience, and current level of teaching assignment) and their perceptions of the importance of intrinsic vs. extrinsic enablers. In addition, an independent t-test was used to examine whether teachers, with more or less years of teaching experience, differed significantly in their perceptions of the importance of intrinsic and extrinsic enablers.

Results

When teachers were asked to rate the level of influence of each enabler on their success as exemplary technology-using teachers, *inner drive* and *personal beliefs* (n=4.84) were rated the most influential, while *pre-service education* was rated the least influential (2.69). Teachers were given the option of responding "*not applicable*" if a specific factor did not apply to them. Those data were then removed from our calculations, in effect reducing the number of respondents for that particular factor. For example, note that pre-service education was rated as 'not applicable' by nine participants (see Table 1). This may be due to the fact that many of our participants completed their teacher education programs prior to the integration of technology into the college classroom.

Table 1 *Teachers' Perceptions of the Influence of Factors on Integration Success.*

Access to Internet	25	4.28	.84
Current Setting	25	3.84	1.11
Administration	25	3.84	1.14
Influential People	25	3.80	1.08
Technology Support	25	3.56	1.04
Peers	24	3.42	1.02
Previous Failure	24	3.37	1.01
Class Size	24	3.33	1.01
Parental Support	24	3.04	1.08
Pre-service Education	16	2.69	1.08

A paired-samples t-test was conducted to determine if the difference between teachers' ratings of the influence of intrinsic and extrinsic factors was significant. The mean rating for intrinsic factors (M=4.51, SD =0.31) was significantly higher [t(24) = 7.23, p > .001)] than the mean rating for extrinsic factors (M=3.86, SD = 0.51), suggesting that teachers perceived intrinsic factors to be relatively more influential than extrinsic factors in their ability to become successful technology-using teachers. This is supported by teachers' responses to the open-ended survey items. When asked what most influenced their use of technology, the majority of teachers described how they were committed to using technology because it increased their ability to enhance student learning. One teacher wrote, "Seeing my students succeed when using it. The more success they had, the more I wanted to use it." Another teacher indicated that the most influential factor in using technology was, "the desire to engage students as active learners and the belief that technology is the tool to achieve that desire."

Pearson product correlation coefficients indicated no significant relationships between 1) teachers' levels of computer proficiency or 2) the number of credit hours earned after a bachelor's degree and the perceived importance of specific internal or external factors. However, years of teaching experience was significantly correlated, at the .05 level, with teachers' perceptions of the importance of professional development (r=.43), commitment to using technology (r=.47), and the influence of previous success (r=.41). In other words, the longer teachers had been teaching, the more important these enablers were perceived to be (see Table 2). In addition, females tended to rate personal beliefs as significantly more influential than did males (r=.59). In addition, females rated technology support (r=.49) and access to hardware (r=.40) as more influential to their success than males did.

Table 2 _Correlations between Teacher Characteristics and Influencing Factors._

Influencing Factors	Years Teaching	Gender	Computer Proficiency	Hours Beyond Degree
Professional Development	.431*	-.005	-.005	-.043
Personal Beliefs	.166	.582**	.127	-.368
Commitment	.470*	.137	-.026	-.061
Previous Success	.411*	-.329	-.161	-.063
Tech Support	.232	.492*	.085	-.001
Access to Hardware	-.322	.397*	.136	.194

Note. * Significant at the .05 level; ** Significant at the .01 level.

An independent-samples t-test indicated that teachers with more experience (years > 13) rated intrinsic factors as being significantly more influential (p = .016) than did teachers with less experience (years ≤ 13). Experienced teachers (n=13) rated intrinsic factors as "extremely" influential (M=4.65), while less experienced teachers (n=12) rated them as "moderately" influential (M=4.36). While teachers with more experience also rated extrinsic factors (M=4.05) as more influential than did teachers with less experience (M=3.67), the difference was not significant (p=.059). In general, teachers with more experience rated more factors as being moderately or extremely influential. For example, every teacher in the more experienced category rated "commitment to using computers to enhance student learning" as being extremely influential (M=5), while teachers with less experience rated it as moderately influential (M=4.5).

Discussion

The results from this study suggest that the factors that most strongly affect teachers' ability to be effective technology users are intrinsic factors such as confidence and commitment, as opposed to extrinsic factors such as resources and time. That is, even when resources and time are limited, exemplary teachers achieve effective use, quite possibly due to their strong beliefs, personal visions, and commitment to using technology. As noted by Zhao and Frank (2003), "… most factors do not directly influence technology uses in a linear fashion; rather, their influence is mediated or filtered by teachers' perceptions" (p. 817). This is also similar to what Becker (1994) and Hadley and Sheingold (1993) reported: that is, the exemplary teachers in their studies described problems with resources as being less

severe than did other teachers. Perhaps because of their confidence, or previous successes with technology, exemplary technology-using teachers are able to devise more ways to overcome obstacles. Based on previous literature (Ertmer, 1999; Ertmer et al., 1999; Marcinkiewicz, 1993; Sheingold & Hadley, 1990), as well as the results of this study, intrinsic belief systems appear to be a strong, if not the primary, contributing factor in teachers' efforts to use technology. This suggests the importance of providing teachers with opportunities to share their stories of successful technology integration with their peers and to reflect on their own beliefs within a supportive and collaborative environment (Sandholtz, Ringstaff, & Dwyer, 1997; Zhao & Frank, 2003). In this way it is anticipated that all teachers, including those who are faced with a limited amount of resources, can find ways to use their resources to improve student learning based on their strong personal commitments and pedagogical beliefs about the power of technology to enhance learning.

In general, teachers in this study rated intrinsic factors as significantly more influential than extrinsic factors on their decisions to use technology. This was supported by teachers' responses to the open-ended survey question in which they described the most influential factor as being their strong commitment to helping students learn. This result is similar to that described by Ertmer et al. (1999; 2001) and others (Dexter, Anderson, & Becker, 1999; Sheingold & Hadley, 1990). While *novice* technology users may base *initial* adoption decisions on their own goals and needs, as noted by Zhao and Frank (2003), more accomplished users appear to focus more on their students' needs, especially when making classroom implementation decisions (DuFour, 2000). The results of this study suggest that, as teachers progress from novice to accomplished users, it may be beneficial to provide opportunities for them to observe the direct impacts on student learning obtained by more accomplished users.

Teachers with more experience tended to rate more factors as being highly influential than teachers with less experience. In addition, results from this study suggest that the longer one has been teaching, the more important professional development, commitment to improving student learning, and previous successes are perceived to be to one's current technology success. These results may be explained by the fact that teachers who entered the teaching profession prior to the integration of technology into teacher education programs are more likely to be self-taught (Hadley & Sheingold, 1993). It is likely that the majority of these teachers learned their skills through their own initiative and on their own time, attending professional development workshops to learn new skills and slowly gaining confidence as they gradually achieved more success. This finding is supported by the rating given by more experienced teachers to the factor of personal commitment (M=5), which may be due to the time and effort they had previously invested to effectively integrate technology, as well as their ongoing commitment to remain current with technological advances. This finding is further supported by the lack of perceived influence that pre-service education had on exemplary use (M=2.69).

One of the largest differences between these groups of teachers was the relatively higher influence that technology support was perceived to have on teachers with more experience (M=4.0; M=3.1, respectively). Similar to the results described earlier, this could be attributed to the fact that teachers who had been teaching longer *required* more support due to having had less formal training with technology. Teachers with fewer years of teaching experience may not have needed as much technology support.

Finally, all the teachers in this study rated professional development as one of the more influential *extrinsic* factors (M=4.44). As noted earlier, for teachers who entered the teaching profession prior to the introduction of technology into pre-service teacher education, professional development may provide the most accessible and affordable means to develop these skills. Even for newer teachers who had technology training in their teacher education programs, professional development enables them to continue to update and refine their skills. Furthermore, after having gained a better handle on classroom management and curricular needs, newer teachers are also in a better position to learn how to apply these skills during professional development programs.

Limitations

Results of this study are limited by the small sample size and the use of five different technology-award programs to identify our participants. While award criteria were similar, this may have biased our sample by eliminating additional potential participants. Future research should draw from a larger sample from the national population, in order to increase the generalizability of the results. In addition, survey results would be better understood if follow-up interviews or observations had been conducted. Finally, the instrument was not as reliable as the research team would have liked it to be; a more reliable instrument would enhance the validity of the study.

<center>**Conclusion / Implications**</center>

The overarching purpose of this study was to identify effective methods for preparing teachers to use technology in an exemplary manner. When teachers were asked to indicate the professional growth opportunities in which they preferred to participate, they responded most frequently with "workshops/seminars" (n=20; 80%) and

"conferences" (n=19; 76%), while "group training with a technology coordinator/aide" was rated the lowest (n=6; 24%). In order to increase the number of exemplary technology-using teachers in our schools, we might consider encouraging interested teachers to collaborate with other exemplary technology-using teachers. Teachers in this study recommended starting with a simple idea and expanding on that idea through a brainstorming session. Many teachers, especially those who participated in this study, have already developed innovative and effective ideas for integrating technology in the classroom. Through interaction with these exemplary models, whether through conferences, workshops, or online mentoring opportunities, new technology-using teachers can find the kind of collegial support they desire and need.

This study highlighted teachers' strong beliefs that exemplary technology use is founded on their own internal beliefs and commitment, but is also supported by important extrinsic factors (professional development, technology support) that enable them to translate that vision into practice. Educators and teacher trainers need to be aware of the important influence that teachers' beliefs and personal commitment have on teachers' practice and incorporate strategies into their professional development programs that address these beliefs and increase teachers' commitment. Asking teachers to share their stories and to reflect on their technology integration experiences is one potential method for highlighting the possibilities of technology, while positively shaping their personal beliefs about those benefits.

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Impact and Perceived Value of Peer Feedback in Online Learning Environments

Peggy A. Ertmer
Jennifer C. Richardson
Brian Belland
Denise Camin
Patrick Connolly
Glen Coulthard
Kimfong (Jason) Lei
Christopher Mong
Purdue University

Feedback has been demonstrated to play an important role in instruction (Mory, 2004, Topping, 1998) with many learning theorists positing that feedback is essential to students' learning (Driscoll, 2000). Current views hold that the purpose of instructional feedback is to provide students with information they can use to confirm what they already know or to change their existing knowledge and beliefs (Mory). Higgins, Hartley, and Skelton (2002) noted that feedback that is meaningful, of high quality, and timely helps students become actively and cognitively engaged in the content under study, as well as in the learning environment in which they are studying.

Compared to a traditional classroom, feedback may play an even more important role in an online environment (Lynch, 2002; Palloff & Pratt, 2001). That is, students in an online course are more likely to disconnect from the material or environment due to a lack of feedback than students attending a lecture-formatted course. Instructor feedback is often cited as the catalyst for student learning in online environments, while lack of feedback is most often cited as the reason for withdrawing from online courses (Ko & Rosen, 2001; Lynch; Palloff & Pratt).

Because of the importance of feedback in online environments, a number of recommendations have been made for increasing its effectiveness. Notar, Wilson, and Ross (2002) specifically called for feedback that was "diagnostic and prescriptive, formative and iterative, and involving both peers and group assessment" (p. 646). According to these authors, feedback should focus on improving the skills needed for the construction of end products, more than on the end products themselves. While students agree that feedback needs to contain a formative aspect, they also desire summative comments. As Schwartz and White (cited in Mory, 2004) reported, students expect feedback in an online environment to be: 1) prompt, timely, and thorough; 2) ongoing formative (about online discussions) and summative (about grades); 3) constructive, supportive, and substantive; 4) specific, objective, and individual; and 5) consistent.

Research has shown that the quality of student discussion responses can be increased through the use of constructive feedback that is prompt, consistent, and ongoing (Ertmer & Stepich, 2004). Discussions without guidance or feedback can be ineffective and inefficient, yet significant instructor time is required to provide meaningful feedback on students' individual postings. Debowski (2002) noted that while online instructors often provide learners with relevant and helpful examples of the content being studied, they are much less likely to offer relevant and useful feedback.

One possible solution is for students to provide feedback to each other. As noted by Maor (2003), feedback "can no longer be considered the sole responsibility of the instructor because there is a much larger focus on dialogue…[and] the joint construction of knowledge" (p. 128). Depending upon how peer feedback is structured, instructors could be spared from evaluating large numbers of student postings, yet still provide as many instances of formative and summative feedback as they deem necessary. Students, on the other hand, would still receive the feedback they require in order to assess their progress in the online environment. While "peer feedback might not be of the high quality expected from a professional staff member, its greater immediacy, frequency, and volume compensate for this" (Topping, 1998, p. 255).

In addition to the benefits of *receiving* adequate feedback, students may also benefit from *giving* peer feedback. Liu, Lin, Chiu, and Yuan (2001) proposed that, when asked to offer feedback to peers, students progress beyond the cognitive processes required for completing a given task, as they must now "read, compare, or question ideas, suggest modifications, or even reflect on how well one's own work is compared with others" (p. 248). McConnell (2002) also suggested that collaborative assessment moves students away from dependence on instructors as the only, or major, source of judgment about the quality of learning to a "more autonomous and

independent situation where each individual develops the experience, know-how, and skills to assess their own learning" (p. 89). Thus, students are offered the opportunity not only to reflect on the work of their peers, but also on their own work.

Although peer feedback can add value to the instructional process, it is not without its challenges. These challenges relate to a wide range of issues, including implementation, students' anxiety over giving and receiving feedback (especially negative feedback), and reliability, to name a few. According to Palloff and Pratt (1999), "The ability to give meaningful feedback, which helps others think about the work they have produced, is not a naturally acquired skill" (p. 123). In terms of implementation, Topping (1998) noted that "both assessors and assessees might experience initial anxiety about the process" (p. 256), but suggests that this may be mitigated by asking students to provide positive feedback before providing any negative feedback. Topping also suggested that learners may perceive peer feedback to be invalid, thus causing low-performing students to refuse to accept negative feedback as accurate. These concerns over accuracy and validity may, in fact, be justified, based on the tendency for students to either inflate or deflate scores (Topping, 1998).

It is unclear whether challenges related to giving and receiving peer feedback in a traditional environment will be exacerbated or mitigated when applied within the online environment. Tunison and Noonan (2001) reported that many students found it difficult to communicate complex ideas in an online environment, and that their ability to express their questions clearly and comprehend detailed explanations was limited by the lack of face-to-face interaction. Arbaugh (2000) reported that while student participation in online course discussions tends to be more equal and at a higher level than in traditional settings, this interaction may not be as effective as face-to-face interaction—at least not until participants achieve a level of comfort with each other. If peer feedback is to be beneficial to all members of the learning community, these are issues that must be addressed (Preece, 2001).

According to Mory (2004), "Although there has been progress in determining ways in which feedback can best be used under certain conditions, there are still many areas in which the feedback literature is not consistent and yet other areas that have been left unexplored" (p. 771). For example, little work has been done that examines the role or impact of feedback in online learning environments in which learners construct their own knowledge, based on prior experiences and peer interactions. The purpose of this study was to examine the perceived value and impact of peer feedback on students' postings in an online learning environment. Specifically, the research questions included:

1. What is the impact of peer feedback on the quality of students' postings in an online environment? Can quality be maintained and/or increased through the use of peer feedback?
2. How do students' perceptions of the value of receiving peer feedback compare to the perceived value of receiving instructor feedback?
3. What are students' perceptions of the value of giving peer feedback?
4. What aspects of the peer feedback process do students perceive as being particularly useful or challenging?

Methods

To determine the viability of either supplanting or supplementing formative instructor assessments with peer feedback in an online environment, we examined the use of peer feedback during a semester-long, graduate-level online course in the College of Education at a large Midwestern university. Using a mixed-methods approach, data were collected through participant interviews, scored ratings of students' weekly discussion postings, and responses to both entry and exit survey questionnaires. Changes in scored postings were used to answer our research question regarding the impact of peer feedback on the quality of students' postings. Survey results captured students' overall perceptions of giving and receiving feedback, while interviews provided insights into individual perceptions and personal experiences with the feedback process, in general, and the peer feedback process, specifically.

Role of researchers

The researchers in this study included two faculty members and seven graduate students (one female/six male) in the educational technology program in the College of Education. All had experience in online learning environments, and all were familiar with the scoring rubric (based on Bloom's taxonomy) used by the participants in this study.

Participants

The participants in the study were 15 graduate students (10 female, 5 male) enrolled in an online technology integration course during the spring semester of 2005. Eight of the participants were administrators, such

as technology directors or principals, and three additional students were former or current teachers. Of those pursuing a graduate degree, five were masters and nine were doctoral students. The human subjects review board deemed this study exempt under university guidelines.

Context and procedures

The online, graduate level course was co-taught by a professor and an experienced graduate assistant. Students met face-to-face (or via Internet-based video conferencing) for the first class session; all subsequent interactions occurred electronically, within a WebCT course environment. In addition to other assignments, the students were asked to respond to discussion questions (DQs) each week. In a typical week, students were expected to post at least one response to the discussion question and one response to another student's post.

For this study, feedback was defined as 1) comments about the quality of students' online postings and 2) a corresponding score based on Bloom's taxonomy. Postings at the knowledge, comprehension, and application levels received 1 point; postings demonstrating analysis, synthesis, or evaluation received 2 points; non-substantive comments received 0 points. The scoring rubric, adapted from Ertmer and Stepich (2004), provided the instructor and students, as well as the researchers, with a concrete tool for determining the quality of online postings. Prior to using the rubric, students were provided with a variety of examples of possible responses, with an explanation of why each response merited a specific score.

Initially, two discussion questions were posted each week, with feedback provided by the two course instructors via e-mail. After observing the process modeled by the instructors, students were asked to provide feedback to two of their peers beginning in week 7 and continuing for the following 6 weeks (peer review assignments were rotated each week). Groups were not self-contained: in other words, no two students were reviewing and being reviewed by the same students for the same DQ. To accommodate the additional effort required by the peer review process, online discussions were limited to one discussion question during those weeks.

All peer feedback was channeled through the instructors prior to being distributed. That is, using an online submission form, students reviewed their assigned postings, scored them using Bloom's taxonomy, and provided comments to support the scoring. These results were then forwarded to the instructor via e-mail. After reviewing the feedback and eliminating peer reviewers' names, the instructor compiled and sent the feedback to students via e-mail. This process ensured anonymity and created a buffer in case the feedback was problematic. Instructor and peer feedback scores both counted toward students' grades. Students received participation points for the peer review activity, but the act of providing peer feedback was not graded.

Data collection

Researchers' ratings of discussion postings, pre- and post-surveys, and student interviews comprised the primary data sources. Course documents (e.g., syllabus, assignment descriptions), and students' peer ratings of discussion postings constituted secondary data sources.

Discussion postings. In order to assure consistency of scoring of students' online postings, the research team scored all discussion postings, using the same rubric students had used. While these were not the scores that students received during the course, they provide a better indication of the changing quality of their responses. That is, because students' postings were rated by many different peers (each with their own interpretations of how to apply the rubric), it was important, for research purposes, to use a more consistent measure of quality. Furthermore, the students were not required to score each posting that a peer had made to a DQ but rather, only the two required postings, thus making the data set incomplete.

Two researchers rated all of the student postings. In order to assure that the scoring was not influenced by the timing of the posts (with later scores automatically receiving higher scores), all evidence of DQ numbers, posting dates, and times was removed from these documents. To assure consistency in scoring, the two raters scored a complete set of postings (n = 59) from a single randomly selected discussion question. Working from separate printed copies, the raters scored the first ten postings independently and then verbally discussed their scores. After securing agreement on the first ten postings, the raters independently scored the next ten postings. Upon completion, the raters compared their results, tallied the number of disputed scores, and then discussed their differences. The raters proceeded with this process until all 59 postings were completed. The final results showed 86.44% agreement between the two raters. Following this, the two researchers divided and independently rated the remaining sixteen discussion questions, containing anywhere from 38 to 81 postings each.

Pre- and post-surveys. At the end of week 5, students completed a survey (13 Likert-style items; 5 open-ended questions) in which they rated their level of agreement (from 1-strongly disagree, to 5-strongly agree) on the importance of various aspects of feedback (e.g., timeliness, quality, quantity) and the extent to which the feedback they had received, from the instructor, met these criteria. Students described their typical responses to receiving

positive and negative feedback (e.g., "*When I receive feedback that is below my expectations, I tend to ...*" and "*The feedback in this course, has changed my postings in the following ways ...*") and their ideas regarding the most effective feedback methods in an online course. The initial survey served as a pre-measure of students' perceptions, as students completed it prior to giving or receiving peer feedback. In week 16, students completed a post-survey in which they rated the importance of peer and instructor feedback and commented on the value of both giving and receiving peer feedback. Additional survey items were used to triangulate results from the student interviews.

   Interviews. Participant interviews were conducted in order to obtain more detail about individual issues arising from the peer feedback process (e.g., "*How easy or hard is it to use Bloom's taxonomy as a scoring rubric?*" "*How do you feel about peers evaluating your postings*?") Each member of the research team interviewed two participants via telephone or in person. The interviews lasted 20 to 30 minutes, were recorded electronically, and then transcribed. Once completed, the interview transcriptions were sent to the participants for member-checking to ensure accuracy and completeness.

Data analysis

   In order to determine the impact of peer feedback on the quality of students' postings, we compared the average scores obtained on postings prior to the use of peer feedback (weeks 3-5) to those obtained during the peer feedback process (weeks 7-13), using a paired sample t-test. T-tests were also used to compare students' ratings, on the pre and post survey, of the value of peer and instructor feedback. These results were then triangulated with ratings collected during participant interviews, conducted several weeks after the peer feedback process had started. Participants' perceptions of the value of the process were compared across open-ended survey questions and interview responses. After selecting a set of standardized analysis codes, NUD*IST qualitative analysis software helped identify recurring themes and patterns across the interview data.

   Validity concerns were addressed through the triangulation of data sources, member-checking of the transcribed interviews, and pattern-matching through coding and discussion with other members in the research team. The use of a standardized interview protocol served to increase reliability, as did having previous experiences with Bloom's taxonomy. The use of multiple interviewers and evaluators helped eliminate interviewer biases.

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Results
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Perceived value and impact of peer feedback

   At the beginning of the course, students believed that feedback in an online course was "slightly more important" than in a traditional course (M=3.6/5.0) and thought that feedback should be timely (M=3.8) and of high quality (M=3.9). Students considered the *quantity* of feedback to be less important (M=3.3) than quality. By the end of the course, students' perceptions of the importance of feedback in an online course had significantly increased (M=4.7; $t[11]=2.24$; p=.05), as had their expectations that feedback should be timely (M=4.3; $t[11]=3.32$; p=.007). (Note: Only 12/15 pre-surveys were returned.)

   A paired t-test indicated no significant difference ($t[14]=.29$; p=.77) in the quality of students' postings on discussion questions in which they received instructor feedback (weeks 3-5, M=1.31) compared to those on which they received peer feedback (weeks 7-13; M=1.33). Thus, although the quality of students' postings did not improve with peer feedback, neither did it decrease, suggesting that peer feedback may be effective in *maintaining* quality of postings, once a particular level has been reached.

   While specific changes in the quality of postings was not evident as a result of peer feedback, interview comments suggested that students (n=8) used information obtained from the feedback process to improve the quality of their postings.

> Yes, it has impacted on my own posts. Because I remember the first time I got feedback [it said] "it is important to give an example." And so I try to put more examples in my answers.

> Somebody scored me on a 2, and one gave me a 1 because they didn't think I got to the higher levels of Bloom's taxonomy; one did, one didn't. You know, you sit down and you say, "Well maybe there's something I need to improve in how I write my answers so they could clearly see that I'm hitting that, so I now throw in words like, "In evaluating this concept, I believe…" I tend to use clearer terms to help them identify where I believe my thinking process is.

Instructor vs. peer feedback: Perceptions of value

   As expected, at the beginning of the course, feedback from the instructor was perceived as being more

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important (M=4.3) than peer feedback (M=3.3). In general, students disagreed with the statement that they would rather receive feedback from their peers than from the instructor (M=2.0). They explained that the instructor was more knowledgeable and thus, should oversee scores that peers provide. By the end of the semester, students' perceptions of the value of instructor feedback (M=4.6) did not significantly change; furthermore, it was still perceived as being more important than peer feedback (M=3.7). A paired t-test [t(11) = 3.19] showed this difference, between the perceived values of instructor and peer feedback, to be significant at the .009 level. Interview comments provided additional insights into reasons why students preferred instructor feedback. For example, students expressed concerns about potential biases in peers' evaluations due to the fact that it was required (n=3), that not everyone was motivated to provide quality feedback (n=5), or that it took a great deal of time to give quality feedback (n=4). One student noted:

> The feedback was kind of superficial. You just kind of go through the motions—at least the stuff I've gotten back. There's not really any real substance to it. If the person did not score at the highest level, [peers should] identify something that would take them to the next level or the highest level.

Additional comments, while still describing benefits to peer feedback, point to the previous experiences, unbiased approach, and general expertise of the instructor:

> … It is good to know everybody else's opinion. [And] I guess it can help you [move] to some other directions that might lead you to some more questions, but overall, it is not really going to change my perspective on the question.

> I like the peer feedback better, in the sense of how it makes me feel. But as far as valuing what they're saying about me, I would value [instructor's] feedback more. Her grading was a little harder than what my peers has been, but it was probably more on target.

As noted above, even though students *preferred* instructor feedback, the majority of them (n=13) still valued the peer feedback process and many described important aspects of the process (e.g., anonymous format; relative weight given to it). As noted by one student:

> This experience is more in-depth, and I would have to say, more positive [than in other courses], because if peer feedback is the sole source of feedback that we are getting [it] … has to be more thorough and more comprehensive. Previous peer feedback experiences I've had were coupled with feedback from the instructor, and were seen more as a secondary measure. In this instance, as a primary measure, it has been a lot more valuable.

Additional benefits to receiving peer feedback included receiving confirmation that their ideas were meaningful to others as well as having opportunities to profit from the insights of their peers, who could offer a variety of perspectives that the instructor could not provide.

> It's nice to get some validation that what you had to say was important to somebody else, that they got something from it.

> My impressions are that it is very beneficial to learning in that peers often have different perspectives than the instructor, and there are significantly more of them, and they can provide a lot of insight and ideas that the instructor might not have noticed. Peers are more often on the same level and may be able to explain things in a manner that makes more sense than the instructor might have.

Perceived value and impact of giving peer feedback

When asked, on the post-survey, to rate the importance of both giving and receiving peer feedback, students rated them at the same level (M=3.7), that is, as "important" to their learning. The significantly high correlation (r=.78; p=.003) between these ratings suggests that students, on average, did not perceive one aspect as being more important than the other. That is, those who rated the process of *giving* feedback as important also tended to think that *receiving* peer feedback was important to their learning. In the interviews, students talked about reflecting on the feedback they had given to peers as they formed their own responses to discussion questions. Moreover, several students (n=6) discussed specifically how the process of providing peer feedback increased their own learning. Comments from three students are illustrative:

> I often think that the tutor or the person giving the feedback often learns more than the person receiving the feedback. … The person giving the feedback learns through the suggestions that they come up with in evaluating the response. They learn through the content of the person's [post] they are evaluating, and they learn from their own thought process. So I think it's very beneficial to do.

> I think that I considered more often how others would view what I was about to post and it made me consider alternatives and other ideas that I may have not thought of if I had not been doing peer feedback. It brought Bloom's taxonomy into a greater focus and how I am formulating my responses.

> When you teach what you learn, you retain what you learned 300% better. When we present things to

people who maybe don't have [the same experience], we're actually reinforcing our own learning much more strongly. So we're gaining.

However, as with receiving peer feedback, students perceived difficulties with the process. The main concerns for giving feedback related to being consistent and fair (n=4). For example, one student commented, "I think peer feedback is good, but in some respects, I don't know if I'm really qualified to give a grade to anybody." Particularly worrisome to some students was having to give a 0-score. In fact, some students simply would not do this. I am not sure if I could give a 0 to anyone because I don't feel that I have the power to say, "That's not a good idea."

Even though I don't know them, I don't think I'd give them a 0, no.

This is supported by the peer feedback data; in approximately 160 peer-rated postings, peers gave a 0-score only 7 times (4%). Still, a few students (n = 4) indicated that the issue was not one of assigning a low score but of being a conscientious educator. These students believed that a low score provided a teachable moment, providing the opportunity to offer constructive criticism and suggestions for improvement. Overall, the majority of students (n = 8) felt that the benefits of providing peer feedback outweighed the costs. While specific benefits related to learning how to improve the quality of their own posts as well as their feedback to others, the main cost related to the time needed to do a good job. Still, students described the time commitment as appropriate to a graduate course, as well as relevant to their future careers, as noted by one student: "Skills associated with peer evaluation are going to carry on much longer than the course."

Perceived benefits and challenges to the peer feedback process

An important aspect of the feedback provided in this course was the use of Bloom's taxonomy as the basis for scoring. In general, the students (n = 8) responded favorably to this approach, describing how it provided more structure and guidance for achieving and acknowledging quality postings. For example, two students commented:

… The grading was done more consistently than in other courses I have taken, and there were specific things that were mentioned on every score that we received in terms of the evaluation level that the instructor believed the (post) merited, and the exact characteristics of that level that were characterized by the response. … In previous courses, points were based on more subjective measures in terms of what the professor thought was an appropriate response.

It leveled the playing field for everyone and it did make it easier to respond. As I formulated my responses [it was useful] to know what the person would be looking for.

However, the use of Bloom's taxonomy added a layer of difficulty to the course for which not all students were prepared. While two students explained that they just needed time to adjust to using the rubric, two other students noted that it continued to be difficult to apply: "I think it's hard. [The taxonomy] is vague; the rubrics are pretty wide open." One of these students described his/her confusion while trying to decide which level of Bloom's was most applicable to a response and often just ended up using the top level (evaluation).

In addition, one student felt constrained by the use of the rubric, noting that it was kind of "undergraduate-ish" to rate each other's postings using Bloom's taxonomy, especially since many of the students in the class were high-level administrators. Furthermore, because students' participation grades were based on scores provided by their peers, there was some concern on both sides (givers and receivers), about the potential impact of their evaluations. While some students (n=3) were worried that their peers were being too nice to them (thus not providing any valuable suggestions for improvement), others (n=3) worried that their grades would suffer because their scores were too low. As one student noted, "I see the importance. But I also think that the instructor should have the overall decision on how many [points] you get."

Summary

Though participants' perceptions of the importance of feedback in an online course significantly increased from the beginning to the end of the course, students continued to believe that instructor feedback was more important than peer feedback. Furthermore, despite seeing no quantitative improvement in the quality of students' postings during the peer feedback process, interview data suggested that participants valued the peer feedback process and benefited from having to give and having received peer feedback.

Discussion

Value and impact of feedback in an online environment

Results from this study highlight the importance of feedback in an online environment and support the assumption that students' postings can reach, and be sustained at, a high level of quality through a combination of instructor and peer feedback. In general, students' postings, across 17 discussion questions, averaged 1.32 on a 2-

point "quality" scale. While we expected that the quality of students' postings might gradually improve over the semester, as was demonstrated in a similar study by Ertmer and Stepich (2004), our results showed no significant improvement in students' postings from the beginning to the end of the course. We suspect that a number of factors may have mediated students' efforts to achieve high quality postings. First, the online course was structured such that students were required to submit two postings (for grading) each week: an "initial" post to the weekly discussion question, as well as one response to another student. Additional postings were not required, nor did students expect them to be scored for quality. Therefore, once the initial and follow-up postings were made in a specific forum, students had little motivation to strive for high quality with any additional postings. Furthermore, scoring postings with a grading rubric that allowed for only two meaningful levels of quality may not have provided enough room for growth, thus causing a ceiling effect to occur. Since students started out with relatively high scores on their two required posts, there was little opportunity to demonstrate improvement in these scores during the semester. In the future, it might be important to include a scoring rubric that allowed for more variation among scores. The disadvantage to this, however, is that as the scale becomes more finely gradated, it becomes increasingly difficult to differentiate among the various levels of quality.

Another reason students may not have demonstrated increased quality in their postings relates to the discussion starters used. In this course, many of the discussion starters, especially those developed by student leaders, were not particularly conducive to high-level responses. For example, student leaders tended to ask their peers to provide examples of current issues they faced in their classrooms or schools (e.g. how to integrate technology, how to cope with security issues, how to apply distance learning opportunities in the classroom). While these types of discussions might be expected to stimulate responses related to the application level on Bloom's taxonomy (score = 1 point), they would not readily engender responses related to analysis, synthesis, or evaluation (score = 2 points). As Black (2005) noted, "most online discussion consists of sharing and comparing information, with little evidence of critical analysis or higher order thinking. Such findings serve to remind us that it is not the technology itself but the manner in which it is applied that is most critical" (p. 19). Thus, it is important for instructors to not only facilitate meaningful online discussions but also to be cognizant of the development of discussion questions in such a way that allows students to attain higher-order thinking.

Communication in online courses serves many functions, only some of which are specifically content-focused (Ko & Rosen, 2001; Palloff & Pratt, 1999, 2001). However, in this study, we rated every response posted in 17 different discussion forums, including responses that were intended solely for interpersonal or motivational purposes. While these types of postings serve important roles, they would not be likely to receive a high-quality score, based on Bloom's taxonomy. Given this, we considered scoring only the required posts in each forum; however, it was difficult to determine, post-hoc, which postings students intended to "count" as their required two postings. Additionally, this would have reduced the total number of analyzed postings from 778 to 160, which would have greatly limited our ability to measure changes in posting quality. In the future, it will be important to clarify exactly how many postings will be scored in a discussion forum while also leaving room for students to make additional postings that serve to build a sense of community and trust.

Perceptions of value: Peer vs. instructor feedback

Despite the fact that the quality of students' postings was maintained with the use of peer feedback, students still tended to favor instructor feedback over that received from peers. Furthermore, despite participating in what they, themselves, described as a "valuable process," students began and ended the course believing that instructor feedback was more important to their learning. This perception is similar to that reported by a number of researchers (Ko & Rosen, 2001; McKeachie, 2002; Topping, 1998) who have noted that students often believe that their peers are lax in their assessment approaches or that they lack required skills to provide valuable feedback. As Topping noted, if learners perceive peer feedback to be invalid, they may end up de-valuing the entire peer feedback process. This suggests the importance of explicitly addressing students' perceptions, up front, and taking steps to counter their strong preconceived ideas of the relatively weaker value of peer feedback.

Specifically, in this study, students expressed concerns about being qualified to give feedback to each other. This may have led, on the one hand, to the perception that they were receiving superficial or low-quality feedback to, on the other hand, feeling apprehensive about being consistent and fair while evaluating their peers' postings. As noted earlier, "The ability to give meaningful feedback, which helps others think about the work they have produced, is not a naturally acquired skill" (Palloff & Pratt, 1999, p. 123) and students might experience initial anxiety about the process (Topping, 1998). In this study, these concerns appeared related to a more fundamental concern about how peer scores would impact grades, whether their own or others. To help the peer feedback process work most effectively, students need to be assured that postings will be fairly and consistently evaluated and to appreciate the additional benefits made possible through the peer feedback process.

One of the potential advantages to using peer feedback, as noted by Topping (1998), is the increased timeliness in receiving feedback. However, in this study, students' feedback was channeled through the instructor, thus causing a delay in delivery time—initially taking as long as two weeks. The significantly higher rating, at the end of the course, of the importance of timeliness of feedback may have been in reaction to the perceived delay in receiving peer feedback. This lag time, then, may have cancelled out one of the proposed benefits of peer feedback, that is, increasing the timeliness of receiving feedback.

Still, despite these logistical problems, the majority of students indicated that peer feedback positively impacted the quality of their discussion postings. They described a number of specific benefits from receiving peer feedback including recognition of their ideas, access to multiple perspectives, and receiving a greater quantity of feedback than would have been received from the instructor alone. Students also noted positive aspects of the peer feedback process, including the ability to provide anonymous feedback and the ability to receive a grade that reflected the average score given by two different peers.

In addition to impacting the quality of their discussion postings, students also described how peer feedback helped them improve the quality of the feedback they, in turn, provided to others. In other words, after receiving initial peer feedback, some students realized they had not been as in-depth or constructive as they could have been in providing feedback to others and thus improved the quality of their own feedback. Ko and Rosen (2001) noted that the ability to "cross-check" one's understanding is an essential step in the learning process.

Learning by doing: Benefits to giving peer feedback

Perhaps the greatest potential benefit of the peer feedback process lies in the constructive aspect of forming and justifying peer feedback. For example, in this study many students described how they benefited from providing peer feedback. Through this process, they reflected more critically on the discussion postings for which they were providing feedback as well as on their own postings and how they could be improved in a similar manner (Juwah, 2003). Many authors have suggested that this type of reflection contributes to the assessor's comprehension of the topic by forcing him/her to reflectively analyze postings and to think about what constitutes high-quality work (Henderson, Rada, & Chen, 1997; Topping, 1998). According to Dunlap and Grabinger (cited in Dunlap, 2005), "The process of reviewing someone else's work can help learners reflect on and articulate their own views and ideas, ultimately improving their own work" (p. 20). Furthermore, requiring students to justify their peer ratings by specifying which level of Bloom's taxonomy was demonstrated in the peer response forced them to engage in activities at a higher level of cognitive skill: providing explanations, making justifications, and drawing conclusions (King, Staffieri, & Adelgais, 1998). Finally, Garrison, Anderson, and Archer (2000) argued that an essential element of online learning rests with what they referred to as "cognitive presence," which allows learners to construct meaning through sustained reflection and discourse, which is after all, the focal point of the peer feedback process.

Limitations and suggestions for future work

The results of this study are limited by the small sample size, the relatively short duration of the study, as well as the fairly limited scale used to judge the quality of student postings. Conducting the study over a longer period of time, with a rating scale that allows for greater improvement, could result in a measurable difference in the quality of student postings. Furthermore, providing more time, up front, to discuss the benefits of the peer feedback process and to train students to use the rating scale more effectively might impact students' perceptions of the value of receiving feedback, particularly in relationship to the perceived value of instructor feedback. Given that feedback is likely to become an increasingly complex and important part of the online learning process (Mory, 2003), it is important that educational practitioners have access to relevant information regarding how to effectively use peer feedback to increase student learning. While the results of this study suggest that peer feedback is a viable alternative to instructor feedback, specifically related to maintaining the quality of student postings, additional research is needed to determine the most effective means for facilitating the process in an online learning context.

Implications and conclusion

Discussions play a key role in online learning environments, providing the primary means for students to exchange ideas, offer explanations, share multiple perspectives, clarify understandings, and engage in other types of high-level discourse (Dunlap, 2005; King et al., 1998). However, "facilitating discussions is the single most time-consuming and effort-intensive component of an online course" (Dunlap, p. 21). In order to decrease instructors' workload, without jeopardizing students' learning, instructors need to implement strategies that enable them to share the responsibility for feedback with their students.

Results from this study highlight students' perceptions of the importance of feedback in an online environment and specifically point to the expectation that feedback consist of quality rather than quantity of

feedback, and that it be delivered in a timely manner. Although the survey results indicated that student ideas about the value of peer and instructor feedback did not change over the course of the semester, interview comments helped us determine where the specific strengths and weaknesses of the feedback process occurred. While many of the strengths seemed to be related to the inherent value of participating in the feedback process (e.g., reflection during the feedback process, improving posts and feedback), weaknesses seemed to be associated, at least to some extent, with the logistics of the process (e.g., time delay from providing feedback to receiving feedback). Perhaps if instructors can simplify the logistics involved in giving and receiving peer feedback, and can somehow assure the importance and validity of peers' responses, students will be able to appreciate and accrue the potential benefits. Furthermore, if the use of peer feedback can decrease an instructor's workload in an online course while continuing to maintain a high quality of postings, this may offer a viable alternative, or at least a reasonable supplement, to facilitating learning in an online course. That is, by addressing these logistical issues, it may be possible to increase both the efficiency and effectiveness of the process, as well as the perceived value for the participants. As summarized by one student:

> I think that if it were developed a little more, I think it would be really effective. It seemed kind of OK I think right now it's of value to the person evaluating, but I don't really think it's much of a value to the person receiving it. It's kind of like, "Ok great." But I think that maybe if it wasn't every week, and maybe in a different format than these discussion postings, the peer evaluation would work great. … That's my opinion. I think it's a good beginning, but I think it could be built much more.

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Online Follow-up to Professional Development for Texas School Librarians: The Value of a Collaborative Learning Environment

Marybeth Green
University of Texas at San Antonio

Lauren Cifuentes
Texas A&M University

Abstract

The purpose of this study was to examine the effects of online follow-up and collaboration on attitudes towards the professional development program and course completion of an online follow-up course added to face-to-face professional development for librarians in 12 Texas school districts. This study used a posttest-only control group experimental design with self-selected participants.

At the beginning of the 2004-2005 school year, school librarians participated in a face-to-face workshop during inservice training. The workshop dealt with the process of creating a TAKS Support Plan, a plan for the library to support weaknesses on the TAKS at their school. At the conclusion of the workshop, school librarians were given the opportunity to participate in an eight-week online follow-up course that supported implementation of inservice themes. School librarians were stratified by level of service and socioeconomic school status and were randomly assigned to one of three environments. Two experimental environments were used: (a) Collaborative Follow-up and (b) Noncollaborative Follow-up and a control environment, No Collaboration/No Follow-up. The experimental environments were given additional information and support in an online course to aid the creation of their TAKS Support Plan.

Results indicate that inclusion of online collaboration and follow-up resulted in more positive attitudes toward the professional development than the professional development with no collaboration or follow-up. Logistic regression revealed that the likelihood of completion could be predicted by membership in professional development condition. The likelihood of completion by participants in the Collaborative Follow-up condition was significantly greater than participants in the NonCollaborative Follow-up and No Collaboration/No Follow-up conditions. No difference was found between the completion rates of the NonCollaborative Follow-up and No Collaboration/No Follow-up conditions.

Introduction

Follow-up to face-to-face professional development has long been established as essential to sustaining educator change. Initial enthusiasm for content presented in a professional development workshop may be reassuring to organizers, but has relatively little influence on educator learning The need for follow-up to professional development has been summarized as: "Without continuing encouragement and support [upon completion of workshops and courses], the average educator has a remarkable capacity for reverting back to old practices under a new name (Beeby (1980), p.466."

The ultimate goal for educator professional development is educator learning that promotes changes in the educators' knowledge, understanding, behaviors, skills, values, and beliefs. The process of implementing change, however, can be very threatening - challenging educators' accepted pedagogical beliefs and philosophies, requiring educators to adopt and use new practices, and exchanging familiar materials and resources with those that are foreign. Through well-structured follow-up over time, educators are given opportunities to grapple with change, to engage in discussions regarding beliefs and assumptions about issues related to practice, to build competence in new tasks or strategies and to try new roles and create new structures in safe conditions.

Follow-up conditions founded on collaborative learning philosophies enhance educators' capacities to adapt to and implement change. Collaboration removes feelings of educator isolation and the sense that educator learning is solely an individual responsibility. In collaborative learning conditions, multiple opportunities are provided for discourse so that educators can learn though and from each other in a learning community. Discourse becomes a tool for reflecting critically on practice and on the impact educators have on students' learning.

The growth of powerful network and communication technologies in schools creates new opportunities for follow-up and collaboration to support professional development. These technologies enable online professional development with a high degree of communication and interactivity among educators spread across vast geographic

landscapes. However, there is enormous diversity in instructional design among the various offerings. At one end of the scale are courses offering rich opportunities for interaction with content, with other students, and the instructor while at the other end are those offering only interaction with the content.

Therefore, the researchers asked the questions:

Is there a significant difference between professional development environments that include online Collaborative Follow-up, online NonCollaborative Follow-up and No Collaboration/No Follow-up in attitudes towards the professional development program? "

Does the likelihood of course completion of a follow-up course to a face-to-face workshop for school librarians differ among online professional development conditions including Collaborative Follow-up, NonCollaborative Follow-up and No Collaboration/No Follow-up?

Methododology

Participants

Participants were drawn from the population of school librarians in 12 school districts in Texas. These districts represented several of the largest districts in Texas whose library services directors have been active in Texas Library Association. This created a population of 812 school librarians. School librarians' experience ranged from school librarians in their first year of practice to school librarians with thirty-plus years of service. School librarians' level of service ranged across elementary, middle and high school representing the distribution in the field.

Procedure

At the beginning of the 2004-2005 school year, school librarians in 12 K-12 school districts across the state of Texas participated in a face-to-face workshop in their district presented by the Library Services Directors or his/her designee. The workshop focused on training librarians to create a plan for the Library to support weaknesses on the Texas Assessment of Knowledge and Skills (TAKS), the state standardized test, at their school. One of the researchers trained the Library Services Directors or their designee during the summer so that all workshops were consistent. Each presenter used an agenda and a PowerPoint presentation developed by one of the researchers. During the workshop, school librarians were trained on:
- the need for a TAKS Support Plan,
- how to obtain and read the report of student weaknesses at their school provided by the Texas Education Agency,
- the components of the plan and
- resources available to help them complete the plan.

At the end of the face-to-face workshop, school librarians were offered the opportunity to continue working on creating a TAKS Support Plan through an online follow-up course sponsored by the study. The online follow-up course was divided into six modules each requiring approximately one hour of time online each week.

A total of 444 school librarians indicated an interest in participating in the online course. These participants were stratified by level of service (elementary, middle, high) and by socioeconomic status of the school. They were then randomly assigned to one of three online conditions: Collaborative follow-up, NonCollaborative follow-up and No Collaboration/No Follow-up. They were enrolled in an online continuing education course matching their treatment condition at the Continuing Education division of Instructional Technology Services at Texas A&M. WebCT Vista was the course management software used to deliver the courses.

Of the 444 who indicated an interest, 278 actually entered the course. The Collaborative Follow-up environment had 94 participants. The Noncollaborative Follow-up environment had 96 participants. The No Collaboration/No Follow-up environment had 88 participants

Treatment Environments

All follow-up learning took place in separate WebCT Vista courses that were configured to support the three conditions. In those conditions which received follow-up support, course modules were released weekly using the selective release tool within WebCT Vista. Table 1 illustrates the attributes of the various treatment conditions. Discussion questions in the Collaborative Follow-up environment and journal questions in the NonCollaborative condition were the same.

Table 1.Treatment Conditions for the Creating a TAKS Support Plan Online Professional Development

	Collaborative Follow-up	NonCollaborative Follow-up	No Collaboration/ No Follow-up
Participate in initial workshop	✓	✓	✓
Logon to WebCT Vista	✓	✓	✓
Upload TAKS Support Plan through WebCT Vista	✓	✓	✓
Cueing messages Follow-up	✓	✓	
		Readings Weekly module questions completed independently and submitted to instructor through Assignment tool Email to course instructor	
Collaborative Follow-up	Readings Online discussion of weekly module questions with peers Email to peers or course instructor View and discuss peers' TAKS Support Plans Online Chat with peers		In a typical week in the collaborative environment, a school

librarian in this environment might log on and take part in the following activities online:
- Check for announcements
- Read the objectives for the week
- Read feedback from instructor on previous week's TAKS Plan section submission
- Read the journal articles and PowerPoints chosen to extend understanding and support writing weekly TAKS Support plan assignment.
- Read email.
- Read and participate in the weekly discussion.
- Participate in a chat.

In a typical week, a school librarian in the Noncollaborative environment might log on and take part in the following online activities:
- Check for course announcements
- Read the objectives for the week
- Read feedback from instructor on previous week's TAKS Plan section submission.
- Read the journal articles and PowerPoints chosen to extend understanding and support writing weekly TAKS Support Plan assignment.
- Read weekly cueing messages in the form of announcements and messages.

Instrumentation
  Attitudes towards the Professional Development Program, an instrument developed by the researcher, measured course satisfaction in five categories drawn from Guskey's (2000) professional development evaluation model: (a) participant reactions, (b) participant learning, (c) participant's use of new skills, (d) organizational culture, and (e) student outcomes. "Participant reactions" was intended to assess whether participants felt that the program was well organized, that time was well spent, and if school librarians felt activities were useful. "Participant learning" was intended to assess how well the participants felt they had learned the concepts, ideas

and/or pedagogies included in the professional development program. "Participants' use of new skills" was intended to assess the extent to which participants planned to implement the new the concepts, ideas, and/or pedagogies in the professional development program in their educational situation. This survey depended on participants' self report on the implementation items. "Organizational culture" assessed the participants' perception of support by their school for their plan. "Student outcomes" measured the extent to which librarians believed that their TAKS Support Plan would impact student performance on the TAKS. The survey included 15 items regarding participation in the overall professional development program. This survey used a 5-point Likert scale to indicate the degree to which they agree or disagreed with the item. Higher scores correspond with a positive response. Mean survey responses ranged from 1 to 5. In reporting scores, mean ratings of 1.0-2. 0 were classified as very negative, 2.01.-2.99 were classified as mildly negative, 3.0 were classified as neutral, 3.01-4.0 were classified as mildly positive, and 4.01 to 5.0 were classified as very positive. A coefficient alpha was generated to determine the relationship between individual test items and the test as a whole. The coefficient for the total test was .92.

Course completion was measured by completion of all six parts of the TAKS Support Plan. Plans that met this criteria were given a 1 and plans that were not completed were given 0.

Results

The following section presents the results of the statistical analysis on attitudes towards the professional development program and completion.

Attitudes

Overall, all groups reported mildly positive attitudes with 3.71. Highest mean ratings were reported by participants in the Collaborative Follow-up environment with 3.94. Participants in the NonCollaborative Follow-up environment had the next highest ratings with 3.77. The participants in the No Collaboration/No Follow-up environment had the least positive ratings with 3.3.1. Means and standard deviations for the Attitudes Towards the Professional Development Survey Items overall and by environment are presented in Table 2.

One-way analysis of variance (ANOVA) was conducted to determine if there were significant differences in attitudes towards the professional development program among the environments.Ttype of professional development environment (Collaborative Follow-up, NonCollaborative Follow-up and No Collaboration/No Follow-up) was used as the independent variable and mean scores from the Attitudes towards the Professional Development Program Survey was used as the dependent variable. Results from the ANOVA are presented in Table 3.A statistically significant difference was found among the three types of professional development environment on attitudes towards the professional development program, $F(2,203) = 10.098$, $p = .000$.

Table 2. Mean and Standard Deviations for Attitudes Towards the Professional Development Survey Items Overall and By Environment

Overall		Collaborative Follow-up		NonCollaborative Follow-up		No Collaboration/ No Follow-up	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
3.71	.77	3.94	.68	3.77	.68	3.36	.84

Table 3. Results of the ANOVA on Attitudes towards the Professional Development Program

Source	df	SS	MS	F	p
Attitudes					
Between groups	2	1.199	.599	10.098	.001
Within groups	201	11.932	.059		
Total	203	13.131			

Post hoc Tukey HSD Tests indicated that the attitudes of the Collaborative Follow-up participants differed significantly from the No Collaboration/No Follow-up, $(p < .001)$. Likewise, a significant difference was found between the attitudes of the NonCollaborative Follow-up and the No Collaboration/No Follow-up $(p < .007)$.

Completion

Table 4 presents the completion rate by online professional development environment. Binary Logistic regression was used to estimate the likelihood of course completion by membership in professional development condition (see Table 3). Differences in course completion were significantly predicted $\chi^2 = 14.474$, df = 2, p < .001. Table 2 presents the frequencies and percentages of completion by environment and Table 3 presents the results of the logistic regression with No Collaboration/No Follow-up as the referent condition. Membership in the Collaborative Follow-up condition was significantly associated with greater likelihood of course completion when No Collaboration/No Follow-up participants were the referent group (OR 3.186). Librarians in the Collaborative Follow-up condition were three times as likely to complete as librarians in the No Collaboration/No Follow-up.

There was no significant difference in the likelihood of completion between the participants in the NonCollaborative Follow-up condition and the participants in the No Follow-up/No Collaboration condition

Table 4. Frequencies and percentages of course completion by environment.

Conditions	Collaborative Follow-up		NonCollaborative Follow-up		No Collaboration/ No Follow-up	
	f	%	F	%	F	%
Completion rates	55	59	41	43	26	30

Table 5. Logistic Regression Predicting Course Completion

Variable	β	SE	Odds Ratio	p
Collaborative Follow-up	1.159	.312	3.186	.000
NonCollaborative Follow-up	.569	.308	1.766	.065
Constant	-.815	.231	.433	.000

Referent: Group for calculating Odds Ratio was No Follow-up/No Collaboration.

A second logistical regression was conducted using a contrast variable to determine whether there was a difference between the Collaborative Follow-up and the NonCollaborative Follow-up conditions in predicting the likelihood of course completion. Participants in the Collaborative Follow-up conditions were significantly more likely to complete than participants in the NonCollaborative Follow-up condition with an Odds Ratio of .544, p< .05. Librarians in the NonCollaborative Follow-up condition were 45% less likely to complete as librarians in the Collaborative Follow-up condition.

Discussion

School librarians whose environment included follow-up reported attitudes that were significantly more positive than the school librarians whose environment did not include follow-up. This finding supports previous theory and research that asserts that educators learn best when professional development learning is sustained over time through follow-up (Garet et al., 2001; Showers et al., 1987). Traditional professional development programs based on standalone workshops are not as well received by educators as professional development programs that include follow-up to support the ongoing process of educator change. Such follow-up enhances educators' feelings of competence (Guskey, 2000). Educators value professional development that enhances their effectiveness with students (Fullan & Stiegelbauer, 1991). Professional development programs that result in educators developing the knowledge and skills that improve student outcomes are rated favorably by educators (Guskey, 2000). Conversely, professional development programs that fail to develop the requisite knowledge and skills are viewed negatively and considered a waste of time (Lindstrom & Speck, 2004).

The effects of follow-up and collaboration were also instrumental in enabling librarians to complete their plans. As TAKS weaknesses at the schools were identified, information was provided to school librarians to support the creation of their plan. Individual needs were addressed through feedback from the instructor and peers. Distributing the course over time, allowed librarians to reflect on and embrace taking a purposeful role in moving beyond the traditional role of supporting English and Language arts and begin addressing those areas where students performed weakly on the TAKS. Providing opportunities for collaboration with other school librarians within the

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course was the second factor contributing to the differences in completion rates. Ideally librarians work within a school community as a member of the instructional team. However, since there is usually only one librarian on a campus, many librarians feel isolated in dealing with issues related to their practice. Providing a network of support through peers enabled librarians to gain from different perspectives as well as to work through the issues related to their plan.

Conclusions

Educators face a constant challenge to maintain their proficiency with effective teaching and learning practices. Daily, they must tackle new curriculums, pedagogies, technologies, and an increasingly diverse student body. Professional development becomes a critical component in enabling schools to meet these challenges. Yet, millions of dollars have been allocated for professional development with little to show for the money. Previous research demonstrates that professional development aligned with traditional methods will not yield the results that are needed to address the broader problems that are facing schools in the United States today.

Online delivery of professional development is a fast-growing industry especially for populations of educators with limited access to professional development directed to their special needs. Course management systems such as WebCT offer increasingly sophisticated platforms that provide many of the affordances of face to face instruction. This research demonstrates that professional development aligned with two research-based strategies, online follow-up and online collaboration, support professional development completion.

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A Cross-Media and Cross-Cultural Study on the Effect of Student-Generated Visualization as a Study Strategy

Yi-Chuan Jane Hsieh
Ching Yun University
Jung-Li, 320, Taiwan

Lauren Cifuentes
Texas A&M University

Abstract

We compared student-generated visualization as a study strategy with unguided study strategy for middle school science concept learning. The relative effectiveness of visualization on paper and on computers and the differential impact of visualization training for Taiwanese and Texan 8th grade students were also investigated. We analyzed data collected in school settings quantitatively and qualitatively. The results showed that Taiwanese and Texan students who received visualization workshops and constructed visualizations on paper or on computers during study time scored significantly higher on a comprehension posttest than those students who applied an unguided study strategy. Overall, Taiwanese students scored higher than Texan students, but there was no interactive effect of visualization and cultural background on test scores.

Theoretical Background

Constructivist learning theory contends that learning occurs when people actively construct their own knowledge and think reflectively about concepts (Lee, 1997). Constructivist pedagogy focuses on "developing the skills of the learner to construct (and reconstruct) plans in response to the situational demands and opportunities" (Duffy & Jonassen, 1991, p. 9). In such a theoretical framework, educators advocate that students should be encouraged to generate their own visual representations of knowledge, instead of passively receiving ready-made illustrations in textbooks or from instructors (Cifuentes, & Hsieh, 2004a, 2004b, & 2004c; Hall, Bailey, & Tillman, 1997; Schwartz, 1993).

Student-generated visualization refers to graphical or pictorial representations of content showing the sequential, causal, comparative, chronological, oppositional, categorical, or hierarchical relationships among concepts, whether hand drawn on paper or created by students on computers (Cifuentes, & Hsieh, 2004a, 2004b, & 2004c; Wileman, 1993). Students' study notes are visualizations if the information is presented in the form of diagrams, matrices, charts, trees, tables, graphs, pyramids, causal chains, timelines, or direct representations (Cifuentes & Hsieh, 2001; Schwartz, 1993; Tufte, 1990). Previous studies have provided evidence for the effectiveness of student-generated visualization in the improvement of students' test performances (Cifuentes, & Hsieh, 2004a, 2004b, & 2004c; Gobert & Clement, 1999; Hall, Bailey, & Tillman, 1997).

Technology may play a role in the impact of visualization on learning. Computer graphics software allows students to draw and paint objects and visually organize and represent what they know. The use of computers in the externalization of students' knowledge structures enriches the individuals' mental models for organizing, retrieving, and using knowledge (Williamson, Jr., 1999). Computer-based visualization tools can be regarded as "mindtools" to extend and reorganize learners' cognitive structures during learning (Jonassen, 2000, Lajoie, 1993). Computer-generated graphics created by learners offer several advantages over pen and paper, such as ease of subsequent revision and the generation of sophisticated looking graphics by students with undeveloped artistic skills.

Culture may also play a role in the impact of visualization on learning. Researchers, such as Dunn, et al. (1990), Hillard (1989), More (1990), and Vasquez (1990) indicated that different cultural groups differ in their sensory modality strength. Asian students are found to have a stronger preference for visual learning than Anglo students. The use of different language writing systems has an impact on Western and Chinese learners' modes of representation of information. Western learners tend to be verbalizers who "consider the information they read, see, or listen to, in words or verbal associations" whereas Chinese learners tend to be imagers who "experience fluent spontaneous and frequent pictorial mental pictures when they read, see, listen to or consider information" (Riding, 1994, p. 48). Studies indicate that verbalizers prefer text, while imagers prefer pictorial information during their learning processes (Riding & Douglas, 1993). Asian students may favor the use of visualization as a study strategy over other cultural groups since the visualization task falls into their visual learning preference. Because of cultural and language differences, the use of student-generated visualization as a study strategy may differentially affect

science concept learning for Taiwanese and American students.

Objectives

We sought evidence regarding the effect and impact of student-generated visualization on paper and on computers during study time for Taiwanese and Texan 8th grade students' science concept learning. To provide such evidence, we compared student-generated visualization as a study strategy with unguided study strategy. The relative effectiveness of visualization on paper and on computers and the differential effect and impact of visualization training for Taiwanese and Texan students were also investigated.

Methods

Mixed methods were applied, including both experimental and naturalistic analyses of data collected in a school setting. The school teachers delivered the visualization training, and the researchers participated in the management of the treatments of students in the context of the students' typical class periods. Both the teachers and the researchers kept reflective journals during the week of the experiment. Following the treatments, students' scores on a comprehension posttest were compared across groups. In addition, journal entries were used to gain understanding of the natural classroom learning environment that contributed to or diminished the generalizability of the findings (Shulman, 1997). Content analyses approaches, as described by Emerson, Fretz, and Shaw (1995), were applied to the journal entries. During and upon completion of data collection, we used the two-phase process of content analyses, open coding and focused coding, to analyze the data.

Participants

The original sample selected to participate in the study was 105 Texan eighth graders and 70 Taiwanese eighth graders (13-14 years old) from rural public middle schools. However, several participants were absent for part of the treatment or were absent for testing, and only 92 Texan 8th graders and 60 Taiwanese 8th graders completed the entire study.

Design

A posttest-only control group design was used in the study. The first independent variable, "treatment," had three levels—(1) the control group that received a non-visualization workshop and applied an unguided study strategy during study time, (2) the experimental/paper group that received the paper-form visualization workshop training and visualized on paper during study time, and (3) the experimental/computer group that received the computer-based visualization workshop training and visualized on computers during study time. The second independent variable, "cultural background," contained two levels: Texan and Taiwanese. The dependent variable was a comprehension posttest score for science concepts studied after treatment.

Six Texan 8th grade intact science classes were randomly assigned to three treatment groups: the control group, the experimental/paper group, and the experimental/computer group. Further, two Taiwanese 8th grade intact science classes were randomly assigned to two treatment groups: the control group, and the experimental/paper group. Computer labs were not available to the Taiwanese students in the middle school; therefore, there was no experimental/computer group for the Taiwanese participants.

All participants received the given treatments as part of their curricular activity in their science classes. Chi-square tests showed no significant differences among groups in terms of their gender, age, and prior knowledge of content on the comprehension test. Texan classes contained no Asian students and Taiwanese classes were exclusively Asian. Texan groups did not differ significantly in their ethnicity or frequency of using a computer at school and at home.

Procedures

Students in the control groups watched science-related videotapes that did not address visualization as a study strategy. The experimental/paper groups attended 100-minute visualization workshops in which they learned how to visualize on paper in their regular classrooms; and the experimental/computer group attended the 100-minute computer-based visualization workshop in which they learned how to visualize on computers in the computer lab.

In the visualization workshops students were instructed to recognize cause-effect, sequence, and comparison-contrast relationships in text and use visual conventions to represent those text structures. The instructor first modeled visualization processes and then scaffolded the learners (with advice and examples), guided them during practice, and gradually tapered off support and guidance until each student visualized alone. Students practiced using path diagrams to represent causal relationships (Schwartz, 1993), matrices to compare one kind of

concept to another (Cifuentes, 1992), and flow charts to point out stages in a chain of events (Wileman, 1993; Cifuentes & Hsieh, 2001).

After the workshops, the control groups were given several science essays for unguided and independent study. The experimental/paper groups and the experimental/computer group were given the same science essays to study as were the control groups. However, they were asked to use their learned visualization skills to create visual representations that showed interrelationships among concepts on paper or on computers during their study time. Students were given a comprehension posttest to measure their understanding of the concepts in the texts when the prescribed study time was over.

Five science essays were excerpted from a Taiwanese biology textbook for 9th graders. The contents were translated into English with reference to the American biology textbook, *Biology: the web of life* (Strauss & Lisowski, 1998), adopted for the 9-12 grade Texas science curriculum. The illustrations were eliminated in order to create the text-based document. The higher level reading passages were used to assure a high level of difficulty and a lack of student exposure to the content.

Thirty test items were derived from the Taiwanese Test Bank for Middle School Biology that measured students' understanding of relevant biological concepts specified in the science essays used in this study. They were constructed and validated by three Texan content experts to be appropriate for this study. The comprehension posttest had a reliability coefficient of 0.71 (coefficient alpha).

Results

The two-way ANOVA results indicated that there was a significant main effect on the type of treatment, $F(1, 114) = 38.893$, $p < .05$. Students from both cultural backgrounds who received the paper-form visualization workshops and constructed visualization on paper during study time scored significantly better on the comprehension posttest than did students who received the non-visualization workshops and applied the unguided study strategy during study time (See Table 1).

Table 1.Two-way ANOVA Summery Table for the Effects of the Type of Treatment and Cultural Background on the Comprehension Posttest Scores

Source	Sums of Square	df	Mean Square	F	p
Treatment	4480.246	1	4480.246	38.893	0.000*
Cultural Background	1186.893	1	1186.893	10.303	0.002*
Interaction	310.518	1	310.518	2.696	0.103
Within Groups	13132.129	114	115.194		
Total	320154.250	118			

* $p < .05$.

The experimental/paper groups yielded a mean score of 56.5 (SD= 10.74); however, the control groups produced a mean score of 44.34 (SD= 11.702). Across cultures, students' learning of visualizing skills and the generation of visualization on paper during study time resulted in a positive effect on science concept learning with a large effect size ($d = 1.08$) (See Table 2).

Table 2.Means and Standard Deviation on Comprehension Posttest Scores Across Cultures

Groups	N	Mean	Standard Deviation	Skewness	Kurtosis
Control Groups	58	44.34	11.702	0.009	-0.592
Experimental-paper Groups	60	56.50	10.738	0.008	-0.279

The one-way ANOVA result indicated that there was a significant difference among the three treatment groups on the mean scores of the comprehension posttest, F (2, 89)= 20.363, p<. 05. The Texan experimental/paper and Texan experimental/computer groups both produced higher scores on the comprehension posttest than did the Texan control group. The Tukey HSD post hoc test result revealed that there were two pairs of Texan groups whose means differed significantly from each other at the p< .05 level. The Texan experimental/paper group and the Texan experimental/computer group scored significantly higher than did the Texan control group. However, the students in the experimental/paper group performed as well as those students who were in the experimental/computer group (See Table 3).

Table 3. One-way ANOVA Summary Table for the Effect of Type of Medium for Generating Visualization on the Comprehension Posttest Scores

Source	Sum of squares	df	Mean squares	F-ratio	p
Between Groups	3899.571	2	1949.786	20.363	0.000*
Within Groups	8521.929	89	95.752		
Total	12421.500	91			

		Texan control group (N=28)	Texan E-paper group (N=30)	Texan E-computer group (N=34)	F (2, 89)
Test scores	M	39.375	54.950	51.676	20.363*
	SD	11.730	8.775	8.832	

* p < .05.

Compared to the mean score of the Texan experimental/computer group, 51.676 (SD= 8.832) and the mean score of the Texan experimental/paper group, 54.950 (SD= 8.775), the Texan control group yielded a lower mean score of 39.375 (SD=11.730). Cohen's d indicated a positive large effect size (d=1.51) for the pairwise comparison of those Texan participants who were in the experimental/paper group, and of those who were in the control group. Additionally, Cohen's d for the pairwise comparisons of those Texan students who were in the experimental/computer group and those who were in the control group was 1.20, a large positive effect size. The effect sizes indicated that the treatments that trained students to visualize on paper and on computers both had positive effects on the Texan 8th grade students' comprehension of science concepts.

Additionally, cultural background had a significant main effect on these scores, F (1, 114) =10.303, p< .05 (Table 1). Overall, the Taiwanese students significantly outperformed the Texan students on the comprehension posttest. All of the Taiwanese participants produced a mean score of 53.508 (SD=11.947); in comparison to all the Texan students who yielded a mean score of 47.431 (SD=12.884).

There was no interactive effect of the treatment by the cultural background, F (1, 114) = 2. 696, p=0.103) (See Table 1). The effect of changing levels of treatment (the control group vs. the experimental/paper group) did not depend on the type of cultural background, and the effect of changing levels of cultural background (the Texans vs. the Taiwanese) again did not rely on the type of treatments.

Qualitative Findings

Because the degree to which students attended to the learning tasks is an important factor for learning (Bransford, 2000), it was essential to understand both the way that students used their study time, and their classroom behaviors. The Texan experimental/paper group was found to be more attentive to the learning tasks than the Texan control group and the Texan experimental/computer group. Furthermore, the Taiwanese participants were more conscious of their cognitive processes than the Texan counterparts. Concentration and persistence characterized the learning process of the Taiwanese students in the experimental/paper group.

Several factors might account for the overall better performance of the Taiwanese participants. First, the Taiwanese students often felt shame or guilt about poor learning. Many Taiwanese participants expressed that they would force themselves to study regardless of whether the assigned reading material was challenging, boring, or interesting.

Moreover, the Taiwanese science teacher tended to give specific directions and close guidance, and was strict with the students regarding behavior. There was an authoritative relationship between the teacher and the students. Discipline problems were not commonly found in the Taiwanese classrooms during the course of this study. However, the Texan science teacher in this study spent a lot of time on classroom management, especially

with the Texan experimental/computer group. With that group, the teacher spent most of the class time roaming to control student behaviors while the researcher led students in the workshop. In the Texan experimental/paper group, the teacher spent less time on classroom management. The comparison between the need for classroom management in the two Texan experimental groups indicated that computers might be distracting to the students. In order to restrict Texan students' bad or offensive behaviors in class, students' conduct behaviors were graded. American students generally did not comply with the teacher's directions to the extent that Taiwanese students did— highlighting a cultural difference (Biggs, 1994; Bond, 1991; Hess & Azuma, 1991).

Conclusion

Student-generated visualization had a positive impact on both Texan and Taiwanese 8th graders' science concept learning, but it did not impact one cultural group more than the other. Visualization as a study strategy had positive effects whether students used paper or computers to generate their visualizations. But students who used computers to visualize did not outperform those who used paper on the science comprehension posttest. These findings extend the accumulating evidence on the effectiveness of student-generated visualization in the improvement of students' concept understanding and furthered our understanding of cross-cultural learning. Student-generated visualization on paper and on computers provides a means for students to construct meanings of science content.

However, an orientation to visualization skills is necessary to prepare students for using visual techniques to represent interrelationships that are causal, sequential, and comparative. With the instructor and the researcher's guidance, students who construct visualization during study time can process the information accurately, and they feel more confident in their own knowledge. It is suggested that educators help young unsophisticated learners develop expertise in how to learn, so they can use that expertise to construct useful knowledge within each subject domain.

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Self-Regulation in Web-Based Distance Education: From a Requirement to an Accomplishment

Haihong Hu
Florida State University

In web-based distance learning courses, individuals are able to participate at their convenience with little to no supervision. The learner control inherent in these courses is usually considered as a positive feature to enhance motivation (Reeves, 1993). However, research has shown that learner control is associated with a number of negative outcomes, such as less time spent on task and the use of poor learning strategies (K. G. Brown, 2001; Williams, 1993). Bernt & Bugbee (1993) found that distance learning students who have not completed college are at risk because they lack metacognitive or executive skills for approaching coursework and taking examinations. A number of researchers (Keller, 1999; McMahon & Oliver, 2001; Zimmerman, 2000) have proposed utilizing self-regulatory strategies, particularly goal setting (Keller, 1999) and self-evaluation (McMahon & Oliver, 2001), to promote online learners' motivation and ultimately learning. Some other researchers (Ley & Young, 2001) have even provided specific guidelines for implementing these strategies in an online setting. Due to the importance of completion and achievement in distance education, strategies that promote motivation and learning warrant investigation.

Self-Regulated Learning

What is Self-Regulated Learning?

Zimmerman (1990) defines self-regulated learning with three distinctive features: learners' application of self-regulated learning strategies, their sensitivity to self-evaluative feedback about learning effectiveness, and their self-generated motivational processes. He (Zimmerman, 1998) differentiates academic self-regulation from a mental ability, such as intelligence, or an academic skill, such as reading proficiency. He suggests that it is a "self-directive process through which learners transform their mental abilities into academic skills" (Zimmerman, 1998, p. 2).

From a social cognitive point of view, self-regulatory processes and beliefs consist of three cyclical phases: forethought, performance or volitional control, and self-reflection.[(Zimmerman, 1998, 2000) According to (Zimmerman, 1998)the forethought phase happens before efforts to learn, and sets the stage for learning. Performance or volitional control processes occur during learning efforts, and concerns concentration and performance. Self-reflection processes take place after learning efforts and affect learners' reactions to that experience. As a result, these self-reactions completes the self-regulatory cycle by influencing forethought of subsequent learning efforts (Zimmerman, 1998).

Similarly, the information processing point of view (Butler & Winnie, 1995) summarizes the cognitive processes central to self-regulation as that self-regulated learners engage in this sequence of processes reflectively, flexibly, and recursively. They continually reformulate their learning activities as they plan, monitor, and modify their engagement in learning tasks (Butler & Winne, 1995 as cited in Butler, 1998).

Self-Regulated Learners

"All learners try to self-regulate their academic learning and performance in some way", but there are remarkable differences among students (Zimmerman, 1998, p. 6).

Expert learners are strategic, self-regulated, and reflective. (Ertmer & Newby, 1996) They demonstrate planfulness, control, and reflection; they are aware of the knowledge and skills they have, or are missing, and use appropriate strategies to actively apply or acquire them.

Less effective self-regulated learners often have trouble monitoring and regulating their cognition. They are not aware of their loss of attention and comprehension, and they do not self-evaluate their comprehension. They often set distal and global goals, which can interfere with their learning. They sometimes have problem regulating their motivation and affect for learning. They may doubt their ability to succeed in studying, and they may have high test-anxiety. Their high level of anxiety may cause them to use simple cognitive strategies, such as memorization, rather than deeper processing strategies for learning. They often compare with other students instead of with their own previous performance (Pintrich, 1995).

Therefore, students' level of self-regulation eventually decides whether their learning experiences will become destructive or fulfilling. Once established, personal cycles of self-regulation, whether skillful or naïve, are difficult to change without using interventions to address their inherent qualities Awareness of the importance of self-regulation is the foundation for students to assume the responsibility for their own academic achievement. (Zimmerman, 1998).

All learners are self-regulated to some degree, but effective learners are distinguished by their awareness of the relationship between self-regulatory strategies and learning outcomes and their use of these strategies to reach their academic goals (Zimmerman, 1990). Systematic use of metacognitive, motivational, cognitive and/or behavioral strategies is a key feature of most self-regulated learners.

Self-Regulated Learning Strategies

"Self-regulated learning strategies refer to actions and processes directed at acquisition of information or skills that involve agency, purpose, and instrumentality perceptions by learners" (Zimmerman, 1990, p. 5)

The self-regulated learning process consists of execution of several major strategies, including (1) metacognitive strategies such as planning, goal setting, monitoring and self-evaluation, (2) cognitive strategies for learning and comprehending the materials such as rehearsal, elaboration and organization, (3) resource-management strategies including help seeking and time management, (4) motivational strategies, such as self-efficacy, attribution and self-satisfaction.

Development of Self-Regulated Learning

It is possible to develop self-regulated learning by personal discovery (Zimmerman, 2000). However, it is often monotonous, frustrating, and less effective. Fortunately, Zimmerman pointed out that self-regulatory processes could be learned from and maintained by social as well as self-sources of influence. The acquisition of a wide range of task competencies, including academic learning strategies, evolves in a series of regulatory skill levels.

An observational level of skill occurs when learners can generate the major features of the skill or strategy from observing a model learn or perform. An emulation level of self-regulatory skill is reached when a learner's behavioral performance moves closer toward the general strategic form of the model. Self-controlled level of self-regulatory skill happens when learners are proficient in performing a skill in structured settings without the models. A self-regulated level of task skill is attained when learners can systematically modify their performance to changing personal and contextual conditions. At this phase, learners can choose a strategy and adapt its features with little to no dependence on the model. Learners are motivated by their perception of self-efficacy to maintain this level of skill. Skills usually can be performed with minimal process monitoring, and the learners' attention can be moved toward performance outcomes without negative consequences. The source of learning of regulatory skill is primarily social for the first two levels, but the locus shifts to self-sources at more advanced levels (Zimmerman, 2000). The speed and quality of learners' self-regulatory development can be facilitated significantly if learners proceed according to this multilevel developmental hierarchy (Zimmerman, 2000).

To promote students' development of self-regulation, support must be provided to assist students to engage flexibly in the sequence of cognitive processes that comprise self-regulated learning (Butler, 1998). Butler made the following suggestions. First, students must study how to analyze tasks effectively and to set appropriate goals. Second, once students are clear about task requirements, they must execute learning approaches to successfully achieve their goals. Finally, facilitating self-regulation requires assisting students to monitor their performance. During monitoring, students compare current progress to goals, thus generating students' perceptions of progress that provide the basis for further decision about how to proceed (Butler, 1998).

To promote self-regulated learning, it is not sufficient to simply inform students what expert learners know or even to demonstrate the procedures that expert learners use (Ertmer & Newby, 1996). Even if a student completely comprehends the expert learning process in a declarative sense, extensive practice is still needed for him to be able to automatically and effectively implement expert learning strategies. As a result, extensive long-term practice and feedback are considered critical for the development of expert learning (Ertmer & Newby, 1996).

Self-Regulated Learning in Web-Based Distance Learning

Influence of Self-Regulation on Web-Based Distance Learning

Several researchers have studied the influence of self-regulatory behaviors on learning in the online mode, but most of these studies focused on identifying self-regulatory strategies as predictors for achievement. King, Harner, & Brown (2000) conducted a study to measure students' perceptions concerning the effect of technology and student self-regulatory skills in two distance education courses. A factor analysis of the data shows that two constructs attributed to online learning success are study skills and goal setting. These researchers also found that students who indicated their intention for registering for future distance courses had higher study skills and goal setting factor scores. Those who completed their homework scored higher on the goal setting factor than those who did not complete the homework.

already have are related to the effectiveness of learning in a computer-networked hypertext/hypermedia

environment. He divided self-regulatory strategies into four subcategories of metacognitive, cognitive, self-management and motivational strategies. Planning and monitoring (including self-evaluation) are classified in the metacognitive category. Results showed that metacognitive and motivational strategies significantly influenced the prediction of achievement, while cognitive and self-management strategies did not show significant effects. Metacognitive and motivational strategies were the most influential on achievement in a computer-networked hypertext/hypermedia learning environment. The researcher also suggested that learners' should develop metacognitive and motivational strategies before they study with such learning environment and instructional designers might consider integrating metacognitive and motivational strategies into a computer-networked hypertext/hypermedia learning environment.

Sankaran & Bui (2001) investigated how learning strategies and motivation influence performance in Web and face-to-face lecture settings of a business information systems course. Learning strategies and motivation beliefs were measured using a survey instrument, learning performance by test scores. The researchers found that using either deep or surface learning strategy leads to equivalent positive performances, but undirected strategy, such as cramming for exams at the last minute, affects performance negatively. While motivation is significantly correlated to performance in both web and face-to-face settings, the relationship is stronger in the Web setting. High motivation is related with the use of deep learning strategy, and low motivation with undirected strategy.

Greene, Dillon, & Crynes (2003) conducted a study to examine student performance and approaches to study in a CD-ROM version of a chemical engineering course. This study consisted of three phases. Phase 1 was a formative evaluation of the CD-ROM approach, and the result supported the validity of the CD-ROM based instruction. In phase two, the researchers interviewed both successful and less successful students in the course to examine any differences in their strategies for learning the content. Researchers found differences consistent with a surface versus deep approach to studying. During the third phase, the researchers used an Approaches to Learning Instrument with a new group of students to determine the factors that contribute to success in the CD-ROM version of the course. Results illustrated that deep cognitive engagement and motivation, defined in terms of goals and self-efficacy, were significant predictors of success based on two indices of course performance.

Sankaran & Bui (2001) summarizes that "students who choose distance education need a high level of motivation if they are to complete the course work successfully. During their studies, they often have to work by themselves with little or no opportunities for face to face interaction. They will have to deal with more abstract and ambiguous situations than someone taking a lecture class. They need to be efficient in time management, be responsible and in control of their studies and maintain an image of self-worth and self-efficacy. They should see the value of education and be able to postpone current enjoyments and cope with interruption life frequently entails."(p. 193). It is not surprising that Greene et al. (2003) suggested "although technology provides opportunities for learners to learn in increasingly independent environments, educators need to prepare students to learn independently using newer electronic technologies."(p. 2). In addition, she recommended that instruction should promote more metacognitive processing throughout the modules, and we must also incorporate approaches to help students learn how to learn when designing more independent learning environments because the growth of distributed learning in education will continue place more responsibility for learning upon the learner.

Need for Self-Regulated Strategy Training for Web-Based Instruction

Ulitsky (2000) reported that the independent web-based learning environment also created stress even though it was considered as conducive to self-reflection. The participants were forced to look inward for direction when they were left on their own. They became frustrated when asked to manage their own learning in the multimedia environment because "the training they received in traditional classrooms did not prepare them as independent learners, and the multimedia environment, in and of itself, did not instruct them in independent thinking, nor could it provide them with the challenge naturally present in a traditional classroom --- accountability to other students or the teacher" (Ulitsky, 2000, p.313). Twenty-one participants in (Ulitsky, 2000)s study regarded independent learning as a new barrier with or without technology. This study (Ulitsky, 2000)informs us that adequate and appropriate training in general and medium-specific learning strategies is necessary and needs immediate attention given the novelty of technology as a learning tool. Providing students with the tools to assist them with their cognitive and metacognitive process is crucial to the success of the learning experience with the web-based environment.

Likewise, Atman (1990)suggested that systematic self-regulatory strategy instruction (with feedback and follow-through) might encourage "nonorganizers" to develop the skills they need for successful completion of independent academic work. She believed that an interactive individualized distance education orientation program

could make "nonorganizers" aware of the structure and embedded processes within the distance education format, and the unique aspects of themselves as learners that may assist or hinder their academic progress within that format. It was expected (Atman, 1990)that training in self-regulatory skills might enhance the potential for "nonorganizers" to become academically successful.

Similarly, in the case of students' withdrawal from the distance program offered by the Department of Instructional & Performance Technology (IPT) at Boise State University (Chyung, 2001) they applied the Organizational Elements Model (OEM) (Kaufman, 1988, 2000)and the ARCS model (Keller, 1987) to redesign their online instruction and were able to reduce the attrition rate greatly from 44% in fall 1996 to 15% by the end of the 1999-2000 academic year. Several items within their interventions based on the ARCS model were designed to enhance the goal- and performance-oriented characteristics of online learners. They stated weekly goals clearly and explained why it was important to achieve the goals; defined clearly how learners will be assessed; offered specific guidance on how to successfully achieve the goals; and provided concrete and constructive feedback on how they are doing in a timely manner.

Online instruction requires students to develop a stronger sense of competence through completing self-directed assignments (Parker, 2003). Self-regulated learning strategies are critical in assisting students to cultivate the self-management skills, which are necessary in independent study. In addition, it has been illustrated that self-motivation and even student persistence can be enhanced with well-designed online instruction having an emphasis on goal-related behaviors. Since students must be responsible for their own time management, skill building, and eventual academic success, web-based instruction lends itself to the belief that self-regulated learning strategies might be one of the answers to resolve the mystery of high attrition rate and low motivation.

Self-Regulated Learning Strategy Intervention and Web-Based Distance Education

Even though numerous studies, on the effects of self-regulated learning strategies, have been conducted on various learning domains in traditional classroom settings, the process and outcome of using these strategies in the distance learning context is virtually unexplored. Empirical studies on the topic of online instruction are still in the stage of establishing primitive theories.

Facilitating Self-Regulated Learning Using Tools in Web-Based Distance Instruction

Azevedo, Comley, Thomas, Seibert, & Tron (2003) examined the effect of different online process scaffolding in facilitating students' change to more sophisticated mental models as represented by both performance and process data. Fifty-three undergraduate students were randomly assigned to one of three scaffolding conditions, which are adaptive content and process scaffolding (ACPS), adaptive process scaffolding (APS), and no scaffolding (NS), and were taught to use a hypermedia environment to study the circulatory system.

In the adaptive content and process scaffolding (ACPS) condition (Azevedo et al., 2003), students were provided with a general learning goal. They could reach a tutor who offered two types of adaptive scaffolding during learning. Content scaffolding refers to assessing the students' ongoing understanding of the circulatory system to guarantee that they met their overall learning goal; while process scaffolding involves facilitating students' learning by helping them perform various aspects of self-regulated learning (SRL), such as planning, monitoring their emerging understanding, using different strategies to learn about the different aspects of circulatory system, dealing with task difficulties and demands, and evaluating their understanding. The tutor used these two types of scaffolding dynamically and adaptively during learning to ensure that the learners attained the overall learning goal. In the adaptive process scaffolding (APS) condition, the students were provided with the same general learning goal and also access to a tutor. This APS condition was identical to the ACPS condition, except that the tutor only provided process scaffolding, which means he or she only facilitated students by helping them perform various aspects of self-regulated learning but never provided content scaffolding. In the no scaffolding (NS) condition, the researchers examined whether students could learn about a complex science topic without any scaffolding.

During the study(Azevedo et al., 2003), pretest, posttest, and verbal protocol data were collected. It was found that the ACPS and APS conditions were equally effective, and they both assisted the shift in learners' mental models significantly more than did the NS condition. In addition to the usefulness of adaptive scaffolding condition in facilitating students' understanding, process data showed differences in students' self-regulatory behavior during learning. Students in the ACPS condition managed learning by participating in help-seeking behavior and relying too much on the tutor to regulate their learning. Students in the APS condition regulated their learning by planning, monitoring their ongoing understanding, employing various strategies to learn and tackle task difficulties. Learners in the NS condition were less effective at managing their learning and displayed great variability in self-regulation of their learning during the knowledge building activity. ACPS participants were also different from the two other groups in the amount of time expended on each representation of information.

Kauffman (2003)conducted a study to investigated strategies teachers can use to improve self-regulated learning in a web-based setting. In this study self-regulated learning is defined as "a learner's intentional efforts to manage and direct complex learning activities" and consists of three major components including "cognitive strategy use, metacognitive processing, and motivational beliefs". These three components are operationalized corresponding to "note-taking methods (cognitive component), self-monitoring prompts (metacognitive component), and self-efficacy building statements (motivation component)". One hundred nineteen participants were randomly assigned to each cell in a 2x2x2 design. Students took notes either in a matrix or a free form method from a web site, which teaches educational measurement. And they were either provided or not provided self-monitoring prompts and self-efficacy building statements. Findings revealed note-taking method had the strongest impact on both the amount of information gathered and achievement. Moreover, both academic self-efficacy building statements and self-monitoring prompts displayed modest effects on achievement.

Self-Regulated Learning Strategy Training With Web-Based Technology

As early as in 1985, Hythecker et al. (1985) pointed out the strengths and weakness of computer-assisted/managed instruction for learning strategy training. Computer-assisted/managed instruction has several essential strengths regarding learning strategy training. In particular, it can: 1) provide an inexpensive (compared with human experts) source of expertise in both subject matter and process, 2) direct, monitor, and support learning activities in an objective and effective manner, 3) record subject responses for future analysis, and 4) customize training activities based on pretraining individual difference data and on responses to tasks within the training process. One weakness mentioned by the researchers was that computers could not provide a realistic model for students to imitate and to use as a standard for self-evaluation of their strengths and weaknesses. The researcher thought this was unfortunate because social modeling is one of the powerful methods of imparting learning strategies.

A learning strategies training module was created (Hythecker et al., 1985)to merge the strengths of computer-assisted instruction and cooperative learning. Evaluation of this computer-assisted cooperative learning (CACL) training module revealed that strategy training enhanced performance on free recall tests in comparison with studying without an imposed strategy. Analysis of a post-experimental questionnaire confirmed the notion that the CACL module presented the most effective environment for learning.

More recently, Hartley (2001) commented that some features of hypermedia, such as the use of multimedia and the greater control over sequence available to the learner, may make learning harder for less strategic students. The researcher (Hartley, 2001)conducted a study to investigate the potential of integrating learning strategy instruction into hypermedia learning materials. In this study, an intact high school computer class was used, and a six-week intervention was carried out. The experimental group received learning strategy training together with hypermedia computer networking lessons. Pre and post measures of metacognitive awareness and achievement were assessed. Findings revealed that strategy training had a positive effect on student's regulation of their own cognition, however, students' knowledge of cognition and achievement was almost the same as those of the control group.

In this study (Hartley, 2001), the learning strategy instruction was presented to students via computer in a hypertext format. The strategy instruction lessons each showed up on one page. Each strategy instruction page was related to a computer network lesson. The strategy instruction pages illustrated a learning strategy, supplied an example and assigned a task related to each particular lesson. A task journal template was provided for each week's lessons. Students were required to record the results of the assigned task in the designated area of the task journal.

Instructional Design Principles to Promote Development of Self-Regulated Learning

This section contains a summery of the instructional elements that facilitates the development of self-regulated learning, and derives instructional design principles to promote development of self-regulated learning.

Principle 1: Promote Learners' Metacognitive Awareness of Their Behavior, Motivation, and Cognition

First, it is suggested (Pintrich, 1995) that for students to become self-regulated learners, it is necessary that they become more aware of their behavior, motivation, and cognition by contemplating on these aspects of their learning. Self-reflection is a fairly hard task for most individuals. Students are required to have better awareness of their own behavior, motivation, and cognition (Pintrich, 1995). Hattie, Biggs, & Purdie (1996) also recommended that training for complex learning strategies should promote a high degree of learner activity and metacognitive awareness. The researchers [Hattie, 1996 #144]suggest that the student need to know not only what those strategies are, but also the conditional knowledge, the how, when, where, and why of their use, which enables the student to make use of the strategies effectively. It is impossible for learners to observe their own behaviors, detect flaws and modify their learning strategies if they do not have a keen perception of their own motivation, and cognition.

Metacognitive awareness is the prerequisite for learners to be able to learn from and utilize the self-regulated learning strategies that interventions are intended to teach.

It is suggested (Pintrich, 1995) that standardized assessment instruments, such as the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1991)or the Learning and Study Strategies Inventory (Weinstein & Palmer, 2002), can be used to provide students with an overview of their motivational beliefs and learning strategies.

Principle 2: Provide Strategy Training Using the Methods of Modeling or Self-Constructions/Explanations.

Second**,** strategy teaching is regarded (Schunk & Zimmerman, 1998)as a major means of promoting self-regulated learning. Only when students have knowledge of a systematic approach for academic study, they are able to apply it independently. Strategy learning also elevates motivation in that students who believe they can apply a strategy effectively tend to feel more efficacious about being successful.

Modeling (Kitsantas, Zimmerman, & Cleary, 2000; Orange, 1999) and self-constructions/explanations (Bielaczyc, Pirolli, & Brown, 1995) are the two major methods used to teach self-regulated learning strategies**.** Social models represent an important channel for conveying skills and strategies (Bandura, 1986; Rosenthal & Zimmerman, 1978; Schunk, 1987 as cited in Schunk & Zimmerman, 1998) and models are commonly utilized in strategy instruction (Graham & Harris, 1989a, 1989b; Schunk & Rice, 1987, 1992, 1993; Schunk & Swartz, 1993 as cited in Schunk & Zimmerman, 1998). In addition to strategic skill, models transmit related self-regulatory processes, including "performance standards, motivational orientation, and values" (Zimmerman, 2000, p. 29). In spite of the value of this vicarious information, most learners also need to perform the strategies in person to integrate them into their behavioral repertoires (Zimmerman, 2000). On the other hand, strategy instruction can be less formally formulated, such as in self-construction or self-explanation, so that students play a more important role in mastering strategies while the teacher's responsibility is to provide support and assistance as needed.

The effectiveness of these two different methods depends on factors such as the type of research participants and the requirement for precision in strategy learning. In areas where different strategies are evenly effective, self-constructions may succeed and have the additional benefit of offering students a greater sense of control over their learning. On the contrary, where only one or a few strategies will work well and students may construct incorrect ones, then strategy modeling may a better choice. It is also suggested that strategy modeling might be most effective during early learning when participants' ability to formulate strategies is inadequate, but as students obtain competence they might become capable of selecting effective alternatives independently (Schunk & Zimmerman, 1998).

Hagen & Weinstein (1995) considers it imperative for students to have ample knowledge of strategies for "general learning tasks and for learning specific content areas". Moreover, Pintrich (1995) proposes that faculty can model self-regulated learning. By modeling their contemplation about subject content knowledge, their strategies for learning, and how they think and reason, faculty can help students become alert to what is entailed in courses and help them become more self-regulated in learning.

Principle 3: Provide Ample Opportunities for Learners to Practice Self-Regulated Learning Strategies and Feedback about Strategy Effectiveness.

Third, two crucial elements are practice of self-regulatory strategies and feedback on strategy effectiveness. These mechanisms facilitate learning and motivation by communicating learning progress, and they also enhance strategy transfer and maintenance (Schunk & Zimmerman, 1998)

Pintrich (1995) also pointed out the need for students to practice self-regulatory learning strategies. He commented that developing into a self-regulating learner could not be accomplished in a short period of time. Students need time and opportunity to cultivate their self-regulatory strategies. Classroom tasks can be adapted as opportunities for student self-regulation. Other tasks that college students deal with should also be arranged to provide them with opportunities for self-regulation. For example, a professor can provide students with "a selection of essay questions or topics within a given list", which "allows students some control over their work while preserving integrity of the curriculum content" (Pintrich, 1995, p. 9).

Ertmer & Newby (1996) echoes this notion by claiming it is not sufficient to simply inform students what expert learners know or even to display the actions that expert learners take because a great deal of what they know and do is not observable nor easily available to the student. Even if a student completely understands the expert learning process declaratively, extensive practice is still needed for him to implement it automatically and effectively. Therefore, extensive long-term practice and feedback are considered vital for the development of expert learning. Many years of performing the metacognitive and regulatory skills in the environment of meaningful learning activities are the only way to develop expertise in learning (Ertmer & Newby, 1996).

Principle 4: Incorporate Motivational Processes, Especially Positive Beliefs, into Instruction.

Fourth**,** motivation plays an important role in developing self-regulated learning**.** To participate in self-regulation requires that students have the motivation or willingness to learn over extensive periods (Schunk & Zimmerman, 1998). Motivation is essential because it plays a mediating role to the effect of self-regulated learning strategies.

It is necessary for students to have positive motivational beliefs (Pintrich, 1995). Having a mastery orientation and focus on learning and understanding the material is much more facilitative for self-regulated learning. Another motivational belief that promotes self-regulated learning is positive self-efficacy for learning. Self-efficacy beliefs should be neither excessively pessimistic nor overly optimistic. Students should have a reasonably accurate and positive idea that they can learn and master course material (Pintrich, 1995). Providing information about strategy value also serves as a valuable motivational function (Schunk & Rice, 1992) as cited in(Schunk & Zimmerman, 1998).

Ironically, Hattie et al. (1996) pointed out that affect is much more open to change by intervention. Study skill training is usually more effective in enhancing attitudes than in improving study skills. In addition, the most striking improvements in the affective domain happen with attribution training. In attribution training students are taught to change their attributions for success and failure from maladaptive, which is success due to effort and failure to lack of ability, to adaptive ones, which is success due to ability, failure to lack of effort. When the purpose is to change students' attributions, teachers should stress the importance of using appropriate strategies systematically. Teachers' feedback to students about their use of strategies will probably affect their attributions more than will feedback concerning either ability or effort (Hattie et al., 1996).

Principle 5: Integrate Self-Reflective Practice systematically with instruction on self-regulated learning strategies.

Finally, across interventions there is an emphasis on self-reflective practice, "where student practice skills and reflect on their performance". Self-reflective practice often is built into the instructional procedure with independent practice or time for self-reflection (Schunk & Zimmerman, 1998).

Schunk & Zimmerman (1998) also pointed out that, preferably, self-reflective practice offers students opportunities to review their learning process and the effectiveness of strategies, modify their approach as needed, and make alteration to environmental and social factors to set up a conducive setting to learning. The need for self-reflective practice may vary based on settings. Self-reflective practice may be less imperative where feedback is provided frequently and self-assessment is clear-cut. In environments with less structure, student self-reflection may have more helpful functions. Systematic forethought, such as assuming a learning goal orientation gets a student ready for most effective forms of self-reflection, for instance a strategy rather than a fixed ability attribution. As a result, it is suggested (Schunk & Zimmerman, 1998)that "self-reflection can be systematically developed by training in forethought and performance or volitional control" (p. 230).

Format of Self-Regulated Learning Strategy Instruction

Hofer, Yu, & Pintrich (1998) suggested that for Self-Regulated Learning Strategy training, multistrategy programs that teach a range of cognitive, metacognitive, and motivational strategies for students to have both the "skill" and the "will" to use the strategies properly, might be more useful (p. 60). Hattie et al. (1996) also recommended based on the results from meta-analysis that training for complex strategies should be in context and use tasks within the same domain as the target content. Therefore, the self-regulated learning strategy instruction in this study will try to teach a variety of cognitive, metacognitive, and motivational strategies, which will be particularly relevant to the context of web-based online courses.

According to Hofer et al. (1998), the timeframe of an intervention affects the scope and content of a program. He suggests that a program of a few weeks or a short-term experiment cannot possibly teach the array of cognitive, metacognitive, or motivational strategies for self-regulated learning. On the other hand, even shorter-term programs can help college students develop their knowledge and effective use of self-regulatory strategies because college students are much more likely to know how to execute metacognition and self-regulation than younger students. Therefore, the researchers believe that a semester-long course can be facilitative in developing self-regulated learning at the college level (Hofer et al., 1998).

There are two kinds of intervention programs for training of self-regulated learning strategies (Hofer et al., 1998). Adjunct interventions present learning strategy instruction as an individual course separate from disciplinary content at the college level. Integrated programs embed strategy instruction in disciplinary courses, and convey to students that general cognitive and self-regulatory strategies can be helpful in many situations other than a study skills course (Hofer et al., 1998). Hofer et al. (1998) concluded from their studies that adjunct courses could improve

the likelihood of transfer by persuading students to be metacognitive and reflective about their strategy use in not only the study skill course, but also other disciplinary courses.

Similarly, Osman & Hannafin (1992) discusses detached content-independent strategies (DCIS), which are generic strategies taught independently, without relationship to particular lesson content. DCIS methods focus on diverse contexts and lesson content for applying strategies during training, and support skills that are applicable to various academic subjects and learning tasks. Therefore, they are necessary when strategy generalization is preferred. The major purpose of DCIS approaches is to assist students to become independent learners gradually.

Some of the implications for designing DCIS instructions (Osman & Hannafin, 1992)include: 1) ensuring that metacognitive strategies do not demand too much cognitive resources; 2) using more explicit and more implicit strategies for younger versus older learners differently and use higher-order strategies for more mature learners and those with relevant prior knowledge; 3) detaching metacognitive training and use various lesson content when far transfer is desired; 4) stressing not only knowledge about strategies, but also methods for maintaining and transferring strategies; 5) focusing on learner characteristic variables in addition to task and strategy variables; 6) encouraging learners to share their experience by describing their learning processes, evaluating their performance, and providing feedback to each other; 7) integrate matching strategies that include both transferable strategies and direct manipulation of the lesson content.

Ley & Young (2001) also suggested principles for embedding support in instruction to promote regulation in less expert learners. These principles were considered suitable for supporting self-regulation regardless of content, media, or a specific population, and they could be utilized systematically in diverse settings including print-based, instructor-led instruction, and synchronous or asynchronous Web-based instruction. These four principles (Ley & Young, 2001)are based on research on self-regulation components, and can be adapted for adjunct self-regulated learning strategy training: 1) directing learners to arrange an effective learning environment; 2) teaching learners to organize instruction and activities to support cognitive and metacognitive processes; 3) guiding learners to use instructional goals and feedback as opportunities for monitoring; 4) educating learners to seek opportunities for continuous evaluation and chances to self evaluate.

Summary

In a learner-centered environment, such as a web-based online instruction, learners do not automatically possess the metacognitive skills required to make independent judgments and selections about how to learn (C. Brown, Hedberg, & Harper, 1994). However, Hofer et al.(1998)'s work suggests that an intervention that targets a range of cognitive and motivational components can benefit college students who need help with metacognitive skills. A meta-analysis (Hattie et al., 1996) recommended that strategy training should be a balanced system in which "an individual's abilities, insights, and sense of responsibility"(p. 131) are put into full function, so as to employ appropriate strategies to tackle the task at-hand most effectively. If this is the case and the intervention is effective, then the withdrawal of social support, (Schunk & Zimmerman, 1998) such as the use of mentors in web-based online courses, may become possible when students become more competent in self-regulation.

Based on a review of the instructional design principles, a self-regulated strategy training, which is made up of an adjunct web-based online instruction on self-regulated learning and opportunities for self-reflective practice of self-regulated learning strategies, might be helpful to the improvement of distance learners' metacognitive skills. In the author's vision, learners' existing motivational issues can be addressed throughout the whole intervention, and the instruction can be adapted to facilitate students' revision of problematic self-regulated learning process. The intervention can be a semester-long multistrategy program that teaches a range of cognitive, metacognitive, and motivational strategies for students to have both the "skill" and the "will" to use the strategies properly. The instruction can try to utilize the principle of modeling and self-explanation, and to contain ample opportunity for exercise and feedback. Every step of the intervention should serve the purpose for promoting learners' metacognitive awareness. With the assistance of an intervention like this, it might be possible to accomplish the task of preparing web-based distance learners with the required self-regulated learning skills for academic success.

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Will Self-Regulated Learning Strategy Training Be Useful In a Web-Based Distance Education Course?

Haihong Hu
Florida State University

Web-based distance instruction has become a popular approach for education. The purpose of this study is to examine the effects of self-regulated learning (SRL) strategy training on students' performance, motivation and strategy use in a web-based course. This study may enable the researcher to prove whether SRL strategies are teachable in a distance learning environment; and to demonstrate whether this kind of training can be effective for accomplishing superior outcome and completion rate.

Context of the Problem

Web-based distance instruction has become a popular approach for education. Many challenges of using web-based courses have been identified by researchers. The active and learner-centered nature of web-based instruction may have posed difficulty for students prepared by their previous education to be passive, when they have to assume more responsibility for managing their own learning. This might be the reason why online courses are facing the problems of high attrition rate and low satisfaction.

It was reported by the U. S. Department of Education that 8 percent of undergraduates and 10 percent of graduate and first-professional students took distance education courses during 1999-2000 (Sikora & Carroll, 2002). In 1990, distance education was generally defined by Moore as "all arrangements for providing instruction through print or electronic communications media to persons engaged in planned learning in a place or time different from that of the instructor or instructors" (Moore, 1990, p. XV). With the development of technology within the last decade, the definition of distance education has evolved to be more specific with the educational medium that is used to deliver instruction.

In this study, web-based distance education refers to courses delivered off campus using Internet-based technologies, such as live, interactive TV or audio; prerecorded TV or audio; email; asynchronous discussion and synchronous chat. This definition places more emphasis on the use of the Internet, and is more applicable to most of the web-based distance courses offered these days. It was accounted in the same statistical report presented by the U. S. Department of Education that during 1999-2000 a majority of undergraduates (60%) and graduate and first-professional students (67%) who participated in distance education did so via the Internet. About 37 percent of undergraduates participated via live, interactive TV or audio, and 39 percent participated using prerecorded TV or audio while about 43 of percent graduate and first-professional students participated via live, interactive TV or audio, and 28 percent participated using prerecorded TV or audio (Sikora & Carroll, 2002).

According to a 1997 American Management Association study (Zielinski, 2000), 75% to 80% of people who start an e-learning course do not complete it. According to a statistics report provided by the US Department of Education (2002), a higher proportion of both undergraduate and master's students were less satisfied than more satisfied with the quality of instruction compared with their regular classes.

Because of its nature of independent study and special participants' characteristics, self-regulation becomes a requirement for learners receiving web-based distance education to be successful. Researchers have found that the major causes to the high drop-out rate are: lack of time (Kember, Murphy, Siaw, & Yuen, 1991; Osborn, 2001) and environment management skills (Osborn, 2001), mismatch between learners' interest and course structure (Chyung, 2001; Kember et al., 1991), low self-motivation (Osborn, 2001; Parker, 2003), lack of learning strategies (Chyung, 2001; Kember et al., 1991), discomfort with individual learning (Fjortoft, 1995), negative attitude towards the course (Kember et al., 1991) , low learner self-efficacy on using the technology for distance education program (Chyung, 2001; Osborn, 2001). On the other hand, students' use of self-regulated learning strategies, such as goal setting (Eom, 1999; Greene, Dillon, & Crynes, 2003; King, Harner, & Brown, 2000; Ulitsky, 2000), self-efficacy (Eom, 1999; Greene et al., 2003; Sankaran & Bui, 2001), deep cognitive engagement (such as monitoring and evaluation) (Eom, 1999; Greene et al., 2003; King et al., 2000; Sankaran & Bui, 2001; Ulitsky, 2000), was identified as important predictor for students' achievement and completion in the web-based environment. It was suggested (Atman, 1990; Chyung, 2001; Ulitsky, 2000) that learning strategy training might be helpful for facilitating students' performance and completion in web-based instruction.

Online instruction requires students to develop a stronger sense of competence through fulfilling requirements in a self-directed manner (Parker, 2003). Self-regulated learning strategies are essential in assisting students to cultivate self-management skills, which are required for independent study. In addition, self-motivation

and even student persistence may be enhanced with well-designed online instruction with an emphasis on goal-related behaviors. Since students must take the responsibility for their own time management, skill building, and eventual academic success, self-regulated learning strategies might be one of the keys to resolve the issues of high attrition rate and low motivation in web-based instruction.

Over the last decade, learners' self-regulation of their cognition, motivation, and behaviors to promote academic achievement has been a topic receiving increasing attention in the field of education (Zimmerman, 1989, 1990, 1998). Driscoll (2000) refers to self-regulation as skills that learners use to "set their own goals and manage their own learning and performance"(p. 304). Learners who reported more extensive use of self-regulated learning strategies, such as goal setting and self-evaluation, demonstrated higher academic achievement than learners who used same strategies less often (Zimmerman & Martinez-Pons, 1986). It seemed that self-regulated learning strategies did play an important role in students' academic achievement (Zimmerman, 1990).

Zimmerman (2000) defines self-regulation as "the self-generated thoughts, feelings, and actions that are planned and adapted cyclically to the attainment of personal goals". He describes this concept as cyclical because learners use the feedback from prior performance to make adjustments during their current efforts.

Pintrich (1995) emphasizes the regulation of three general aspects of learning in his interpretation of self-regulated learning. First, learners self-regulate their behavior including the control of various resources, such as time, study environment, and students' use of others such as peers and faculty members to ask for help (Garcia and Pintrich, 1994; Pintrich, Simth, Garcia, and McKeachie, 1993) as cited in (Pintrich, 1995); Second, learners self-regulate motivation and affect through controlling and modifying motivational beliefs such as efficacy and goal orientation to adapt to the demands of a course; Third, learners self-regulate their use of various cognitive strategies to achieve learning outcomes (Pintrich, 1995).

Published studies that examine the effects of self-regulated learning on achievement and motivation in various learning domains include the work of Albert Bandura, Dale Schunk, Barry Zimmerman and others. The literature supports the notion that learners' self-regulation is a powerful predictor for their academic achievement (Ley & Young, 1998; Pintrich & Groot, 1990). In addition, self-regulation of learning progress is found to have a positive effect on learners' motivation (Kitsantas, Reiser, & Doster, 2003; Lan, 1996; Schunk, 1996; Zimmerman & Kitsantas, 1996) and perception of responsibility (Garcia & Pintrich, 1991; Heo, 1998).

New learning environments, such as web-based instruction, require proactive and active learning to construct knowledge and skills. As Schunk & Zimmerman (1998) mentioned that "an area that lends itself well to self-regulation is distance learning, where instruction originates at one site and is transmitted to students at distant sites… Self-regulation seems critical due to the high degree of student independence deriving from the instructor's physical absence"(p. 231-232). One critical feature of active learners is the responsibility for learning. Therefore, learner responsibility for learning and ownership must increase for learners to achieve academic success. It was found that engagement in self-regulated learning could increase learner perception of responsibility (Garcia & Pintrich, 1991; Heo, 1998). Therefore, one way to increase learner responsibility is to develop self-regulated learning strategies and engage them in self-regulated learning activities.

Self-regulated learning is appropriate to the college context. Most college students have more control over their own time and schoolwork and need to decide how they actually carry out studying (Pintrich, 1995), and traditional academic environment rarely encourages the use or development of self-regulatory skills (Orange, 1999). At the same time, many college students have difficulty managing this freedom in terms of the amount of time they spend on learning and the quality of cognitive effort they exert because "they had few opportunities to become self-regulated in their elementary and secondary school years, and as a result, they have few if any self-regulatory skills and strategies" (Orange, 1999, p. 36-37). It may be hard for busy college students, especially those with job and family responsibilities, to find time to learn to use self-regulation strategies. Not surprisingly, they are less motivated than students with fewer responsibilities. This is why it is suggested (Orange, 1999) that self-regulation strategies should be taught at all levels of education and research on self-regulated learning might be more relevant to college students (Pintrich, 1995).

Fortunately, Pintrich (1995) pointed out that "self-regulated learning is teachable"(p. 7-9). Teachers can teach students to become self-regulated learners, while "Students can learn to be self-regulated." Students learn self-regulated learning strategies through experience and self-reflection. Pintrich claimed, "Self-regulated learning is controllable. Students can control their behavior, motivation and affect, and cognition in order to improve their academic learning and performance." He believed that "students should accept responsibility for their own learning and realize that they have the potential to control their own learning"(Pintrich, 1995, p. 7-9).

Self-regulation has been identified as one of the important mechanisms that may promote learner achievement and motivation, which are the major determinants to completion rate and satisfaction in web-based distance learning courses. But few studies have empirically examined the role of self-regulated learning strategy

training in on-line courses. The underlying theoretical relationship between self-regulation and achievement and motivation in the web-based environment has not been extensively explored. This deficiency of empirical studies might have been caused by the fact that online instruction is comparatively a new phenomenon, or the requirements for online technical competencies to design, develop and implement experimental treatments.

Method

The primary purpose of this study is to examine the effects of self-regulated learning strategy training on students' learning performance, self-efficacy, self-satisfaction and strategy use in a web-based academic course.

The following specific research questions were explored in this study:

Question 1. Will self-regulated learning strategy training in a web-based distance learning course influence learning performance?

Question 2. Will self-regulated learning strategy training in a web-based distance learning course influence learner motivation (task value, self-efficacy and self-satisfaction)?

Question 3. Will self-regulated learning strategy training in a web-based distance learning course influence learners' strategy use?

Participants

This pilot study occurred at a Southeastern University in Summer term 2005 with 12 volunteers from one Information Studies major on-line course. These volunteers have an average age of 24.58, average GPA of 2.89, average registration for 9 credit hours, and they spent an average of 4.38 hours weekly to study for this course, worked for pay for an average of 20-30 hours per week, used computer for an average of 14-15 hours weekly. Six of these volunteers are seniors, 5 juniors and 1 sophomore. Eight of them are females and 4 males. Five of them are African-Americans, 1 Asian-American, 3 Caucasians, 2 Hispanics, and 1 from other ethnic background. Seven of these volunteers had never taken online courses before, 3 had taken 1, one had taken 2, and one had taken 4. Ten of them did not take on any volunteer work, and 2 of them offered 1-10 hours per week. Seven of them had no family responsibilities to affect their time for studying for this course. Three of them paid tuition for this course by themselves, 7 people relied on financial assistance, and 2 people's tuition were paid by parents or grandparents. Eleven of the volunteers thought they were competent with PC and MAC, 11 with Internet, 12 with Email, 8 with asynchronous and 7 with synchronous discussion.

Because the major purposes of the pilot study were to test the validity of experimental materials and procedures, and there were only limited number of student volunteers, the researcher assigned all volunteers to the experimental condition at the beginning of the intervention. Unfortunately, there was still a very high attrition rate of participants during the process of the study and only 5 of them continued until the end.

Instructional Course

Beginning beyond the computer literacy level, the Technologies for Information Services course focuses on the application of computer hardware, software, and information systems for the provision of information services. It highlights features and offers up-to-date coverage of technical developments with examples of real-world software applications. It also examines the principles by which computer systems and their networks support information seekers.

Students' grades were made up of 1) participation (10%), 2) weekly activities (50%), 3) project resource list (10%) and 4) final project (30%). Weekly assignments were assessed according to the criteria that were included in each assignment description. In addition, points were deducted for reasons including (but not limited to) the following: sloppiness; excessive typographical errors or misspellings; egregious grammatical errors; failure to adhere to assignment requirements; lack of attention to detail. Weekly activities were not accepted after due date as full credit. A 20% late penalty was assessed. All grades were given either on a 4-point scale or on a 100-point scale.

Intervention Materials

This self-regulated learning strategy training includes two sections: a web-based tutorial on self-regulated learning strategies and a strategy application practice using sets of online forms.

The purpose of this web-based tutorial is to teach self-regulated learning strategies. The content of this tutorial focuses on what self-regulated learning strategies are, more specifically, what metacognitive, motivational, cognitive and resource-management strategies are, as well as examples of them. Besides introducing different types of self-regulated learning strategies, this tutorial also introduces when and how to use them.

In addition to the knowledge about self-regulated learning strategies, this tutorial also provides participants with opportunities to practice the knowledge about strategies that they just learned.

After completing the practice on the knowledge about self-regulated learning strategies, learners were required to actually apply the strategies in their studying of the academic content of the course. The main purpose of this practice was for learners to apply the strategic planning and self-evaluation strategies, through the use of online forms, to specific tasks within a study period (such as 2 weeks).

Procedures

It took 7 weeks in one semester of the course to complete the experiment of this study due to the nature of distance education environment and content of training (learning strategies). The original instruction of the course was used for the purpose of the experiment, and the experiment did not affect the content of the instruction by any means.

This study consisted of 4 phases. In Phase 1, the researcher solicited participation and collected initial data, including demographic information, task value, self-efficacy and level of strategy use through the use of online forms. This phase lasted for 1 week.

In Phase 2, the participants went through the web-based SRL strategy tutorial. Participants' attendance in the tutorial was measured using ungraded exercises for each section of the tutorial. Participant's knowledge of SRL strategies was measured using a graded test included in the tutorial. This phase also lasted for 1 week.

In Phase 3, the participants took part in the strategy application practice. Participants practiced strategic planning and self-evaluation strategies using the study plan and self-evaluation online forms. This phase lasted for about 2 weeks, which is considered as a study period.

In Phase 4, the researcher conducted an Evaluation of Outcome. Post-experiment data, including task value, self-efficacy, self-satisfaction and level of strategy use were measured. Data on performance of learning (assignment scores) were also collected for analysis. This phase lasted for about 0.5 week.

Measures and Data Analysis

Three criterion measures were used in the study: (a) student cumulative assignment grades, (b) student pre-survey, and (c) student post-survey.

Student cumulative assignment grades. Student cumulative assignment grades served as a measure for assessing student performance. The cumulative grades consisted of scores for 11 weekly activities, a statement of topic for technology project, a resource list, a final project and participation. The assignments were directly aligned with the objectives of the instructional course.

Student pre-survey. This survey served as the criterion measure for assessing student motivation and strategy use before the experiment. The items were 5-point Likert-type questions with the response choices ranging from *very true of me*, scored as (5), to *not at all true of me* (1). These items dealt with topics such as students' task value, self-efficacy, goal-orientation, and their general use of learning strategies. These items were adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991). The MSLQ originally included 81 items and was a self-report instrument designed to assess motivational orientations and use of learning strategies for college students. The internal reliability for the scales of the survey, using Cronbach's alpha, ranged from 0.71 to 0.93. The remaining items on the survey were questions dealing with student demographic information and open-ended questions to ask students to describe their learning strategies, clarify reasons and provide explanations for their answers to multiple-choice questions.

Student post-survey. This survey served as the criterion measure for assessing student motivation and strategy use after the experiment. The items were 5-point Likert-type questions with the response choices ranging from *very true of me*, scored as (5), to *not at all true of me* (1). These items dealt with topics such as students' task value, self-efficacy, self-satisfaction, goal-orientation, and their general use of learning strategies. These items were adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991). Except for the items for self-satisfaction, student post-survey used the same items as those on the student pre-survey. The remaining items on the post survey were open-ended questions to ask students to describe their learning strategies, clarify reasons for their answers to multiple-choice questions and to provide suggestions for improvement to the intervention materials.

Since this is mainly a study to compare the pre- and post-condition of the experimental group and there were only 5 voluntary participants, non-parametric statistic tests were used to analyze variables.

Results

Results are discussed below by student learning performance, motivation and strategy use.

Learning Performance

The mean scores for cumulative assignment grades were *15.60* for the 5 participants in the experimental group, and *12.35* for the 20 participants in the control group, who made up the remaining of the class but did not take part in any activity of the study.

The Mann-Whitney Test conducted on the cumulative assignment grades yielded a non-significant result, U= 37.00, p> .05. This test revealed that the difference in the cumulative assignment grades between the experimental and control group was not statistically significant.

Table 1: Mean Scores for Cumulative Assignment Grades by Treatment Group

| Measure | Treatment | | U | *p* |
	SRL Training (n=5)	No SRL Training (n=20)		
Cumulative assignment grades	15.60	12.35	37.00	ns

Student Motivation

The variable of student motivation is made up of measures of 4 separate items: students' task value, self-efficacy, goal-orientation, and self-satisfaction. Among these items, students' task value, self-efficacy, goal-orientation were measured in both pre- and post-surveys. Self-satisfaction was measured during both Phase 3 and Phase 4 of the experiment. Only data from the 5 voluntary participants in the experimental condition were analyzed to examine whether there is any difference in these variables between the pre- and post-experiment situation.

Task value. The mean scores for task value were *26.60* for the pre-experimental situation, and *26.20* for the post-experimental situation. The Wilcoxon Signed Rank Test conducted on the task value yielded a non-significant result, Z=-.368, p> .05. This test revealed that the difference in task value between the pre-and post-experimental situations was not statistically significant.

Self-efficacy. The mean scores for self-efficacy were *36.20* for the pre-experimental situation, and *36.40* for the post-experimental situation. The Wilcoxon Signed Rank Test conducted on the self-efficacy yielded a non-significant result, Z=-.447, p> .05. This test revealed that the difference in self-efficacy between the pre-and post-experimental situations was not statistically significant.

Intrinsic goal orientation. The mean scores for intrinsic goal orientation were *14.60* for the pre-experimental situation, and *15.80* for the post-experimental situation. The Wilcoxon Signed Rank Test conducted on the intrinsic goal orientation yielded a significant result, Z=-2.12, p< .05. This test revealed that the difference in intrinsic goal orientation between the pre-and post-experimental situations was statistically significant.

Extrinsic goal orientation. The mean scores for extrinsic goal orientation were *16.00* for the pre-experimental situation, and *15.00* for the post-experimental situation. The Wilcoxon Signed Rank Test conducted on the extrinsic goal orientation yielded a non-significant result, Z=-1.34, p> .05. This test revealed that the difference in extrinsic goal orientation between the pre-and post-experimental situations was not statistically significant.

Self-satisfaction. The mean scores for self-satisfaction were *8.20* during Phase 3, and *9.20* during Phase 4. The Wilcoxon Signed Rank Test conducted on the self-satisfaction yielded a non-significant result, Z=-1.63, p> .05. This test revealed that the difference in self-satisfaction between Phase 3 and Phase 4 was not statistically significant.

Table 2: Mean Scores for Motivation Measures by Situation

| Measure | Situation | | Z | *P* |
	Pre-Experiment (n=5)	Post-Experiment (n=5)		
Intrinsic Goal Orientation	14.60	15.80	-2.12	<.05
Self-Efficacy	36.20	36.40	-.447	Ns
Extrinsic Goal Orientation	16.00	15.00	1.34	Ns
Task Value	26.60	26.20	.368	Ns

Strategy Use

The variable of strategy use is a cumulative score of students' use of cognitive, metacognitive, and

resource-management strategies. These items were measured in both pre- and post-surveys. Only data from the 5 voluntary participants in the experimental condition were analyzed to examine whether there is any difference in this variable between the pre- and post-experiment situation.

The mean scores for strategy use were 177.00 for the pre-experimental situation, and 172.00 for the post-experimental situation. The Wilcoxon Signed Rank Test conducted on strategy use yielded a non-significant result, $Z=-.73$, $p> .05$. This test revealed that the difference in strategy use between the pre-and post-experimental situations was not statistically significant.

Table 3: Mean Scores for Strategy Use by Situation

Measure	Situation		Z	P
	Pre-Experiment (n=5)	Post-Experiment (n=5)		
Strategy Use	177.00	172.00	.73	Ns

Discussion

This study examined the effects of self-regulated learning strategy training in a web-based distance learning course on learning performance, learner motivation (task value, self-efficacy and self-satisfaction), and learners' strategy use. Self-regulated learning strategy training did not significantly influence student performance, most items (task value, self-efficacy, extrinsic goal orientation and self-satisfaction) of learner motivation, and strategy use. However, students' intrinsic goal orientation was significantly changed during the process of the training.

The first research question asked if self-regulated learning strategy training in a web-based distance learning course would influence learning performance. Students who received self-regulated learning strategy training did produce higher mean cumulative assignment grades than those who did not, but the difference was not significant enough to distinguish the two conditions.

Performance is one of the outcomes from distance learning courses, and it is one of the major elements leading to students' self-efficacy and satisfaction, which are the primary causes to the high impletion rate. Improving learning achievement creates the possibility for promoting learners' self-efficacy and satisfaction, and eventually reducing drop out rate and increasing cost effectiveness of web-based distance learning courses.

Self-regulated learning strategy training is found effective to promote learning achievement from numerous studies (e.g., Butler, 1998; Graham et al., 1998; Lan, 1996; Schunk, 1996; Weinstein et al., 2000; B. J. Zimmerman & Kitsantas, 1996). However, different learners may respond differently to this kind of strategy training (Hofer, Yu, & Pintrich, 1998). The fact that the addition of self-regulated learning strategy training did not significantly improve learner performance could be attributed to the extreme imbalance in number of participants in the two conditions and lack of consideration of learners' existing level of strategy use. It is possible that strategy training may be less effective to learners who are already highly strategic and self-regulated, and more effective to learners who are in need of strategies for self-management and self-discipline when taking web-based online courses.

The second research question asked whether self-regulated learning strategy training in a web-based distance learning course would influence learner motivation (self-efficacy and self-satisfaction). Students who received self-regulated learning strategy training did report higher mean scores in self-efficacy, self-satisfaction and intrinsic goal orientation in the post-experiment situation than in the pre-experiment situation, but the differences in self-efficacy and self-satisfaction were not significant enough to distinguish the two situations, while that in intrinsic goal orientation was significant enough. Students who received self-regulated learning strategy training reported lower mean scores in task-value and extrinsic goal orientation in the post-experiment situation than in the pre-experiment situation, but the differences were not significant enough to distinguish the two situations.

Social cognitive approaches to self-regulated learning (Bandura, 1986; Schunk & Swartz, 1993; Zimmerman & Martinez-Pons, 1992) have concentrated on self-efficacy as the critical source of students' motivation. Self-efficacy operates as an antecedent as well as an outcome of self-regulated learning. On the other hand, self-satisfaction is critical because people participate in things that produce satisfaction and positive affect, and stay away from things that initiate dissatisfaction and negative affect (Bandura, 1991 as cited in Zimmerman, 2000). These two are crucial elements in learner motivation.

At the same time, several major causes to students' dropout from distant programs, such as low self-motivation (Osborn, 2001; Parker, 2003), lack of learning strategies (Chyung, 2001; Kember et al., 1991), discomfort with individual learning (Fjortoft, 1995), negative attitude towards the course (Kember et al., 1991), low learner self-efficacy on using the technology for distance education program (Chyung, 2001; Osborn, 2001), are either directly or indirectly related to learner motivation.

Students' self-efficacy is correlated with their use of self-regulated strategies (Zimmerman & Martinez-

Pons, 1990). It was found (Bouffard-Bouchard, Parent, & Larivee, 1991) that high self-efficacy students demonstrated a more active control of their time and were more persistent on the task than those with low self-efficacy. When students have the required cognitive skills to solve the problems, similar levels of self-efficacy are likely to make similar effects on self-regulation and performance (Bouffard-Bouchard et al., 1991). Thus, enhancing students' self-efficacy may increase their use of self-regulated learning strategies and eventually promote their persistence in web-based online courses.

In line with the social-cognitive model, it is assumed (Hofer et al., 1998) that self-efficacy can be changed and regulated like other strategies (Schunk, 1994) as cited in (Hofer et al., 1998). Recently it was found (Hofer et al., 1997) as cited in (Hofer et al., 1998) from a learning to learn course that student grew in their master orientation to learning, self-efficacy, and value and interest for the course, and declined in test anxiety. In addition, they improved in their self-reported strategy use. More importantly, correlational analyses have shown that students' motivational beliefs, such as mastery goals, efficacy, and interest and value, were positively correlated with their use of cognitive and self-regulatory strategies (Hofer et al., 1997) as cited in (Hofer et al., 1998). Thus, learners' self-efficacy has been proved to be changeable through involvement in strategy training.

Students' engagement in self-regulated learning behaviors also seems to bring about satisfaction. It was found that girls who self-recorded (a form of self-monitoring) reported higher degree of satisfaction than those who did not self-record (Zimmerman & Kitsantas, 1999). Therefore, it is reasonable to assume that students will feel more satisfied about their learning experience if they participate in the web-based instruction on and self-reflective practice on self-regulated learning strategies.

This study is intended to improve learners' self-efficacy and self-satisfaction by engaging them in learning and implementing self-regulated learning strategies through the web-based instruction and self-reflective practice. The potential enhancement in learners' motivation might lead to more active participation and increase in completion rate.

The third research question asked if self-regulated learning strategy training in a web-based distance learning course would influence learners' strategy use. Participants' responses to the surveys revealed that the difference in strategy use between the pre-and post-experimental situation was not statistically significant. These results may be attributable to the fact that there were not enough participants in the study and a self-report measure was used to collect data.

Strategy use is found to be helpful for developing learner motivation. In a study, Sankaran (2001) investigated how learning strategies and motivation influence performance in Web and face-to-face lecture settings of a business information systems course. While motivation is significantly correlated to performance in both web and face-to-face settings, the relationship is stronger in the Web setting. High motivation is related with the use of deep learning strategy, and low motivation with undirected strategy (Sankaran & Bui, 2001).

Greene et al. (2003) conducted a study to examine student performance and approaches to study in a CD-ROM version of a chemical engineering course. Results illustrated that deep cognitive engagement and motivation, defined in terms of goals and self-efficacy, were significant predictors of success based on two indices of course performance.

This study hoped to improve learners' strategy use by engaging them in learning and implementing self-regulated learning strategies through the web-based instruction and self-reflective practice. The hypothesized improvement in students' metacognitive awareness might bring about more frequent use of self-regulated learning strategies and in term higher learner motivation, and ultimately a rise in completion rate.

A wealth of studies in the field of distance education has been conducted on comparing the outcomes of instructional media, learner characteristics, learner perceptions and interaction (Simonson, Smaldino, Albright, & Zvacek, 2000), but few have actually provided facilitation on learning strategies. By exploring the role of self-regulated strategy training in an on-line course, this study enabled the researcher to prove that self-regulated learning strategies are helpful in the web-based distance learning environment. However, there is still a lot to do for educators to prepare students with the necessary knowledge and skills to learn successfully in an independent online course, to identify guidelines for designing learner-friendly web-based distance learning courses, and ultimately to develop more effective facilitation approaches for accomplishing optimal achievement, satisfaction and completion rate. Future research that investigates potentially productive self-regulated learning strategy training in web-based environment should be cautious with the limitation on the number of volunteers available for study and the complete reliance on self-report measures. With the rapid growth of E-learning, it becomes increasingly important to identify a more helpful way to reduce the attrition rate and ultimately realize the desired cost-effectiveness of on-line distance learning courses.

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Toward Improving Information Technology Acceptance Through Contextual Training – A Research Framework

Ioan Gelu Ionas
University of Missouri - Columbia

Abstract

Ever since the introduction of information technology (IT), organizations have struggled with the issues of accepting and using it in the workplace. Toward this end, organizations use important financial and human resources on training to improve effectiveness in IT utilization. However, despite the efforts organizations make to plan and implement training programs, many employees still show reluctance in accepting and using these technologies. Existing research (Davis, 1989; Venkatesh, 2000; Venkatesh & Davis, 2000) shows various factors that explain technology acceptance in organizations and provides ways of predicting it but does not help organizations improve it. This research represents an attempt to anchor pre- and post-implementation training activities in the context of the end-user's everyday work life to improve technology acceptance in organizations.

Using the Technology Acceptance Model (TAM) as a measurement tool, this research proposes the use of Activity Theory to analyze and describe the employee's workplace and to design a training environment and training activities to improve technology acceptance by overcoming end-user acquired preconceptions about the planned IT implementation or upgrade in the workplace.

Why Contextual Training?

A number of theories and frameworks, such as Situated Learning (Lave & Wenger, 1991), Activity Theory (Leont'ev, 1974, 1989), and Contextual Training and Learning (CTL) (Berns & Erickson, 2001; Sandlin, 2000), developed in the education research arena, emphasize the importance of context in approaching emotional, attitudinal, and in the end, behavioral issues in the process of learning.

As a more generic view, the Contextual Training and Learning framework has been developed in recent years based on the previous work of Dewey (1900), Piaget (1929), Brunner (1966), and others (Owens et al., 1999; Parnell, 2000; Smith, 2000). Under various labels, such as "applied learning", CTL is used mainly in the areas of adult technical training and continuing education. Fundamentally, CTL is a theoretical approach that incorporates much of the recent research in the cognitive sciences field that recognizes that learning is a complex and multifaceted process that goes beyond the traditional behaviorist approaches.

According to CTL learning occurs only when learners are able to embed the new information and knowledge in their own frames of reference, as the mind is naturally seeking meaning in relation to the person's current environment. To this end, CTL is interested in multiple aspects of any learning environment, indifferent of the actual settings and encourages the instructors to choose and/or design learning environments that incorporate as many different forms of experience as possible (social, physical, cultural, psychological) in working toward the desired learning outcomes.

With roots in the constructivist learning theory as well as in the theories of cognition and learning (Berns & Erickson, 2001; Sandlin, 2000), CTL emphasizes (Imel, 2000) problem solving, recognizes that teaching and learning need to occur in multiple contexts, assists and encourages self-regulated learning, adapts teaching to diverse life contexts, encourages learners to learn from each other, and uses authentic assessment.

What CTL does not specify is how contextualization can be achieved. Therefore, to approach contextualization, other frameworks need to be used. Considering the target of this research, the training process that takes place in organizations before IT implementation or upgrade, Activity Theory (AT) (Kari Kuutti, 1991) can be used to analyze and understand the activities the employees are currently performing and will have to perform using the new technology. In the end AT will be used to design a training environment that would embed end-users' activity in context, thus approaching, along with the main cognitive component, the emotional and attitudinal issues through training.

Activity Theory

Activity theory can be viewed as "a philosophy and cross-disciplinary framework for studying different forms of human activity" (Kariq Kuutti, 1996). In essence, AT is a form of socio-cultural analysis (Nardi, 1996) combined with a theory of mediated action (Kari Kuutti, 1991; Wertsch, 1998) which holds that the relations within an activity are not direct ones but are mediated by a variety of artifacts. Historically activity theory is rooted in the

works of the classical German philosophers Kant and Hegel, the dialectical materialism of Marx and the works of Russian psychologists Vygotsky, Leont'ev, and Luria (Kariq Kuutti, 1996).

According to Leont'ev (1974), "activity is a nonadditive molar unit of life for the material, corporeal subject". Therefore, activities are the basic units of human life and thus the basis for the study of contextuality. In reality, an individual can participate in several activities at any given time (Kari Kuutti, 1991). Kuutti (1991) describes an activity in terms of the following properties: 1) an activity has a motive (object) which tells us why the activity exists; 2) it is a collective phenomenon; 3) it has a subject (individual or collective); 4) it exists in a material environment which is in turn transformed by it; 5) it is a historically developing phenomenon; 6) the forces driving the development of an activity are based on contradictions; 7) it is performed through conscious and purposeful actions of its participants.

Engeström (1987), pursuing the idea of mediation in human activity systems, further develops Lenont'ev's theory by replacing the main binary relationships with mediated ones. In this way, the central relationship between the subject and the object of the activity becomes a relationship mediated by one or more tools. Still, this simple structure is not yet adequate to support a systemic analysis of the systemic relationships of an individual with his/her environment. In consequence, a third main component, the community, was added. Its relationships with the subject and the object are also mediated, by rules in the first case and by the division of labor in the second case. The resulting activity system is represented as shown in Figure 1:

Figure 1 – The activity system model (Engeström, 1999)

Jonassen (2000) further defines the model as follows:

Subject – individual or group of individuals engaged in the activity;

Object – physical, mental, or symbolic artifacts produced by the system;

Tools – any tools, sign systems, theories, and procedures that mediate the relationship between subject and object. They can be anything used in the transformation process;

Rules – consist of regulation, laws, policies, conventions that constrain the activity system as well as of social norms, standards and relationships within the community that guide to some degree the subject's actions;

Community – is made of individuals and groups of individuals that focus at least part of their activity on the object;

Division of labor – refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status inside an organization;

Outcome – represents the intention of the activity system.
Further analysis shows that an activity system is composed of four main subsystems: production, consumption, exchange, and distribution. The top triangle, the production subsystem, formed between subject, tools, and object, is interested in the process through which the subject acts on the object using the available tools to produce the outcome. It is generally regarded as being the most important of the four subsystems of an activity system (Jonassen, 2000).

The consumption subsystem describes how the subject and the community of which the subject part of act together on the object. Because the subject can be part of many activity systems, the consumption subsystem represents a fundamental contradiction as the subject and the community have to divide their efforts between the many activities they are involved in.

The distribution subsystem shows how the activities are divided among subjects and community based on social laws and expectations (division of labor), both horizontally, as a division of tasks, and vertically as a division of power and status.

The exchange subsystem both regulates the activities in terms of personal needs and defines the rules that constrain the activity and the community with which the subject interacts. It creates the framework for defining the work culture and climate for all individuals and groups involved in an activity system.

The Contextual Training and Learning framework and Activity Theory provide the rationale for contextualizing technical training and the means of doing it. The remaining question is about how technical training can be anchored in the realm of information technology acceptance. For this purpose the present research proposes the use of a third theoretical framework, the Technology Acceptance Model (Davis, 1989).

Information Technology Acceptance and the Technology Acceptance Model

A review of the literature shows that considerable research efforts have been directed toward understanding and predicting technology acceptance and use. Among them, the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), with roots in the social psychology field, holds that a person's attitude toward a behavior is determined by that individual's beliefs about the behavior's consequences. Another theoretical framework, Theory of Planned Behavior (TPB) (Armitage & Conner, 2001; Taylor & Todd, 1995) shows that attitudes, subjective norms, and perceived behavioral control are direct determinants of intentions, which in turn influence behavior. Also, Diffusion of Innovation Theory (DoI) (Moore & Benbasat, 1991; Rogers, 1993; Tornatzky & Klein, 1982) seeks to identify salient perceived characteristics of technology that may be expected to influence user adoption of technology.

Rooted in these three theoretical frameworks, Davis' Technology Acceptance Model (TAM) (Davis, 1989) offers a more focused approach to understanding and predicting technology acceptance. The initial model proposed by Davis in 1989 considers two key determinants of the intention to use IT: perceived usefulness (PU) as the degree to which a user believes that the use of the technology will bring both personal and work related benefits, and perceived ease-of-use (PEoU) as the degree to which the user believes that the system will be easy to use and learn and that the amount of effort to operate it in the future will be low.

Figure 2 – Davis' Technology Acceptance Model

TAM, shown in Figure 2, proposes that the user's perceptions of technology usefulness and of its ease-of-use are the main determinant factors of the user's attitude toward using the system. Consistent with the theory of reasoned action, behavioral intentions to use are determinants for the attitudes toward using the system which, according to the TAM model, at their turn determine the actual system use. In addition to the relationships described above, TAM proposes a direct relationship between PU and the behavioral intention to use.

Since its first appearance in the research literature in 1989, TAM has been tested and validated in various contexts, on various technologies, different types of subjects, and across cultures. From a technology point of view in the last 15 years, studies on the following groups of technologies have been reported:

Use of spreadsheets (Chau, 1996; Mathieson, 1991);

Adoption and utilization of personal computers (Moore & Benbasat, 1991; Rose & Straub, 1998; Thompson et al., 1991);

Use of word processors (Chau, 1996; Davis et al., 1992);

Self-reported and actual use of e-mail, fax and voice mail (Adams et al., 1992; W. W. Chin & Todd, 1995; Gefen & Straub, 1997; Straub et al., 1997; Straub et al., 1995; Subramanian, 1994; Szajna, 1996; Venkatesh & Davis, 1994);

Use of geographic decision support systems (GDSS) (Sambamurthy & Chin, 1994);

Intended use of Internet based applications (Venkatesh, 1999);

E-commerce and online shopping (Gefen et al., 2003b; Gefen & Straub, 2000; Olson & Boyer, 2003);

Intended adoption of a new enterprise resource planning system (Gefen, 2000);

Researchers in the field also made attempts to extend the initial Technology acceptance model to account for a variety of other intrinsic and extrinsic factors such as:

Mood (Venkatesh & Speier, 1999);

Intrinsic and extrinsic motivation (Venkatesh & Speier, 1999; Venkatesh et al., 2002);

Cultural differences such as uncertainty avoidance and power distance (Zakour, 2004);

Psychological attachment (Malhotra & Galletta, 1999);

Performance and social expectations (Lee et al., 2003);

Time span (Chau, 1996);

Social awareness (Bjorn et al.);

Computer attitude and self-efficacy (Chau & Hu, 2001; Compeau & Higgins, 1995; Igbaria & Iivari, 1995; Yi & Hwang, 2003);

Perceived user resources (Wayne W. Chin et al., 2001);

Trust (Dahlberg et al., 2003; Gefen et al., 2003a; Gefen et al., 2003b);

Task-technology fit constructs (Dishaw & Strong, 1999);

Gender differences (Gefen & Straub, 1997);

Age differences (Morris & Venkatesh, 2000).

Gefen & Straub (2000) shows that Davis' TAM model is stable and has high predictive power. Therefore, the survey-based research instrument used in TAM research to measure acceptance has also been proven stable and adaptable to various contexts.

Despite all these efforts, TAM is a descriptive/predictive model which does not provide a framework that can be used by organizations to overcome or at least reduce information technology acceptance issues during IT implementation or upgrade. Therefore in the context of this research, which proposes the use of contextualized training to approach IT acceptance issues, the TAM model will inform the Activity Theory framework, while the TAM survey tool will be used to measure and predict technology acceptance of the IT end users as a mean to evaluate the effectiveness of the resulted training activities.

Theoretical Model Development

A small section of research in TAM is interested in the effects of training on technology acceptance. A further analysis shows that the existing literature falls in one of the following two categories:

Creating/inducing a state of playfulness among users, through interventions that tap enjoyment (Starbuck & Webster, 1991; Webster & Martocchio, 1992; Venkatesh & Speier, 1999; Venkatesh, 1999 & 2002);

Use of procedural training as antecedent for the Perceived Ease of Use (Venkatesh & Davis, 1996);

Almost unanimously, the results show that technology acceptance issues can be diminished through the use of training interventions. Considering the TAM model (Figure 2), the problem of this research is that it only approaches the Perceived Ease of Use (PEoU). But the TAM model also includes Perceived Usefulness (PU) as determinant for technology acceptance which has, according to existing research, a more powerful determinant for attitudes than PEoU. It is expected that a training intervention that would approach PU along with PEoU would have a much larger impact on the end-users' acceptance of technology.

To understand the gap a revised version of the taxonomy of learning proposed by Anderson et. al (2001) will be used to extend the TAM model (Figure 3).

Figure 3 - Taxonomy of learning (adapted from Anderson et. al. 2001)

Returning to the research on training done in the TAM area one can see that at the most, current training practices deliver declarative/factual and procedural knowledge to the trainees. Based on the presented taxonomy, by leaving out the structural/conceptual knowledge the trainees are missing essential cognitive abilities related to understanding, analyzing and evaluating the technology and its impact.

If the declarative/factual and procedural knowledge is more about the use of the information technology, the structural/conceptual knowledge is fully contextualized and provides the trainees with the ability to understand the place the new technology and their role, as IT users, in the organizational business processes based on a larger organizational picture.

Figure 4 - Proposed research model

Considering this assertion, this research will attempt to develop methods to contextualize training by redesigning the current training activities to incorporate structural/conceptual knowledge. In the context offered by the TAM model, this approach would provide support for the Perceived Usefulness determinant of the end-users' attitudes. The resulting theoretical model is shown in figure 4.

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In Figure 4 the dotted lines show existing research, while the continuous ones represent the proposed relationships and effects. The line thickness indicates the strength of the relationship. Considering the proposed model, it is expected that the structural/conceptual knowledge would influence primarily PU, but will also have a lower impact on PEoU also.

The forth knowledge dimension, metacognition is an elusive concept, very difficult to measure. Also, due to various restrictions, such as time limitations, it would be difficult to help the trainees build metacognitive abilities during training. Therefore, the influence of metacognition on attitudes and behaviors will not be studied.

The Research Question

Considering the theoretical frameworks presented above is expected that contextualizing training in the trainees' workplace and work life will have a positive impact on the easiness with which will accept the technology on which training is delivered.

Technical training is an ongoing process at the target organization. Therefore, considering the wide range of potential subject and technologies that are planned to be implemented and the timeline of this research, a more generic research question is proposed:

"To what degree does a contextualized training program, designed to target specific factors that influence perceived usefulness and perceived ease-of-use have a positive impact on end-user technology acceptance levels." Considering the bounding conditions presented above, this paper proposes the following research framework which has the potential to become a design roadmap for technical training activities, if the research results will support the assumption that contextualized training can improve technology acceptance.

Research Plan

Current negotiations with the training department of the target organization provide some bounding conditions and support for this research:
The organization is currently delivering short (up to two days) training sessions, of which many span over three to four hours;

Only up to 15 individuals are being trained in one session;

If the number of trainees is larger than 15, separate training sessions will be offered;

The organization decides what topic the training will have and when & where this training will be delivered;

Diverse training topics are available, ranging from the use of Microsoft Outlook to manage e-mail messages to the use of specific module of the organization-wide ERP (Enterprise Resource Planning) software;

Many training sessions are repeated at various intervals to cover the employees that were recently hired.

On one side, the shortness of the training sessions will make it almost impossible to approach at least one of the research model components, the metacognition. On the other side, short, repetitive training sessions on the same subject, will provide the opportunity to use a quasi-experimental approach, in which some of the training sessions will not receive any treatment, while for others the treatment will be present. The same research process will be applied to both groups.

On a larger scale, this situation also provides support for the use of a specific research methodology - design based research (Jonassen et al., 2006). The assumption of design-based research is that instructional design should fundamentally be a research process rather than a procedural process. For the purpose of this study, the design based research approach is used toward reaching a potential normative training design process that is thought to be attainable as an outcome of multiple iterations.

The small number of trainees that usually join a training session makes possible the use of a wider variety of training interventions, such as hands-on training, one-to-one conversations etc., compared to what would be feasible for a larger group of people.

In addition, based on some initial observations of a couple of training sessions and on the interview with the training department manager, the currently delivered training can be clearly classified as procedural. Moreover, the observations show that the majority of the questions asked by the trainees were mainly related to structural/conceptual knowledge ("who will input this information if I'm not the one doing it?", "What reports are managers running based on the information I'm entering into the system?"). Therefore, without any attempt to generalize to other organizations, the proposed research model fits well in the existing context.

In an attempt to find an answer to the research questions, the following timeline has been developed (Figure 5).
    Note: The Technology Acceptance Model instrument will be used for assessment in pre- and post-tests.

Figure 5 - The research process

Three data collection methods are being considered: observations, interviews, and focus groups.
Observations (Patton, 2002, p. 21) will be conducted during the training session(s) and will focus on the added training intervention and trainees' questions. All training sessions will be videotaped.

Research Steps	Snapshot using AT		Training design	Training delivery / Assessment		Snapshot using AT
Target	Employee activity system	1. SME 2. Current training	Training activities	Approach previously found issues	Training related variables	Post implementation employee activity system
Objective(s) & Outcomes	Find existing systemic tensions	1. Find potential effects of the new technology. 2. Find what is addressed by existing training.	Contextualized training program based on AT analysis results	Deliver the contextualized training	Assessment of training effectiveness	Find systemic tensions after IT implementation

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Semi-structured interviews (Patton, 2002, p. 343) will be conducted face-to-face in both the initial and final stages of the research. The interview will be videotaped or audio taped, depending on the location. The interview will approach two categories of topics. One category is aimed at positioning the subject in his or her activity system, relative to a known set of parameters resulted from existing research such as motivation, performance, expectations, etc. The second category is aimed at understanding more specific, contextual factors.
    Focus groups (Patton, 2002, p. 385) will be used in both training design activity and as part of the training assessment process. The activities of the focus groups will be videotaped. Several focus groups will be organized to design the training.
    A second use of the focus group will be conducted to assess training effectiveness. Because assessment is dependent on the training intervention, it will be developed together with the training design activities. Therefore, any instruments used in the training assessment focus group will be developed at the same time too and are not available at the time of this writing.
    Due to the nature of the research and to the variety of theories and frameworks involved in its development, the unit of analysis will vary depending on the research activity. During some of the research steps, the use of the Activity Theory suggests the employee's activity system as the main unit of analysis, while for the assessment of the training outcomes for example the individual will be the focus of the research activities.
    Sample and sample size is also dependent on the research activity. Overall, the total number of employees in the target organization represents the population considered for this research. Sample selection is bounded by certain limitation the researchers face at the target organization. Considering the bounding conditions discussed in the research context subchapter, a combination of purposeful typical case and convenience sampling methodologies (Patton, 2002, p. 236, 241) is considered.
    The participants in the training sessions and in the study will be determined by the training schedule designed by the organization at the time of the research. From the employees that will be in the training session the researchers will purposefully select not more than a couple individuals for the initial part of the research, the analysis of the employee's activity system so that the subjects will be representative for the larger population.

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Research Limitations and Concerns

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    Several concerns and limitations need to be considered, such as the elements that are unknown to the researcher(s) when developing the research plan (e.g. training focus or specific context), issues related to access, as well as the extent of the research. As previously explained the researcher does not have knowledge of the specific IT or section of IT on which the training will be conducted at the time of the research. This particular situation puts the

researcher in the situation of developing more comprehensive (and in the end more vague) instruments.

Also, since the focus of the training and its context are unknown, data analysis (steps 1 & 2) and the development of the training intervention will have to take place in a very limited time slot to maintain at minimum the perturbations the normal activities of the training department. In this context, a pilot study might be feasible to be conducted to develop the initial analysis instruments (e.g. basic coding schemes)

The trainers' ability to apply the treatment effectively to the trainees has to be considered also. A possible solution to this problem is to have the trainers participate in the training development process to help them better understand the intended outcomes. In addition, their commitment to the idea of this research and training interventions needs to be secured.

Many other issues can be also considered, such as access to the training sessions and the subjects, especially for those employees that work with sensitive information, the researcher's interviewing abilities, or any potential language barriers in this particular case.

In the end, one important issue needs to be approached – the extent of the research, both in time and resources. Therefore, a pilot study will be run first, which if shows potential validity of the proposed model, will be the foundation for further resource allocation.

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A Research Framework to Study the Effects of Contextualized Training on Information Technology Acceptance

Ioan Gelu Ionas
University of Missouri Columbia

Abstract

Ever since the introduction of information technology (IT), organizations have struggled with the issues of accepting and using it in the workplace. Toward this end, organizations use important financial and human resources on training to improve effectiveness in IT utilization. However, despite the efforts organizations make to plan and implement training programs, many employees still show reluctance in accepting and using these technologies. Existing research (Davis, 1989; Venkatesh, 2000; Venkatesh & Davis, 2000) shows various factors that explain technology acceptance in organizations and provides ways of predicting it but does not help organizations improve it. This research represents an attempt to anchor pre- and post-implementation training activities in the context of the end-user's everyday work life to improve technology acceptance in organizations. Using the Technology Acceptance Model (TAM) as a measurement tool, this research proposes the use of Activity Theory to analyze and describe the employee's workplace and to design a training environment and training activities to improve technology acceptance by overcoming end-user acquired preconceptions about the planned IT implementation or upgrade in the workplace.

Why Contextual Training?

A number of theories and frameworks, such as Situated Learning (Lave & Wenger, 1991), Activity Theory (Leont'ev, 1974, 1989), and Contextual Training and Learning (CTL) (Berns & Erickson, 2001; Sandlin, 2000), developed in the education research arena, emphasize the importance of context in approaching emotional, attitudinal, and in the end, behavioral issues in the process of learning.

As a more generic view, the Contextual Training and Learning framework has been developed in recent years based on the previous work of Dewey (1900), Piaget (1929), Brunner (1966), and others (Owens et al., 1999; Parnell, 2000; Smith, 2000). Under various labels, such as "applied learning", CTL is used mainly in the areas of adult technical training and continuing education. Fundamentally, CTL is a theoretical approach that incorporates much of the recent research in the cognitive sciences field that recognizes that learning is a complex and multifaceted process that goes beyond the traditional behaviorist approaches.

According to CTL learning occurs only when learners are able to embed the new information and knowledge in their own frames of reference, as the mind is naturally seeking meaning in relation to the person's current environment. To this end, CTL is interested in multiple aspects of any learning environment, indifferent of the actual settings and encourages the instructors to choose and/or design learning environments that incorporate as many different forms of experience as possible (social, physical, cultural, psychological) in working toward the desired learning outcomes.

With roots in the constructivist learning theory as well as in the theories of cognition and learning (Berns & Erickson, 2001; Sandlin, 2000), CTL emphasizes (Imel, 2000) problem solving, recognizes that teaching and learning need to occur in multiple contexts, assists and encourages self-regulated learning, adapts teaching to diverse life contexts, encourages learners to learn from each other, and uses authentic assessment.

What CTL does not specify is how contextualization can be achieved. Therefore, to approach contextualization, other frameworks need to be used. Considering the target of this research, the training process that takes place in organizations before IT implementation or upgrade, Activity Theory (AT) (Kari Kuutti, 1991) can be used to analyze and understand the activities the employees are currently performing and will have to perform using the new technology. In the end AT will be used to design a training environment that would embed end-users' activity in context, thus approaching, along with the main cognitive component, the emotional and attitudinal issues through training.

Activity Theory

Activity theory can be viewed as "a philosophy and cross-disciplinary framework for studying different forms of human activity" (Kariq Kuutti, 1996). In essence, AT is a form of socio-cultural analysis (Nardi, 1996) combined with a theory of mediated action (Kari Kuutti, 1991; Wertsch, 1998) which holds that the relations within

an activity are not direct ones but are mediated by a variety of artifacts. Historically activity theory is rooted in the works of the classical German philosophers Kant and Hegel, the dialectical materialism of Marx and the works of Russian psychologists Vygotsky, Leont'ev, and Luria (Kariq Kuutti, 1996).

According to Leont'ev (1974), "activity is a nonadditive molar unit of life for the material, corporeal subject". Therefore, activities are the basic units of human life and thus the basis for the study of contextuality. In reality, an individual can participate in several activities at any given time (Kari Kuutti, 1991). Kuutti (1991) describes an activity in terms of the following properties: 1) an activity has a motive (object) which tells us why the activity exists; 2) it is a collective phenomenon; 3) it has a subject (individual or collective); 4) it exists in a material environment which is in turn transformed by it; 5) it is a historically developing phenomenon; 6) the forces driving the development of an activity are based on contradictions; 7) it is performed through conscious and purposeful actions of its participants.

Engeström (1987), pursuing the idea of mediation in human activity systems, further develops Lenont'ev's theory by replacing the main binary relationships with mediated ones. In this way, the central relationship between the subject and the object of the activity becomes a relationship mediated by one or more tools. Still, this simple structure is not yet adequate to support a systemic analysis of the systemic relationships of an individual with his/her environment. In consequence, a third main component, the community, was added. Its relationships with the subject and the object are also mediated, by rules in the first case and by the division of labor in the second case. The resulting activity system is represented as shown in Figure 1:

Figure 1 – The activity system model (Engeström, 1999)

Jonassen (2000) further defines the model as follows:

- Subject – individual or group of individuals engaged in the activity;
- Object – physical, mental, or symbolic artifacts produced by the system;
- Tools – any tools, sign systems, theories, and procedures that mediate the relationship between subject and object. They can be anything used in the transformation process;
- Rules – consist of regulation, laws, policies, conventions that constrain the activity system as well as of social norms, standards and relationships within the community that guide to some degree the subject's actions;
- Community – is made of individuals and groups of individuals that focus at least part of their activity on the object;

- Division of labor – refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status inside an organization;
- Outcome – represents the intention of the activity system.

Further analysis shows that an activity system is composed of four main subsystems: production, consumption, exchange, and distribution. The top triangle, the production subsystem, formed between subject, tools, and object, is interested in the process through which the subject acts on the object using the available tools to produce the outcome. It is generally regarded as being the most important of the four subsystems of an activity system (Jonassen, 2000).

The consumption subsystem describes how the subject and the community of which the subject part of act together on the object. Because the subject can be part of many activity systems, the consumption subsystem represents a fundamental contradiction as the subject and the community have to divide their efforts between the many activities they are involved in.

The distribution subsystem shows how the activities are divided among subjects and community based on social laws and expectations (division of labor), both horizontally, as a division of tasks, and vertically as a division of power and status.

The exchange subsystem both regulates the activities in terms of personal needs and defines the rules that constrain the activity and the community with which the subject interacts. It creates the framework for defining the work culture and climate for all individuals and groups involved in an activity system.

The Contextual Training and Learning framework and Activity Theory provide the rationale for contextualizing technical training and the means of doing it. The remaining question is about how technical training can be anchored in the realm of information technology acceptance. For this purpose the present research proposes the use of a third theoretical framework, the Technology Acceptance Model (Davis, 1989).

Information Technology Acceptance and the Technology Acceptance Model

A review of the literature shows that considerable research efforts have been directed toward understanding and predicting technology acceptance and use. Among them, the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), with roots in the social psychology field, holds that a person's attitude toward a behavior is determined by that individual's beliefs about the behavior's consequences. Another theoretical framework, Theory of Planned Behavior (TPB) (Armitage & Conner, 2001; Taylor & Todd, 1995) shows that attitudes, subjective norms, and perceived behavioral control are direct determinants of intentions, which in turn influence behavior. Also, Diffusion of Innovation Theory (DoI) (Moore & Benbasat, 1991; Rogers, 1993; Tornatzky & Klein, 1982) seeks to identify salient perceived characteristics of technology that may be expected to influence user adoption of technology.

Rooted in these three theoretical frameworks, Davis' Technology Acceptance Model (TAM) (Davis, 1989) offers a more focused approach to understanding and predicting technology acceptance. The initial model proposed by Davis in 1989 considers two key determinants of the intention to use IT: perceived usefulness (PU) as the degree to which a user believes that the use of the technology will bring both personal and work related benefits, and perceived ease-of-use (PEoU) as the degree to which the user believes that the system will be easy to use and learn and that the amount of effort to operate it in the future will be low.

Figure 2 – Davis' Technology Acceptance Model

TAM, shown in Figure 2, proposes that the user's perceptions of technology usefulness and of its ease-of-use are the main determinant factors of the user's attitude toward using the system. Consistent with the theory of reasoned action, behavioral intentions to use are determinants for the attitudes toward using the system which, according to the TAM model, at their turn determine the actual system use. In addition to the relationships described above, TAM proposes a direct relationship between PU and the behavioral intention to use.

Since its first appearance in the research literature in 1989, TAM has been tested and validated in various contexts, on various technologies, different types of subjects, and across cultures. From a technology point of view in the last 15 years, studies on the following groups of technologies have been reported:

- Use of spreadsheets (Chau, 1996; Mathieson, 1991);
- Adoption and utilization of personal computers (Moore & Benbasat, 1991; Rose & Straub, 1998; Thompson *et al.*, 1991);
- Use of word processors (Chau, 1996; Davis *et al.*, 1992);
- Self-reported and actual use of e-mail, fax and voice mail (Adams *et al.*, 1992; W. W. Chin & Todd, 1995; Gefen & Straub, 1997; Straub *et al.*, 1997; Straub *et al.*, 1995; Subramanian, 1994; Szajna, 1996; Venkatesh & Davis, 1994);
- Use of geographic decision support systems (GDSS) (Sambamurthy & Chin, 1994);
- Intended use of Internet based applications (Venkatesh, 1999);
- E-commerce and online shopping (Gefen *et al.*, 2003b; Gefen & Straub, 2000; Olson & Boyer, 2003);
- Intended adoption of a new enterprise resource planning system (Gefen, 2000);

Researchers in the field also made attempts to extend the initial Technology acceptance model to account for a variety of other intrinsic and extrinsic factors such as:

- Mood (Venkatesh & Speier, 1999);
- Intrinsic and extrinsic motivation (Venkatesh & Speier, 1999; Venkatesh *et al.*, 2002);
- Cultural differences such as uncertainty avoidance and power distance (Zakour, 2004);
- Psychological attachment (Malhotra & Galletta, 1999);
- Performance and social expectations (Lee *et al.*, 2003);
- Time span (Chau, 1996);
- Social awareness (Bjorn *et al.*);
- Computer attitude and self-efficacy (Chau & Hu, 2001; Compeau & Higgins, 1995; Igbaria & Iivari, 1995; Yi & Hwang, 2003);
- Perceived user resources (Wayne W. Chin *et al.*, 2001);
- Trust (Dahlberg *et al.*, 2003; Gefen *et al.*, 2003a; Gefen et al., 2003b);
- Task-technology fit constructs (Dishaw & Strong, 1999);
- Gender differences (Gefen & Straub, 1997);
- Age differences (Morris & Venkatesh, 2000).

Gefen & Straub (2000) shows that Davis' TAM model is stable and has high predictive power. Therefore, the survey-based research instrument used in TAM research to measure acceptance has also been proven stable and adaptable to various contexts.

Despite all these efforts, TAM is a descriptive/predictive model which does not provide a framework that can be used by organizations to overcome or at least reduce information technology acceptance issues during IT implementation or upgrade. Therefore in the context of this research, which proposes the use of contextualized training to approach IT acceptance issues, the TAM model will inform the Activity Theory framework, while the TAM survey tool will be used to measure and predict technology acceptance of the IT end users as a mean to evaluate the effectiveness of the resulted training activities.

Theoretical Model Development

A small section of research in TAM is interested in the effects of training on technology acceptance. A further analysis shows that the existing literature falls in one of the following two categories:

- Creating/inducing a state of playfulness among users, through interventions that tap enjoyment (Starbuck & Webster, 1991; Webster & Martocchio, 1992; Venkatesh & Speier, 1999; Venkatesh, 1999 & 2002);
- Use of procedural training as antecedent for the Perceived Ease of Use (Venkatesh & Davis, 1996);

Almost unanimously, the results show that technology acceptance issues can be diminished through the use of training interventions. Considering the TAM model (Figure 2), the problem of this research is that it only approaches the Perceived Ease of Use (PEoU). But the TAM model also includes Perceived Usefulness (PU) as determinant for technology acceptance which has, according to existing research, a more powerful determinant for attitudes than PEoU. It is expected that a training intervention that would approach PU along with PEoU would have a much larger impact on the end-users' acceptance of technology.

To understand the gap a revised version of the taxonomy of learning proposed by Anderson et. al (2001) will be used to extend the TAM model (Figure 3).

The Cognitive Process Dimension

	Remember	Understand	Apply	Analyze	Evaluate	Create
	Recognize Recall	Interpret Exemplify Classify Summarize Infer Compare Explain Understand	Execute Implement	Differentiate Organize Attribute	Check Critique	Generate Plan Produce
Declarative/ Factual Knowledge	Factual What?					
Structural/ Conceptual Knowledge		Conceptual What?		Structural Why?		
Procedural Knowledge			Procedural How?			
Meta-cognitive Knowledge						Reflective Synergy

Figure 3 - Taxonomy of learning (adapted from Anderson et. al. 2001)

Returning to the research on training done in the TAM area one can see that at the most, current training practices deliver declarative/factual and procedural knowledge to the trainees. Based on the presented taxonomy, by leaving out the structural/conceptual knowledge the trainees are missing essential cognitive abilities related to understanding, analyzing and evaluating the technology and its impact.

If the declarative/factual and procedural knowledge is more about the use of the information technology, the structural/conceptual knowledge is fully contextualized and provides the trainees with the ability to understand the place the new technology and their role, as IT users, in the organizational business processes based on a larger organizational picture.

Figure 4 - Proposed research model

Considering this assertion, this research will attempt to develop methods to contextualize training by redesigning the current training activities to incorporate structural/conceptual knowledge. In the context offered by the TAM model, this approach would provide support for the Perceived Usefulness determinant of the end-users' attitudes. The resulting theoretical model is shown in figure 4.

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In Figure 4 the dotted lines show existing research, while the continuous ones represent the proposed relationships and effects. The line thickness indicates the strength of the relationship. Considering the proposed model, it is expected that the structural/conceptual knowledge would influence primarily PU, but will also have a lower impact on PEoU also.

The forth knowledge dimension, metacognition is an elusive concept, very difficult to measure. Also, due to various restrictions, such as time limitations, it would be difficult to help the trainees build metacognitive abilities during training. Therefore, the influence of metacognition on attitudes and behaviors will not be studied.

The Research Question

Considering the theoretical frameworks presented above is expected that contextualizing training in the trainees' workplace and work life will have a positive impact on the easiness with which will accept the technology on which training is delivered.

Technical training is an ongoing process at the target organization. Therefore, considering the wide range of potential subject and technologies that are planned to be implemented and the timeline of this research, a more generic research question is proposed:

"*To what degree does a contextualized training program, designed to target specific factors that influence perceived usefulness and perceived ease-of-use have a positive impact on end-user technology acceptance levels.*" Considering the bounding conditions presented above, this paper proposes the following research framework which has the potential to become a design roadmap for technical training activities, if the research results will support the assumption that contextualized training can improve technology acceptance.

Research Plan

Current negotiations with the training department of the target organization provide some bounding conditions and support for this research:

- The organization is currently delivering short (up to two days) training sessions, of which many span over three to four hours;
- Only up to 15 individuals are being trained in one session;
- If the number of trainees is larger than 15, separate training sessions will be offered;
- The organization decides what topic the training will have and when & where this training will be delivered;
- Diverse training topics are available, ranging from the use of Microsoft Outlook to manage e-mail messages to the use of specific module of the organization-wide ERP (Enterprise Resource Planning) software;
- Many training sessions are repeated at various intervals to cover the employees that were recently hired.

On one side, the shortness of the training sessions will make it almost impossible to approach at least one of the research model components, the metacognition. On the other side, short, repetitive training sessions on the same subject, will provide the opportunity to use a quasi-experimental approach, in which some of the training sessions will not receive any treatment, while for others the treatment will be present. The same research process will be applied to both groups.

On a larger scale, this situation also provides support for the use of a specific research methodology - design based research (Jonassen *et al.*, 2006). The assumption of design-based research is that instructional design should fundamentally be a research process rather than a procedural process. For the purpose of this study, the design based research approach is used toward reaching a potential normative training design process that is thought to be attainable as an outcome of multiple iterations.

The small number of trainees that usually join a training session makes possible the use of a wider variety of training interventions, such as hands-on training, one-to-one conversations etc., compared to what would be feasible for a larger group of people.

In addition, based on some initial observations of a couple of training sessions and on the interview with the training department manager, the currently delivered training can be clearly classified as procedural. Moreover, the observations show that the majority of the questions asked by the trainees were mainly related to structural/conceptual knowledge ("who will input this information if I'm not the one doing it?", "What reports are managers running based on the information I'm entering into the system?"). Therefore, without any attempt to generalize to other organizations, the proposed research model fits well in the existing context.

In an attempt to find an answer to the research questions, the following timeline has been developed (Figure 5).
Note: The Technology Acceptance Model instrument will be used for assessment in pre- and post-tests.

Figure 5 - The research process

Research Steps	Snapshot using AT		Training design	Training delivery	Assessment	Snapshot using AT
Target	Employee activity system	1. SME 2. Current training	Training activities	Approach previously found issues	Training related variables	Post implementation employee activity system
Objective(s) & Outcomes	Find existing systemic tensions	1. Find potential effects of the new technology. 2. Find what is addressed by existing training.	Contextualized training program based on AT analysis results	Deliver the contextualized training	Assessment of training effectiveness	Find systemic tensions after IT implementation

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Three data collection methods are being considered: observations, interviews, and focus groups. Observations (Patton, 2002, p. 21) will be conducted during the training session(s) and will focus on the added training intervention and trainees' questions. All training sessions will be videotaped.

Semi-structured interviews (Patton, 2002, p. 343) will be conducted face-to-face in both the initial and final stages of the research. The interview will be videotaped or audio taped, depending on the location. The interview will approach two categories of topics. One category is aimed at positioning the subject in his or her activity system, relative to a known set of parameters resulted from existing research such as motivation, performance, expectations, etc. The second category is aimed at understanding more specific, contextual factors.

Focus groups (Patton, 2002, p. 385) will be used in both training design activity and as part of the training assessment process. The activities of the focus groups will be videotaped. Several focus groups will be organized to design the training.

A second use of the focus group will be conducted to assess training effectiveness. Because assessment is dependent on the training intervention, it will be developed together with the training design activities. Therefore, any instruments used in the training assessment focus group will be developed at the same time too and are not available at the time of this writing.

Due to the nature of the research and to the variety of theories and frameworks involved in its development, the unit of analysis will vary depending on the research activity. During some of the research steps, the use of the Activity Theory suggests the employee's activity system as the main unit of analysis, while for the assessment of the training outcomes for example the individual will be the focus of the research activities.

Sample and sample size is also dependent on the research activity. Overall, the total number of employees in the target organization represents the population considered for this research. Sample selection is bounded by certain limitation the researchers face at the target organization. Considering the bounding conditions discussed in the research context subchapter, a combination of purposeful typical case and convenience sampling methodologies (Patton, 2002, p. 236, 241) is considered.

The participants in the training sessions and in the study will be determined by the training schedule designed by the organization at the time of the research. From the employees that will be in the training session the researchers will purposefully select not more than a couple individuals for the initial part of the research, the analysis of the employee's activity system so that the subjects will be representative for the larger population.

Research Limitations and Concerns

Several concerns and limitations need to be considered, such as the elements that are unknown to the researcher(s) when developing the research plan (e.g. training focus or specific context), issues related to access, as well as the extent of the research. As previously explained the researcher does not have knowledge of the specific IT or section of IT on which the training will be conducted at the time of the research. This particular situation puts the researcher in the situation of developing more comprehensive (and in the end more vague) instruments.

Also, since the focus of the training and its context are unknown, data analysis (steps 1 & 2) and the development of the training intervention will have to take place in a very limited time slot to maintain at minimum the perturbations the normal activities of the training department. In this context, a pilot study might be feasible to be conducted to develop the initial analysis instruments (e.g. basic coding schemes)

The trainers' ability to apply the treatment effectively to the trainees has to be considered also. A possible solution to this problem is to have the trainers participate in the training development process to help them better understand the intended outcomes. In addition, their commitment to the idea of this research and training interventions needs to be secured.

Many other issues can be also considered, such as access to the training sessions and the subjects, especially for those employees that work with sensitive information, the researcher's interviewing abilities, or any potential language barriers in this particular case.

In the end, one important issue needs to be approached – the extent of the research, both in time and resources. Therefore, a pilot study will be run first, which if shows potential validity of the proposed model, will be the foundation for further resource allocation.

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Journal Content Analysis of ETR&D and the Journal of Educational Technology of Korea.

Il-Hyun Jo
Chuncheon National University of Education
Korea

Abstract

The study analyzed the topics and the types of the selected articles from the 20-year-old Journal of Educational Technology(JET), flagship journal of the Korean Society of Educational Technology. Further the results were compared with those of the Educational Technology Research & Development journal. Results indicate that the JET has grown in terms of quantity and quality since its birth 20 years ago. The JET seems to be independent as a young adult. Some issues and concerns also were identified: The articles of the JET are more inclined to Experimental design in terms of research type, and to Design in terms of research topic. Balance across Types and Topics needs be kept for long-term, healthier growth. The emergence of e-Learning and high technology of Korea offered opportunities to the field. However, the monopoly of e-Learning that consumes most of the limited space of the JET raises a red flag. More balanced and quality-oriented endeavors were suggested for another 20 years coming.
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Introduction

Background

The state of the refereed journals is frequently indicative of the status of the research in that field. The field of educational technology, whenever it encountered critical moment to make decisions, has looked back and learned from the past by analyzing major journals (Dick & Dick, 1989; Klein, 1997). The Korean Society of Educational Technology (KSET), the first professional organization of educational technologists in Korea, has been playing a major role to learn, practice, and share the knowledge in this young field. This year KSET celebrates its 20th anniversary. Now is time to look back at the Society's history in order to prepare for the future.

The purpose of the study is to address the history of the research in educational technology in Korea by comparing the Journal of Educational Technology (JET), flagship journal of KSET, with the Educational Technology Research & Development (ETR&D) journal. The result of the study will serve as a guide for educational technologists from Korea and the USA in navigating toward future research and practice.

The Journal of Educational Technology

The Korean Society of Educational Technology (KSET) began publishing the JET in 1985 to "promote and encourage scholarly work of an empirical and theoretical nature that relates to educational technology in Korea"(Lee, 1985. p.1). Since then the JET has been published for 20 years with 408 items presented in 21 volumes. Currently the journal is published four times a year and has an annual subscription rate of over 800. More detailed information on the quantity growth of the journal is shown below at <Table 1>.

<Table 1> Growth of the JET

Year	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
volume	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
# issues	1	1	1	1	1	1	1	0	1	1	2	2	2	3	3	4	4	4	4	4	
#article	10	8	10	11	8	12	11	15	11	14	19	28	24	54	54	69	30	51	51	42	

Method

Sample Articles

For the comparative purpose of the study, 228 articles from both journals were selected for study samples. All of the articles published in the two journals are from the years of 1985-1986, 1995-1996, and 2003-2004. The JET does not have Book Reviews and International sections, therefore only articles from the Research Section and Development Section of ETR&D were included in this study. In total 228 articles from both journals were included in this study(See Table 2).

	Early Stage (1985~1986)	Middle Stage (1995-1996)	Recent Stage (2003-2004)	Total
JET (vol #)	18 (1-2)	42 (11-12)	50 (19-20)	110
ETR&D (vol #)	34 (33-34)	42 (43-44)	42 (51-52)	118

<Table 2> Number of Target Articles

Coding Criteria and Descriptors

(1) Author

For information about authors, the name, gender, and information of the affiliation of the first author and number of co-authors were analyzed. Type of the first author's affiliations were categorized as: 1) Academia (Higher Ed); 2) Research Institute (non-university sponsored); 3) K-12 schools; 4) Private Organizations (& Businesses); and 5) Public Organizations (& Government).

(2) Type

A 9-category approach, a revised version of Dick and Dick's 6-category classification, was utilized for the analysis of the Type of the content. The category's 9-descriptors are: 1) Literature review: a summary of literature, sometimes a critique and sometimes as a statement of the state of the art; 2) Methodological article: a new model or procedure for carrying out a technical activity; 3) Theoretical article: one which primarily draws upon and contributes to the theoretical literature in the field; 4) Empirical research/Experimental; 5) Empirical research/Qualitative; 6) Empirical research/Survey; 7) Descriptive study: a presentation of information about a particular program or event, with little or no use of data; 8) Evaluation study: a representation of information to describe the effectiveness of a particular program or method usually in an applied setting; and 9) Professional article: a description of topics dealing with the profession of instructional technology, such as determination of competencies or descriptions of internship program(Dick & Dick, 1989. p.82).

(3) Topic

For Topic, this study employs AECT's 5-category classification, which includes 1) Design (ISD, message design, message design, instructional strategies/methods, learner characteristics); 2) Development (media utilization, diffusion of innovation, implementation/institutionalization, policies/regulations); 3) Management (project management, resource management, delivery system management, information management); 4) Evaluation (problem analysis, criterion-referenced measurement, formative evaluation, summative evaluation); and 5) Others (introduction of ideas, learning environment, learning theories) (Seels & Richey, 1994).

(4) Citation

Today's academic communities are regarded as a knowledge sharing network. In this network, each article serves as the nodes that are linked with each other by cross-citation. A brief cross-citation analysis was conducted to find out how the two journals were interrelated and to see how ETR&D helped the infant journal grow into an independent and productive youth. For this purpose, the citations, both within and between the two comparative journals and countries, were examined.

3) Coding Process

The researcher and his assistant served as raters for coding and indexing categorical data. The researcher earned his PhD from one of the major Instructional Systems programs in the USA and has been working as an instructional designer and researcher for more than 15 years. The research assistant has a master's degree in educational technology and is pursuing for a doctoral degree. To enhance inter-rater agreement, the researchers studied the coding criteria and descriptors carefully, conducting the raters' workshops two times with actual samples that were used for Yang and Chung's work (Yang & Chung, 2005). Overall Cohen's Kappa of the final coding reached 0.75. Data coded were entered into SPSS 10.1 (Korean version) for relevant statistical analysis.

Results

Author Categories

(1) First Author's Basic Information

In ETR&D, 106 unique first authors contributed 118 articles whereas 98 unique first authors contributed 110 articles in JET. More male authors were seen in ETR&D (female 59.3%. female 33.1, unidentified 7.6%) while

the JET was represented more by female authors (55.5%. male 44.5%). The level of collaboration was measured by the number of co-authors. The average number of coauthors for JET was 1.34, which is small than ETR&D's 2.27. However, as the community grows, the number of collaborative works has increased from 1.00 to 1.66 (See Table 3).

<Table 3> Average Number of Authors

	Early	Middle	Current	Total
JET	1.00	1.10	1.66	1.34
ETR&D	2.06	2.10	2.62	2.27

In its early stage, most pieces shown in the JET dealt with introductory and philosophical issues. As the JET matured, the contributors had opportunities for applying knowledge and skills learned to instructional design projects and wrote up articles. Design and development projects usually involve more than one educational technologists. Korea, a country with high-end computers and Internet environment, requires educational technologists to assume active roles in high-tech instructional solutions, providing ample opportunities for co-working in intra-disciplinary, intra-institute projects. In this instructional design environment of Korea, more co-authored pieces were produced than in years past.

(2) First Author's Affiliation

Most contributors to the JET are from academia. However, when compared with ETR&D (94.9%) the portion of this category was smaller (81.8%). The remaining 18% of the JET's content was submitted by authors from Research Institute such as KEDI (Korea Educational development Institute) and private practitioners. Korea's fast growth in the computer and telecommunications industry provided the field with a rich environment for applying theories and skills. Industrial leaders like Samsung, POSCO, and Korea Telecom with full-time educational technologists with higher-level degrees were able generate practical articles.

However, as the JET required a stricter research methodology and more rigorous approach for acceptable articles in order to keep its high quality, the number of the professional researchers' contributions was getting larger. During recent stage (2003-2004), the portion of authors coming from academia reached 88%, rapidly catching up with that of ETR&D (95%) (See Figure 1).

[Figure 1] Comparison of Type of First Author Affiliations in Both Journals

Frequently seen names of the affiliations of the first authors are shown <Table 4> below. In Korea, the largest – in terms of student enrollment - and oldest academic institute is Ewha Womans University, followed by Hanyang University. Therefore, especially in early stages, these two institutes played major roles. As KSET matures and the number of universities with educational technology programs increases, the readers of the JET will enjoy a greater variety of articles from many institutes with diverse academic and cultural traditions.

<Table 4> Affiliations with First Authors in Both Journals

	Early Stage	Middle Stage	Current Stage
JET	4 pieces(Hanyang U.), 3pieces(Ewha Womans U.), 2pieces(Korea U., Korea Educational Development Institute(KEDI))	5 pieces(KEDI) 4pieces(Seonal Nat'l U., Ewha Womans U.), 3pieces(Hanyang U., Samsung HRD Center), 2pieces(Korea Telecom, Kyunghee U.)	6pieces(Seoul Nat'l U.) 3pieces(Andong Nat'l U., Chonnam Nat'l U., Hanyang U., Mokwon U., Korea Nat'l Open U., Kyeongin Nat'l U. of Edu, Kyunghee, Kwnagju Taebong Elem. School)
ETR&D	3 pieces(Ohio State) 2pieces(FSU, Harvard, PSU, U.of Colorado, U. of Denver, U. of Minnesota, USC, U. of Western Ontario(Canada))	3 pieces(FSU, UGA) 2pieces(ASU, IU, PSU, U.of Memphis, U.of Minnesota, McGill U., James Cook U(Canada)	4 pieces(Open U. of Netherlands) 2 pieces(Iowa State U., PSU, U.of Missouri, U. of Twente(the Netherlands))

(2) Type of Study

In terms of research Type, the JET invited a variety of types of studies during last twenty years while ETR&D showed consistency in its assortment of types of research. One of interesting findings in Type study was the portion changes across the stages of the Empirical (experimental) and Theoretical pieces. The number of Empirical (experimental) type studies on the JET grew rapidly; from 5.6% (early), 31.0% (middle), and 44.0% (recent). The trend is sharply contrasted with that of ETR&D. During the same period of time, the portion of this type of research was decreasing in ETR&D from its early, middle, and recent stages as 47.1%, 40.5%, and 33.3%, respectively. The field of educational technology should be based more on empirical studies than non-empirical/philosophical alternatives (Driscoll & Dick, 1999). Furthermore, when considering that many researchers addressing the naturalistic and formative type of methods are more preferable to controlled situations like randomized experimental design(Driscoll & Dick, 1999; Lee, 2005; Richey, 1998), this trend seems problematic.

In both comparison journals the portion of Evaluation type of research are growing. In ETR&D, Evaluation studies grew from 2.9%, 9.5%, and 16.7% while in JET the proportion increased from 0%, 2.4%, and 8.0%. As an application-oriented discipline, our colleagues from the US and Korea seem to have worked harder to find more empirical evidences of their solutions. The portion of Evaluation studies may not be large enough, but we have exerted more efforts than before.

The proportion of Literature reviews in the JET was relatively large. In its early stage (72.2%) and middle stage (31.0%) before it shrank down to 6.0% in its recent stage. In its early stage, the JET needed basic ideas and theories of the field, and articles that reviewed and introduced then state-of-the-art literature were appropriate response to the needs. Ten years later, because of the inflow of the Constructivist influence and the unseen Web-based Instruction, the portion of Literature reviews was still one of the largest pieces. In recent stage where most of our colleagues in Korea were busy in Designing e-Learning, the proportion of Literature review went down to 6.0%, which is about the same with ETR&D's average 8.5%.

[Figure 2] Type of Research in Both Journals

(3) Topic of Study

During last twenty years of the JET, Design topic has gradually increased whereas Development pieces decreased. The number of Design topic studies of the JET increased rapidly; from 17.6% (early), to 47.6% (middle), and to 62.0% (recent). As with the Type, the trend of Topic went in the opposite direction to that of ETR&D, which decreased 50.0% (early), 45.2% (middle), and 26.2% (recent). In contrast, the number of Development topic studies of the JET shrank gradually from 58.8% (early), 23.8% (middle), and 10.0% (recent), while that of ETR&D increased from 20.6% (early), 31.0% (middle), and 35.7% (recent). According to Seels & Richey's classification, Design category includes Instructional strategies/methods and learner characteristics. There seem two reasons for this trend. First, the needs of design research grew in Korea and the researchers responded to them promptly. Internet and e-Learning showed phenomenal growth rates and the demands for the introduction of valid and effective design strategies were so strong. Many businesses, government, and K-12 educators wanted to have their own design models for the new learning environment. Another reason could be correlated with the increase of Empirical(experimental) type research. As Driscoll & Dick (1999) and Lee, S (2005) discussed, many researchers from higher education who pursue this for their tenure found it easier to conduct "quick and dirty" empirical studies(See Figure 3).

[Figure 3] Topic of Research in Both Journals

It can be easily recognized that the portion of "Utilization" , "Management", and "Evaluation" research consistently has been small in JET. A reason of the deficiency of studies on this practical research area may be found from the background of the contributors. As discussed earlier, most of the contributors of both journals are

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working at academic institutes. In Korea, for professors and professional researchers from research institutes, it is rare to get involved with year-long design-development projects. They do mostly analysis and design, and sometimes evaluation, but not implementation, which is done by field managers. The field managers usually do not have time to write journal papers that require methodological rigor. While analyzing the content of the articles of the JET, another interesting trend was found in the recent stage. Out of fifty articles in the recent stage, 42 articles (84%) were directly related to the Internet. Words like "Web-Based", "Internet", "Cyber", "ICT" could be found in almost every titles of the recent articles.

(4) Citation Analysis

In total, the articles on the JET cited 32.1 references while those shown on ETR&D had 37.8 citations. The number of cited references increased from 19 to 41.7 during the last twenty years. Out of the 32.1 citations, 1.2 (3.7%) are from the other articles of the JET itself, and 1.0 (3.2%) are from ETR&D. Not a single article from JET was cited by ETR&D in the last 20 years.

In terms of the nationality of the citations, the JET is still highly dependent on foreign references (81%). However, in the current stage, the portion of domestic references increased from 9.3% to 29.3%. One of the reasons of the large portion of foreign references may be the impact of several dissertation-based articles published in the JET. These articles were based on the contributors doctoral dissertations earned from the US institutes. Therefore these articles usually have a long and non-Korean reference list that they used for their dissertations.

As the research and practice of educational technology in Korea got its momentum, the portion of domestic references cited in the JET has increased gradually -- from 16.1% (middle stage) to 29.5% (recent stage) of total citation (See Table 5). Following the KSET, there are more academic societies where educational technologists join as members nowadays. These younger societies, such as The Korean Association of Educational Information and Media, and The Society of Computer Education, provide publication opportunities to educational technologists through their own academic journals, which are commonly cited to the JET these days

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<Table 5> Citations in Both Journals

Average # of Citation		Early	middle	current	average
		19	35.6	41.7	32.1
Inter-Journals	JET(self)	0	0.8	2.8	1.2
	%	0.0%	2.2%	6.7%	3.7%
	ETR&D	0.6	1.5	1	1.0
	%	3.2%	4.2%	2.4%	3.2%
Inter-National	Domestic	2.9	3.3	12.2	6.1
	%	15.3%	9.3%	29.3%	19.1%
	Foreign	16.1	32.4	29.5	26.0
	%	84.7%	91.0%	70.7%	81.0%

Summary and Discussion

This study indicates that the Journal of Educational Technology published by the Korea Society of Educational Technology has grown in terms of quantity and quality since its birth 20 years ago. The JET seems to get more independent as it grows. Some issues and concerns also were identified. The articles of the JET are more inclined to Experimental design in terms of research type, and to Design in terms of research topic. Balance across Types and Topics needs be kept for long-term growth. The emergence of e-Learning and high technology of Korea offered opportunities to the field. However, the monopoly of e-Learning that consumes most of the limited space of the JET raised a red flag.

In sum, since its birth 20 years ago, the JET and the community of educational technologists in Korea haw grown steadily. Larger bodies of researcher and professionals and higher education programs that generate future members of the society are only some indicators for the growth. Now, it is time to pursue for maturity as well as physical growth. More balanced and quality-oriented endeavors are expected in the next 20 years.

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Exploring the Nature of Training Distance Education Faculty

Haijun Kang
Pennsylvania State University

Introduction

In the 1990s, along with the increasing number of distance education courses was the critical request of more research on faculty who teach at a distance (Beaudoin, 1990; Dillon & Walsh, 1992). In the 2000s, the situation has improved and most distance education institutions have been giving more attention to their faculty teaching at a distance. Evidences are the increasing number of the training programs for distance education faculty (NCES, 1998) and the increasing number of research on faculty professional deveopment that have been conducted in the past decade. Despite the fact that those research have touched every aspect of faculty professional development including participation motivation, faculty recruitment, workload, etc., very few of them have successfully applied a systems approach. The present study made the attempt of introducing a systems approach to radically look at one important component of faculty professional development - the training of disatnce education fauclty, from an innovative perspective.

Statement of Problem

As Olcott and Wright (1995) states, "Without well-trained and equitably rewarded distance education faculty, there would be no programs" (p. 11). This perception has been widely accepted by practitioners in the past decade. The National Center for Education Statistics' (NCES, 1998) report found that 60 percent of higher education institutions offering distance education courses have designed training programs for their distance education faculty. To name some, Pennsylvania State University's World Campus has begun providing their faculty training programs since 1995; University of Florida's College of Agricultural and Life Sciences (CALS) developed a comprehensive faculty training program called "Distance Education Faculty Training Program"; and, Illinois Online Network (ION), an online faculty development initiative, has provided training programs to over 2000 individual faculty members throughout the state since 1997.

However, literatures have shown that a large number of distance education faculty don't buy into their institutions' efforts. Gunawardena (1990) indicates that "it is crucial to provide faculty training …it is equally important to familiarize them [faculty] with the total communication process…" (p42); 94.9% subjects in Nhahi's research (1999) emphasized the need and importance of training; Schifter (2002, 2004) noted that one of the inhibitors that prevent faculty from teaching at a distance is the insufficient training provided by institution. There are also many other research that ended up with similar findings (Wilson, 1998; Betts, 1998; Clay, 1999; Olcott & Wright, 1995; Wolcott, 2003).

Today's situation, hence, seems to be that while distance education institutions are making efforts to design and offer training to their faculty, their faculty are still complaining about being lacking of training support. How has the situation fallen into such a dilemma? Why these training programs' quantity isn't equal to their quality? I think there are two types of questions that both researchers and practitioners in the field need to ask themselves: (1) Does the literature reflect the real practice? If so, how can we persuade our government and education institution to continuously invest money and labor into designing and delivering training to distance education faculty if our "customers" do not buy into that? (2) But what if what literature has expressed is inconsistent with the reality? Shouldn't we, the researchers, reflect on the researches that have been done and published? Shouldn't we, the researchers, assess the assumptions behind those researches, methodologies widely applied, and even seminal theories/works that have been widely cited?

The discrepancy between the practice and the literature triggered my interest of exploring this phenomenon. From this study, I wanted to have a better understanding of the nature of training distance education faculty by exploring the phenomenon from a systems approach. My belief was that a better understanding of the nature of training would help to explain why there is a discrepancy between the practice and the literature. Introducing a systems approach – Levis' training and development framework, this study tried to answer this question: What is the nature of training distance education faculty? This overarching question has two sub-questions: what are distance education faculty's understandings and experiences of attending training.

Theoretical Framework

In this study, systems approach was introduced. As Moore and Kearsley (2005) state in their 2nd edition of

the book Distance Education: a Systems View, that "adopting a systems approach is the secret of successful practice" (p8). Distance education system is like our body and "building up one part without any attention to the others is also likely to result in damage to the whole body" (Moore & Kearsley, 2005, p8). Training is an indispensable part of the distance education system that support distance education faculty and shouldn't be built up separately from other parts of the whole system. Olcott and Wright's (1995) institutional faculty support framework is a good model for better understanding of increasing faculty participation in distance education. Similar to their research approach, I made the effort of introducing a corporate training framework, Levis' (1997) training and development framework, into this study to explore the notion of training distance education faculty and to address the question of how to fully take advantage of training to satisfy people involved in the training.

Levis stated his training and development framework in the Editorial of the first issue of the International Journal of Training and Development in 1997. According to Levis, "The training system may be seen as comprising organization, strategy, policy and practice" (1997, p. 3). Inputs to the training system are the major factors influencing the training outputs. Inputs can be seen to include the commitments and base level of skills at both micro and macro level while training outputs are the effects of training on individual, organizational and national performance. External stimuli also play an important role in training, such as product/service market and the labor market. Especially at the era of information/knowledge-based society, various environmental and organizational changes have been seen as the principal determinants of training. Today's training is not physical-skill-based training but human-competency-based training. It aims as improving human capital in order to meet modern learning organization's need of sustainable development. Figure 1 provided the basic ideas about Levis' conceptual framework.

Figure 1. Training Framework

Training Definition

Training, according to Longman Dictionary of Contemporary English published in 1988, is the act of training or being trained. Merriam-Webster Online Dictionary's definition has two entries for training: (1) training is "the act, process, or method of one that trains and the skill, knowledge, or experience acquired by one that trains; (2) training is "the state of being trained". Combining these two resources, we can see that training has these features: (1) it is a two-way interaction; (2) there should be at least two subjects; (3) one's certain act, process, and method have impact on the training outcomes; (4) one's skill, knowledge, or experience have impact on the training outcomes. One thing we should note here is that Longman Dictionary emphasizes the equally important positions of the subjects involved in the two-way interaction, which means the act of training is equally important to the act of being trained. Merriam-Webster put more weight on the act of training and the competency of trainer which implies that the act of being trained is more likely a passive act. This slight difference reflects people's different understanding or preference while approaching the concept "training" and people's perception of the concept and their preference will inevitably influence their daily life and work as well. For the purpose of this study, it is necessary to have an operational definition for "training".

The operational definition is: training is the act, process, or method that has trainer and trainee equally involved; training requires skill, knowledge, or experience from both trainer and trainee. In this study, (1) trainers include people who initiative, design, deliver, evaluate training program and trainees refer to the people who attend the training program with the expectation of getting something out of training either to solve a problem or to achieve

a goal that is hard to reach without attending the training; (2) training is a two-way communication but not one-way indoctrination and it is expected that both trainer and trainee are actively involved in the act and the process of training (this means that there might be some situation where trainees train trainers). So, in this study, the terms "trainer" and "trainee" are not exclusively absolute – they are just two terms used to name different people who play different role in the process of training.

Literature Review

Two sets of literature were located: distance education faculty professional development and training of distance education faculty. Reviewing the literature on distance education faculty professional development helped me set up a base for this study because training is an indispensable component of faculty professional development; and, reviewing literature on training of distance education faculty would tell me what's going on in the practical field and what have been researched.

Distance Education Faculty Professional Development

There is a wealth of literature on distance education faculty professional development. Dillion and Walsh (1992) reviewed previous research on distance education faculty's professional development and suggested that faculty professional development mainly comprised of faculty characteristics, rewards and incentives, institutional leaderships, linkage and observability (for example, training, trialability, and networking), intellectual property, etc.. Olcott and Wright's (1995) study reviewed the barriers to faculty participation in distance education and designed an institutional support framework to address distance education faculty's professional development. Lynch and Corry's (1998) work on distance education faculty's recruitment, training, and compensation suggested a systematic approach to the planning and development of distance learning materials, instructional methods, and communication infrastructure to help to improve faculty professional development. Clay's (1999) work indicated that faculty development had 4 stages, which were awareness, consideration, implementation, and innovation.

Training Distance Education Faculty

Research on training needs. Clay (1999) indicated that traditional faculty would not be able to accept distance education at the first sight and they would need time and some support. At different stage of the process of recognition and adaptation of distance education, faculty would generate different needs. Training should be directed to address these needs. In another study, Wilson (1998) researched 77 online instructors at the Southern Regional Electronic Campus about their perceptions, practices, and concerns of teaching online courses. Findings indicated 13 concerns that distance education faculty had experienced while teaching distance education courses. Such as, sufficient time to develop and maintain course material, technical support, administrative support, technical training, etc. Further, Wilson emphasized that technical support and technical training was the one that needs more attention because "65% of the instructors rated technical support a major problem despite the fact that 67% of the instructors reported having a department on campus to assist in the technical development of a web course… 61% of the instructors surveyed received no training in web-course development" (1998). Participants of Wilson's study "were aware that technical support services existed but they were not taking advantage of the services, had difficulty accessing the services, or the services were inadequate." Irani and Telg (2002) discovered three common themes from participants' response to their question about what issue was most critical to distance education training. The findings were: instructional methods, planning, and faculty motivation.

Research on training format and content. NCES (1998) reported that the existing training programs had mainly focused on: technologies competency, curriculum development, teaching methods. Clay (1999) offered a list of 8 effective training formats and a list of issues that needed to be addressed in training. Irani and Telg (2002) surveyed training specialists from 14 land-grant institutions on the issue of faculty training and development. Their findings were that most training programs were voluntary and consisted of a variety of delivery formats; individual colleges delivered their own programs even though the universities had training centers. Their study emphasized that exposing faculty to more distance education teaching methods would be one of the major content of training. Gunawardena (1990) indicates that it is important to consider training for faculty not only in the use of technology but also in the principles of learning theory. Dillion and Walsh (1992) concur with Gunawardena that the training programs in existence "concentrate primarily on the operation of technology rather than on how to teach at a distance."

Research on training evaluation. While doing literature review, I have located very few literatures on evaluation of training programs designed for distance education faculty. There were some literature that talked about some training programs that had allocated a part of their training contents to teaching faculty how to evaluate online courses, such as Sturrock's (1983), but most of them didn't touch the issue of evaluating training program itself.

To summary, faculty professional development in general and training in specific have caught both practitioners and researchers' attention for a while. Literature showed that majority training programs had fallen into three categories: skills, teaching pedagogy, and training needs analysis with a primary emphasis on technology skills. Another thing that I've noticed from literature review is that most literatures that had explored the issue of training distance education faculty focused on training's impact on distance education faculty only. The feeling that I've got from literature is that distance education faculty are the only beneficiary and there are no governments and distance education institutions' training outcomes. There is a wealth of literature on training structure and content. Noticing the possible missing part of the literature, I used this study to explore the nature of training distance education faculty to see whether the literature has failed to present the field, or training in practice actually has missed something important, or both literature and training in practice are all in good shape and there is no need to further pursue this topic.

Research Design, Data Collection and Analysis

In this study, I used phenomenological research method which was qualitative in nature because I wanted to have a better understanding of the phenomenon – training distance education faculty. My assumption of choosing phenomenology was that "through dialogue and reflection the quintessential meaning of the experience will be revealed" (Rossman and Rallis, 1998, p72).

This study involved in-depth interviews with 7 faculty members who had attended a variety of training programs. They came from a land-grant higher education institution. This institution has a long history of distance education. The interview was semi-structured and all interviews were digitally recorded. The purpose of semi-structured interview in this research was to filter out those after-thought interpretations and to guide interviewees to only describe their lived experiences. Two onsite observations were conducted as "Observation is fundamental to all qualitative inquiry" (Rossman & Rallis, 1998, p136). The setting for observation was providers' video conference room. Observation data was collected by taking notes and drawing pictures.

Data analysis was done through the process of sorting, categorizing, checking, and coding. Themes emerged through out the whole process of the data analysis.

Findings

The results of this study were organized around the two sub-questions: what are distance education faculty's understanding and experiences of attending training.

What Are Distance Education Faculty's Understanding of Training.

Research participants' understanding of training was similar to most literatures' findings – training should meet distance education faculty's needs (Clay, 1999, Wilson, 1998). Most training programs that the research participants had attended were not mandatory. Faculty selected and attended those training on their own decision. The reason of attending those training was that they had special need and expected to fulfill that need by attending training. The two major needs were technology and teaching pedagogy. Being asked about what was his understanding of training, a participant said "Training is anything that either gives me a new skill or improves the skills that I already have". All but one participant of this study responded that they began to attend training when they knew they were going to teach distance education courses. The purpose of doing so, according to them, was to equip themselves with advanced technology skills and well-vested distance teaching pedagogies so that they could perform well at a distance. The reason that the one participant who didn't attend training before teaching distance education course was that she didn't know until she was called upon to teach the distance education course. What she did was that she took over the course and at the same time, she called institution's distance education faculty support center and attended series of training programs.

What Are Distance Education Faculty's Experiences of Attending Training.

Data analysis reflected that the majority training content was either technology or teaching pedagogy oriented. This result was consistent with most previous research findings (Dillion & Walsh, 1992; Irani & Telg, 2002; Gunawardena, 1990). In this study, all research participants indicated that the training that they had attended were about technology and teaching pedagogy with primary focus on technology. Technology training included training on learning management system, web page production and software that could help them to enhance distance teaching and communication skills. The major formats were one-on-one, web-based, group sessions, etc. Half of the research participants had also taken some training on teaching pedagogy in the forms of symposium, workshop. In those symposiums and workshops, many faculty gathered together and shared with each other their own distance teaching experiences and strategies. The data from the two on-site observations drew the same

conclusion.

While being asked whether they have had good training experiences or bad training experiences, their responses were both positive and negative. They were positive about the training outputs – improvement of technology and teaching methodology competencies. As one participant said enthusiastically, "But, but clearly, the training was absolutely, positively, essentially critical. If I had not had the Angel training I've had, I can tell you right now, I would not be using Angel to this date." What they were not very much happy with was mainly the way the trainers delivered the training. One participant described one bad experience that "It was very long and it was very drown out. …. I almost fell asleep… and the presenter was very boring". All research participants said that they need "hands-on" practice and more time to interact with both trainers and other trainees to have better knowledge and skills retention.

Discussions and Conclusion – Going Beyond Phenomenon

As was indicated in the aforementioned session, not many new findings were discovered from the phenomenological case study. This result provided evidence that current research literature did literally reflect the reality of the field. Therefore, to explain why there is a discrepancy between the literature and the practice of training distance education faculty, it's necessary to bring in new approach – a systems approach. Using Levis' training and development framework, we could easily identify that there are several training features and functions have been missing and underestimated in the context of training distance education faculty.

System Approach One: Unbalanced Relation Between Training and Performance

According to Levis' framework, training output include national, organizational and individual performance. What we have seen from both literature and the above case study was the sole focus on individual performance with primary emphasis on skills and knowledge-based competencies. No enough attention to national and organizational performance has led to the separation of individual goal and organization goal. The separation made the training system not a whole-body system. The typical phenomenon was that many training units of distance education institutions have designed and delivered training only for the purpose of keeping a record to tell people that they have been working sufficiently because there were xx training programs on record.

System Approach Two: Missing Functions of the Training System

According to Levis (1997), training, as a system, should have its organization, strategy, policy and practice. All of these features come together to make training an integrative body system to improve human performance. Training should not be used as a mold to make a teaching tool, not even an individual scholar or professional. Instead, training should assist the growth of a person, the growth of a learning organization and the booming of a civilized nation. Training, I suggest, should have the following functions:

Training system should be a knowledge pool. Training provides individual faculty an opportunity to develop vocational knowledge, which is "historically, culturally, and situationally constituted" and can't be replaced by traditional form of education (Billett, 2002) Training provides a whole picture of the work and specific vocational skills and knowledge, and help faculty to contextualize those that they have learnt from formal education because "vocational practice changes and the requirements for work performance transforms over time" (Billett, 2002). Training can help faculty update their obsolescent technical skills and acquire expertise in new topics so as to face daily rapid changes in time (Bagnasco, et al, 2003).

Training system should serve as a lubricating system. As a lubricant, training can reduce various conflicts between the distance education institutions and their faculty by providing a place for both sides to talk and negotiate. For example, studies reported that faculty's participation and their sustaining interest in distance education have been discounted by barriers from administrative, economic, technological, learner support, etc. (Clark, 1993). Training can provide a pedagogical situation where it becomes possible for both sides to understand more clearly "how [faculty and institution's] needs are constituted, whose interested are served, and in what ways they emerge in the context of their everyday lives" (as cited in Gouthro, 2002, p343). Doing so during training, institutions and faculty can negotiate their interests to reduce barriers intimidating both sides' participation in and commitment to distance education.

Training system should be a seedbed that triggers faculty's role transformation from a traditional teaching role to online instruction role. Training can help faculty develop the capacities enabling them to transfer their experience from brick-based context to tech-based context, make faculty's practice field-free. But this role transformation would unlikely be achieved without intentionality in the organization of workplace activities and support (Billet, 2002).

Limitations of the Study

This study's contribution to the field was limited by the availability of resources, my understanding of the field and the most important my biased perception rooted in my cultural-historical background. As Baptiste (2004a) said that not all phenomenologists "construe the lived experience in the same way", and my effort in this study was to explore the phenomenon "given my interests, expertise, time, resources, and power". Further research is encouraged to test the validity and generaliability of the systems approach that I tried to propose in this study and/or to introduce new approaches into the field to improve the situation.

In regards with the research design, this study only explored trainees' understanding of the nature of training and therefore the result was made based on the one-side opinion. I personally believe that there should be more interesting points come out if further studies also include people from the State level who initiate and evaluate distance education/training programs and people from distance education institutional levels who design, deliver distance education/training programs.

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Effects of Animation on Multi-Level Learning Outcomes: A Meta-Analytic Assessment and Interpretation

Fengfeng Ke
Huifen Lin
Yu-Hui Ching
Francis Dwyer
Pennsylvania State University

Abstract
This meta-analytic research assesses the ability of animation to facilitate multi-level learning (factual knowledge, comprehension, and application) by summarizing the findings of 34 published experimental studies that involve 13515 subjects. All these studies compared animation with static graphics in an instructional setting. Two hundred eighty one effect sizes were generated. Results indicated that generally animation has a small and positive effectiveness in facilitating multi-level learning. It was also found that animation application is not equally effective on different levels of learning. The study provides the foundation for significant hypothesis generation related to future development and the instructional use of animations.

Introduction

Due to the wide scale and increasing availability of computers as an instructional delivery system, many computer-based instructional products have become popular. Among these CBI products, animation has gained people's enthusiasm and been widely used in instruction of various subjects, such as physics, mathematics, mechanics, biology, and computer algorithm.

According to Mayer, Moreno (2002) and Rieber (1991), animation should, in principle, be effective in illustrating spatial-temporal changes. Theoretical assumptions for instructional applications of animation are that animation is better than static graphics at communicating information which involves change over time or directional characteristics, thereby making learning content more concrete, reducing the processing demands in short-term memory, and increasing the potential for successful encoding into long-term memory (Rieber & Kini, 1991).

Assumptions aside, empirical research on the efficacy of animation over static graphics indicates that animation may or may not promote learning, depending on how it is designed and used (e.g. Baek & Layne, 1988; ChanLin, 2001; Spotts & Dwyer, 1996; Rieber, 1990, 1991; Szabo & Poohkay, 1996). Hence an important question on using animation in instruction is, "When will animation facilitate learning?"

Specifically, this question has been examined by a few animation researchers (e.g. ChanLin, 1998, 2000; Hay, 1996; Hegarty and Sims, 1994; Koroghlanian & Klein, 2004; Rieber, 1990; Yang, et al., 2003) who suggest that animation efficacy may vary for different levels of learning objectives, with the differing spatial abilities of students. But their findings are inconclusive. For instance, Beheshti, Breuleux, & Renaud (1994) claimed that animation promoted procedural learning but not descriptive knowledge, while ChanLin (1998) observed that animation promoted both descriptive and procedural learning. Yang, Andre, and Breenbowe (2003) found that higher spatial ability learners benefit more from animation, while Hays (1996) got contradictory conclusion. Therefore, a meta-analytic synthesis of these empirical findings is warranted to present a lucid observation on animation's efficacy in facilitating different levels of learning.

Research Purpose

In general, this meta-analysis seeks to answer the following questions: 1) Does animation compared to static graphics improve different levels of learning achievement and other outcomes related to attitude or learning efficiency? If so, to what extent? 2) Does spatial ability moderate the effects of animation on student achievement and other outcomes? If so, to which direction and to what extent?

Data Sources and Inclusion/Exclusion Criteria

Based on Mayer & Moreno (2002)'s definition, animation in this study refers to a simulated motion picture depicting movement of drawn (or simulated) objects. The animation studies were identified through comprehensive literature searches on computerized bibliographic databases (e.g. ERIC, PsycInfo, Educational Technology Abstracts, Dissertation Abstracts, and Cambridge Scientific Abstracts), major education and technology journals,

conference proceedings, and the reference lists of several reviews. To be included in this review, each study also met the following criteria for inclusion:

- Each study must involve an experimental comparison of animation with static graphics in an instructional setting. Randomization for subject assignment and statistical data for calculating effect sizes must be present.
- The publishing time for each study should be between 1985 and 2004.

Method and Procedures

This study applied meta-analysis to seek answers to the above-mentioned questions. Meta-analysis is defined as "summarizing or integrating the findings obtained from a literature review" from studies that investigated the same topic (Vogt, 1993; Leech, 2003). According to Glass (1976), the purpose of meta-analysis is to integrate and compare the result of several studies by conducting statistical analysis of findings from individual study.

Coding Procedures

All eligible study reports were read and coded on three separate occasions by only one of the authors, with a 1-month interval, to ensure the coding was accurate and consistent. A detailed coding sheet was designed to facilitate the extraction of information from the studies. The authors initiated the development of the codebook by preliminarily reviewing a sample of twenty studies, then doing nomological coding to identify salient study features present in the literature (Abrami, et al., 1988). A comprehensive codebook was constructed, which include the feature categories of "research design," "subjects (e.g. number, prior-knowledge, age)," "subject content," "independent variable(s)," "covariate(s)," "learning outcome (factual knowledge, comprehension, application, attitudes, learning efficiency)," "measurement instruments (e.g. reliability, test items)," "kinds of animation," and "results."

Inter-rater checking and agreement was adopted during studies inclusion and coding process. Disagreements were resolved through discussion and possible recoding. One hundred fifty six manuscripts have been reviewed and thirty four have been selected as complying with the criteria established for inclusion in this meta-analytic procedure.

Outcome Measures

Learning achievement as measured by post-treatment test performance was the primary cognitive learning outcome considered in our meta-analytic review. Based on the descriptions in the reviewed studies, we classified these achievement tests into three cognitive achievement categories: factual knowledge, comprehension, and application (Bloom, 1956).

Among the thirty four studies included in the meta-analysis, nine of them evaluated the effects of animation by comparing the animation and the static graphics groups in not only the accuracy of test response but also the time needed for test or task performance. Effect sizes for both accuracy and speed measures were calculated.

Different from most of the studies, three research projects evaluated learning effectiveness of animation also through attitudes survey. Then, four studies provided measure of time when participants interacting with learning materials (animation versus static graphics). In our meta-analysis, attitudes and material-interacting time were included as two indexes of affective learning outcome (attitudes and engagement) in our meta-analysis.

Where multiple effect sizes were calculated for individual studies, they were averaged to ensure that each unit of analysis contributed just one effect size to the review (Rosenthal, 1991).

Analysis

The index of standardized mean difference effect size that we used was the unbiased estimator d (Glass, et al. 1981). This index is calculated as the difference between the means of the treatment and control groups divided by the pooled standard deviation of the sample and corrected for small sample bias. Calculations of effect sizes and mean weighted effect size were performed using the procedures suggested by Glass et al. (1981), Hedges (1994). The mean effect size was calculated as weighted average, with each effect size being weighted by the inverse of its variance. The procedure gave proportionally greater weight to effect sizes based on larger samples (Shadish & Haddock, 1994). In the interpretation, an effect size of .20 was defined as small, an effect size of .50 as medium, and an effect size of .80 or above as large (Cohen, 1977).

<center>**Results**</center>

Animation on Multi-Level Learning

Thirty four studies included in our meta-analysis reported small or trivial positive effects of animation in promoting learning. The overall mean weighted average effect size was $d_+ = 0.313$, with 95% confidence interval (CI) being 0.277 to 0.349. Based on Cohen's (1977) *U3* measure, it can be interpreted that, on average, students at the animation group improved multi-level learning achievement at a rate of 62%, as compared with 50% in the students at static graphics group. Detailed information on the measurement and individual effect sizes of 34 studies are illustrated in Table 1.

TABLE 1*Studies investigating the effects of animation*

Study investigating the effects of animation on Factual Knowledge

			Accuracy	
Study	**Participant Ed. Level**	**Content**	**Measurement**	**ES'**
Koroghlanian & Klein, 2004	High School	Biology	Practice item scores	-0.06
			Achievement test	-0.23
Yang, Andre, & Breenbowe, 2003	College	Electronic Chemistry	Knowledge test	3.59
Lin & Dwyer, 2004	College	Human Heart	Drawing test	0.23
			Identification test	0.14
			Terminology test	0.28
Spotts & Dwyer, 1996	College	Human Heart	Drawing test	0.47
			Identification test	0.07
			Terminology test	0.16
Rieber 1989	4th, 5th, & 6th Grade	Physics (Newton's Law)	Fact (near transfer)	0.07
			Fact (far transfer)	0.09
Lewalter, 2003	Undergraduate	Physics	Factual knowledge	0.00
Wong, 1994	Undergraduate	Statistics	Factual Question	-0.45
			Factual Question	-0.81
Blankenship & Dansereau, 2000	College	Human Immune System	Free-recall	0.15
			Fill in the blank	0.28
Iheanacho, 1997	College	Names of Hand & Power tools	Immediate Recall test	-0.17
			Delayed recall test	0.24
Lee, 1996	Undergraduate/Graduate	Operation of Bicycle Tire Pump	Recall	0.07
Ausman et al., 2006	Undergraduate	Human Heart	Drawing test	1.06
			Identification test	0.99
			Terminology test	0.30

Study investigating the effects of animation on Comprehension

			Accuracy	
Study	**Participant Ed. Level**	**Content**	**Measurement**	**ES'**
Lin & Dwyer, 2004	College	Human Heart	Comprehension Test	0.01
Spotts & Dwyer, 1996	College	Human Heart	Comprehension Test	0.14
Hays, 1996	6, 7 & 8 Grade	Concepts of diffusion	Short-term Comprehension	0.04
			Long-term Comprehension	0.50

Study	Participant Ed. Level	Content	Measurement	ES'
Lai, 2000	college	Programming concepts	Comprehension instant test	0.09
			Comprehension delayed test	0.26
Lai, 2000	College	Programming Concepts	Comprehension test	0.87
Wright & Milroy, 1999	Adult	Reading on historic events	Instant quiz on comprehension	-0.17
			Delayed quiz	-0.28
Byrne, Catrambone, & Stasko, 1999	College	Algorithm	Basic questions	-0.07
			Challenging questions	0.34
			Concept comprehension	-0.31
Hegarty, Kriz, & Cate	Undergraduate	Flushing cistern mechanical system	causal chain comprehension description (open-ended questions)	0.42
Williamson & Abraham, 1995	Undergraduate	Chemistry	Conceptual understanding (Unit 5)	0.56
Chanlin, 2001	8th & 9th Grade	Physics	Descriptive learning	-2.99
			Descriptive Learning	3.14
Thompson & Riding, 1990	11-14 years old	Math	Comprehension test	0.38
Wilcox, 1997	7 & 8 years old	Math	Conceptual Subset	-0.02
Ausman et al., 2006	Undergraduate	Human Heart	Comprehension test	0.09

Speed

Study	Participant Ed. Level	Content	Measurement	ES'
Rieber 1989	4th, 5th, & 6th Grade	Physics (Newton's Law)	Processing time	1.64
Lai, 2000	college	Programming concepts	Task time	0.00
Lai, 2000	College	Programming concepts	Task time	-0.07

Study investigating the effects of animation on Application

Accuracy

Study	Participant Ed. Level	Content	Measurement	ES'
Yang, Andre, & Breenbowe, 2003	College	Electronic Chemistry	Transfer	0.28
Rieber, 1991	4th grade	Physics (Newton's Law)	Immediate intentional	0.53
			Immediate incidental	1.92
			Delayed intentional	0.81
			Delayed incidental	1.97
Baek & Layne, 1988	High School	Math	Rule-learning test	0.35
Rieber, Boyce, & Assad, 1990	College	Physics (Newton's Law)	Rule-learning test	0.02
Rieber, 1990	4th & 5th Grade	Physics (Newton's Law)	Rule-learning test Objective 1 (difficulty level)	0.53

Study	Participant Ed. Level	Content	Measurement	ES'
			Rule-learning test Objective 2	0.45
			Rule-learning test Objective 3	0.20
			Rule-learning test Objective 4	0.21
			Rule-learning test Objective 5	-0.01
			Rule-learning test Objective 6	0.36
Szabo, Michael, Poohkay, & Brent, 1996	college	Math	Problem-solving test	0.76
Rieber 1989	4th, 5th, & 6th Grade	Physics (Newton's Law)	Application (near transfer)	0.09
			Application(far transfer)	0.12
Rieber 1991	4th Grader	Physics (Newton's Law)	Incidental learning	0.06
			Intentional learning	1.18
Byrne, Catrambone, & Stasko, 1999	College	Algorithm	Procedure	0.11
Rieber & Boyce, 1991	College	Computer education	Verbal near transfer	0.02
			Verbal/visual near transfer	0.25
			Verbal far transfer	-0.06
			Verbal/visual far transfer	0.05
Hegarty, Kriz, & Cate	Undergraduate	Flushing cistern mechanical system	Trouble-shooting	0.15
Rieber, Boyce & Assad, 1990	Undergraduate	Physics (Newton's law)	Rule-learning test	0.02
Poohkay & Szabo, 1995	Undergraduate	Math	Drawing test	0.81
Rieber,1989	4th & 5th Grade	Physics (Newton's Law)	Rule-learning test	-0.01
Lewalter, 2003	Undergraduate	Physics	Comprehension + Problem Solving	0.60
Wong, 1994	Undergraduate	Statistics	Transfer Question	-0.25
Chanlin, 2001	8th & 9th Grade	Physics	Procedure Learning	-0.71
Lee, 1996	Undergraduate/Graduate	Operation of Bicycle Tire Pump	Problem-solving test	0.76
Wilcox, 1997	7 & 8 years old	Math	Rule Subset	-0.05
			Performance Subset	0.43

Study	Participant Ed. Level	Speed Content	Measurement	ES'
Baek & Layne, 1988	High School	Math	Rule-learning test Response latency	-1.19
Rieber, Boyce, & Assad, 1990	College	Physics (Newton's Law)	Rule-learning test Response latency	-0.46

Park & Gittelman, 1992	College	Electronic circuits	Number of trials in trouble shooting practice	0.92
			Time needed in practice response	0.24
			Number of trials in trouble shooting test	0.45
			Time needed in test	0.09
Park, 1998	College	Electronic circuits	Number of trials in performance test	0.22
			Time spent on performance test	0.07
			Number of trials in transfer test	0.43
			Time spent on transfer test	0.13
Rieber & Boyce, 1991	College	Computer education	Test time in verbal near transfer	0.13
			Test time in verbal/visual near transfer	0.27
			Test time in verbal far transfer	0.06
			Test time in verbal/visual far transfer	-0.10
Wong, 1994	Undergraduate	Statistics	Time on quiz	-0.03

Study investigating the effects of animation on Affective Learning Outcome

Engagement

Study	Participant Ed. Level	Content	Measurement	ES'
Koroghlanian & Klein, 2004	High School	Biology	Time in instruction	0.57
			Time in program	0.64
Spotts & Dwyer, 1996	College	Human Heart	Study time	2.14
			Total time	2.80
Wright & Milroy, 1999	Adults	Reading on historic events	Study time	-0.14
Wong, 1994	Undergraduate	Statistics	Time on tutorial	0.73

Attitudes

Study	Participant Ed. Level	Content	Measurement	ES'
Koroghlanian & Klein, 2004	High School	Biology	Attitudes survey	0.20
Lai, 2000	College	Programming Concepts	Attitudes survey	0.17
Poohkay & Szabo, 1995	Undergraduate	Math	Attitudes survey	0.04

Table 2 reports the weighted mean effect sizes for animation over static graphics on different cognitive and affective learning outcomes, as well as their 95% confidence intervals.

TABLE 2 *Overall effect of animation on multi-level learning*

Learning Outcome	n of Studies	d_+	95% CI

Factual Knowledge		11	0.36	+0.28 to 0.44
Comprehension	Accuracy	13	0.21	+0.13 to 0.28
	Speed	3	0.26	+0.10 to 0.42
Application	Accuracy	19	0.34	+0.28 to 0.41
	Speed	6	0.10	+0.00 to 0.20
Engagement		4	0.83	+0.62 to 1.03
Attitudes		3	0.13	-0.09 to 0.35
Total		34	0.31	+0.28 to 0.35

Note. d_+ = weighted mean effect size; CI = confidence interval; No effect sizes calculated for the Speed in Factual Knowledge because no timing data were provided in the relative studies.

As Table 2 shows, most mean weighted effects of animation on different types of learning outcomes are positive but smaller than .5, reflecting a small and positive association between animation and gains in learning. Because almost all confidence intervals (except the one on attitudes) do not contain zero, it may be concluded with certainty that the true effect size is not zero. Moreover, the mean weighted effect size of animation on learning persistence is $d_+ = 0.83$, with 95% confidence interval (CI) being 0.62 to 1.03, reflecting a large effectiveness of animation over static graphics on promoting learning persistence. According to Cohen (1988), this results means that 80% of the students who received instruction with animation demonstrated more learning persistence than the average students who received instruction with static graphics.

Table 2 also shows that animation played a more important role in helping students develop factual knowledge ($d_+ = 0.36$) and accuracy in application test or performance ($d_+ = 0.34$). That is to say, around 64% of the students in animation group scored higher in the tests corresponding to factual knowledge and application than the average students in the static graphics group. In comparison, animation had fewer effects over static graphics on promoting comprehension (Accuracy $d_+ = 0.21$, Speed $d_+ = 0.26$) or positive learning attitudes ($d_+ = 0.13$).

Spatial Ability in Animation for Learning

Among the 156 studies reviewed, 14 research projects involved spatial ability in the investigation, but only one of them satisfied the criteria to be included in this meta-analysis. Study by Koroghlanian and Klein (2004), Wender and Muehlboeck (2003) indicated that students with high spatial ability generally outperformed ones with low spatial ability, but they offered no data on the interaction between spatial ability and animation. Mayer and Sims (1994) found that high spatial ability learners benefited more from concurrent presentation of animation and narration than low spatial ability learners; their study, however, did not include a static graphic group. Similarly, studies by Chanlin (1998, 2000), Large, et al. (1996), Huk, Steinke, and Floto (2003), Yang, Andre, and Breenbowe (2003), Yang, Thomas, and Greenbowe (2003) supported the ability-as-enhancer hypothesis in animation for learning, but they did not offer enough statistical data (i.e. group size) for calculating effect sizes. Some other studies (i.e. Craig, Gholson, Driscoll, 2002; Hegarty & Sims, 1994; Lewalter, 2003; Sperling, Seyedmonir, Aleksic, & Meadows, 2003) did not indicate either main or moderating effects of spatial ability. The only ability – animation study included in this meta-analysis was conducted by Hays (1996). His study resulted in the following effect sizes of animation for learning:

		d_+	95% CI
Low Spatial Ability	Short-term comprehension	0.41	-2.67 to +3.48
	long-term comprehension	0.61	-1.89 to +3.11
High Spatial Ability	Short-term comprehension	-0.32	-3.78 to +3.12
	long-term comprehension	0.37	-2.87 to +3.60

Note. d_+ = weighted mean effect size; CI = confidence interval.

Hays' finding evidenced that low spatial ability learners benefited more from animation than high spatial ability learners did in both short-term and long-term comprehension, which was contrary to the findings of many animation studies. However, it should be noted that all 95% confidence intervals (CI) of the effect sizes have big range, indicating that the actual effect sizes could be very different from the observed ones.

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Effects of Integrated Motivational and Volitional Tactics on Study Habits, Attitudes, and Performance

John M. Keller
Florida State University

Markus Deimann
Erfurt University
Germany

Zhu Liu
Florida State University

Abstract

A continuing challenge is how to stimulate and sustain learner motivation and persistence in undergraduate general education courses. Most controlled research studies do not generalize to this setting because they typically implement treatments of 30 to 50 minutes so that they can be completed in a single class period (Azevedo & Cromley, 2004). The challenges to motivation that occur during a semester-length course or a significant portion of the course are much different from a "single sitting" research study in which there is hardly time to overcome the novelty effects of an intervention before the experiment is finished. Also, in a longer study, the motivational factors that are present at the beginning of a learning experience cannot be expected to persist over a long period of time unless other things are done to help sustain learner motivation and persistence. The present study took place over a four-week module in a large undergraduate course and incorporated a variety of tactics designed, in accordance with supporting theories, to assist students in maintaining their motivation and self-regulatory habits during this period of time. To provide a means for the rational selection and creation of motivational and volitional tactics, the ARCS model (J. M. Keller, 1987, 2004) of motivational design was expanded to incorporate the volitional theories of Gollwitzer (1999) and Kuhl (1987). The effectiveness of this approach was tested by distributing the strategies as "motivational messages" (Visser & Keller, 1990) in the form of "Study Tips" via email to the participants in this study. The primary finding was that students who opened the study tips emails increased their study time, maintained confidence, and improved their test scores compared to those who did not open them. This has positive implications for sending motivational and volitional study tips directly to students while they are in the process of studying a course.

Introduction

Background

Historically, motivation was considered to have two levels. The first is "will," which refers to a person's desires, wants, or purposes together with a belief about whether it is within one's power to satisfy the desire, or achieve the goal (James, 1890; Paul R. Pintrich & Schunk, 2002). The second level is the act of using the will, or "volition," which refers to a process for converting intentions into actions. In some cases, the mere saliency of a desire is sufficient to lead more or less automatically to action, but often, as William James (1890) pointed out, it is necessary to have a conscious effort supported by determination or extrinsic requirements to convert intentions into action.

Much of motivation research has focused on understanding what people's goals are and why they choose them. For example, the original conceptualization of "will" as being a combination of desires and beliefs about being able to achieve them is reflected in expectancy-value theory which postulates that behavior potential is a function, assumed to be multiplicative, of the perceived importance of a given goal in relation to other goals (value) and one's subjective probability of being able to achieve the goal (expectancy). While this theory has had a powerful influence in motivational theory, its sole contribution is in explaining how people choose a particular goal or set of goals. It does not fully explain volition, or what impels people to action and keeps them working persistently to achieve a goal. Consequently, a distinction between "selection motivation" and "realization motivation" has to be made (Kuhl, 1985). Modern conceptions of volition such as action control (Kuhl, 1987), implementation intentions (Gollwitzer, 1999), as well as work on self-regulation (Zimmerman, 1998a) are based upon this distinction. All of

these pertain to the problem of maintaining goal-oriented behavior and overcoming discouragement and attrition, problems that have been experienced especially in self-directed learning environments including e-learning, and even classroom courses that put a high level of scheduling control into the students' hands or in which there are large numbers of students who are taking the course to meet a requirement.

Kuhl (1985) defines volition as a mediating factor that "energizes the maintenance and enactment of intended actions" (Kuhl, 1985, p. 90) and therefore goes beyond motivation. In other words, strong motivation is a necessary yet not a sufficient condition. Wolters (1998) commented about how students can express strong desires to accomplish a goal but have a very difficult time in managing competing goals and distractions that interfere with their academic work. Similarly, Pintrich and Garcia (1994) pointed out that the influence of volition becomes even more important for college students "who, when you talk to them, are very motivated and concerned about doing well, but often have a very difficult time enacting their intentions, given all the internal and external distractions they confront in college life" (p. 126f). These observations are, of course, readily apparent to anyone, teachers or counselors, who try to facilitate change in people. The interesting point is that this phenomenon has been coming under greater and greater scrutiny in psychological research. Kuhl's action control theory was developed to bridge the intention-behavior gap and to help people overcome maladaptive behaviors in their life. Even though his theory is only recently being applied to learning environments and has not yet been applied in multimedia settings, it has served as a foundation for the work of Zimmerman (1998b) and Corno (2001) who study volitional behaviors in self-regulated learning.

In the theory of action control, Kuhl (1987) specifically addresses the question of what factors influence a person's continued and persistent efforts to accomplish a goal. Kuhl's theory postulates six action control strategies which can be employed as soon as an action tendency achieves the status of a current intention (by committing to the action). In other words, commitment to achieving a given goal is a prerequisite to employing the set of action control strategies, which are:

1. Selective attention: also called the "protective function of volition" (Kuhl, 1984, p. 125): it shields the current intention by inhibiting the processing of information about competing action tendencies.
2. Encoding control: facilitates the protective function of volition by selectively encoding those features of incoming stimulus that are related to the current intention and ignoring irrelevant features.
3. Emotion control: managing emotional states to allow those that support the current intention and suppress those, such as sadness or attraction, in regard to a competing intention that might undermine it.
4. Motivation control: maintaining and reestablishing saliency of the current intention, especially when the strength of the original tendency was not strong ("I must do this even though I don't really want to.")
5. Environment control: Creating an environment that is free of uncontrollable distractions and making social commitments, such as telling people what you plan to do, that help you protect the current intention.
6. Parsimonious information processing: Knowing when to stop, making judgments about how much information is enough and to make decisions that maintain active behaviors to support the current intentions.

Kuhl assumes that processes of action control underlie virtually any kind of activity, but especially those in which the person faces difficulties and hindrances. The effectiveness of employing action control strategies has been confirmed in many studies in a variety of behavior change settings (Kuhl, 1987) as well as in educational settings (Corno, 2001; Kuhl, 1984; Zimmerman, 1998a). However, action control theory does not provide detailed examination of intention commitment, or implementation intentions. For this, Gollwitzer's work (Gollwitzer, 1999) on volition is helpful.

The first step in moving from desire to action, that is, from the identification and acceptance of a personal goal to a set of actions to accomplish the goal is that of intention formation. On the one hand, the concept of "good intentions" is used as a rationalization when things go wrong, or an excuse for not taking action as in the expression, "the road to hell is paved with good intentions." But, on the other hand, intentions can be a powerful influence on goal accomplishment. In a laboratory study with preschool children who were asked to work on a repetitive, boring task that was interrupted with a tempting distraction (a clown head encouraging children to select and play with toys instead of working on their assigned task), Patterson and Mischel (Patterson & Mischel, 1976) tested the effects of task-facilitating intentions versus temptation-inhibiting intentions. The children were told that a clown box might tempt them to stop working. The task-facilitating group was told to keep their attention on the task if this happened, and the temptation-inhibiting group was told to direct their attention away from the clown box. This study and subsequent research (Gollwitzer & Schaal, 2001) shows that temptation-inhibiting intentions have the superior effect no matter whether motivation to perform the task is high or low.

Adding volition to the motivational design process may be of particular benefit to students in large undergraduate lecture courses in which many of the students are enrolled to fulfill a general education requirement rather than being in their major area of interest. Problems in these courses include such things as procrastination,

ineffective study habits, lack of perceived relevance of the content to their lives, low personal priority for the course requirements, and not knowing how to build resistance against distractions that occur during their available time for study. The work of Zimmerman (1998a), Corno (1993), and others on self-regulation has had some success in improving volitional behaviors, but the problems persist, especially when one moves outside the controlled study environment to an actual classroom.

Another major issue in research on self-regulated learning pertains to the availability of volitional strategies. Previous research finding indicate that learners do not posses adequate strategies to deal with outside or inside interferences (Bannert, 2004). Therefore, providing learners volitional strategies can help in establishing volitional competence. Moreover, much of the previous research in the areas of motivation and volition deals with isolated aspects of attitudes and behavior instead of being grounded in a more holistic theory of motivation and volition. Also, the interventions tend to be presented at the beginning of the treatment (e.g. Azevedo & Cromley, 2004). The present study, in contrast to this research, expands the ARCS model of motivational design to include volitional design, and also distributes strategies in two different ways. One approach was to bundle all of the strategies, called 'Study Tips', into one booklet and send it as an email attachment at the beginning of the treatment period. The second approach was to distribute the strategies throughout the four-week treatment period via email at those times when the strategies would be most likely to be immediately useful. We also included a placebo group which received messages with information and humor that was related to the topic of the course but tangential to its formal content and tests. The purpose of having a placebo group was to control for potential reactive effects that might result from the novelty of sending numerous and diverse emails to the class, regardless of their content. It is common in studies of motivation to fail to control for novelty effects, but in this study all three treatment groups received the placebo messages to determine whether the designed motivational and volitional messages in the distributed and bundled treatments had an effect independently of the novelty influences.

In summary, the purpose of this study was to test the effectiveness of a combined set of motivational and volitional strategies on the motivation and persistence of a group of undergraduate students in a general education course that satisfies one of their curricular requirements. It was expected that the blending of motivational and volitional strategies and distributing them at the most appropriate times would result in higher levels of improvements in study habits, attitudes toward the course, and learning performance than when bundled and distributed all at once in a booklet, but that both of these treatments would be superior to the placebo group.

Method

Participants
Participants in this study were 90 of the 115 students in an undergraduate archaeology course who indicated their willingness to participate by filling out a pre-treatment questionnaire of study habits, volitional habits, and course-specific motivational attitudes. Twenty-five of the original participants were eliminated because they failed to return 3 or more of the 10 weekly logbooks.

Research Design
In the first set of analyses, there was one independent variable, message type, with three levels: bundled messages, distributed messages, and placebo. For the second set of analyses, there was one independent variable, study tip use, with two levels: opened study tips versus unopened study tips. Repeated measures analyses were conducted in both sets of analyses because pre- and post-measures were taken on each of the dependent variables consisting of study habits as measured by study time, three components motivational attitudes toward the course (interest, relevance, and confidence) as measured by the appropriate scales in the Course Interest Survey (Keller & Subhiyah, 1993), and achievement as measured by test grades.

Variables, Measures, and Analysis
There were two independent variables in this study, and they were used in two separate sets of analyses. The first one, message type, refers to the way messages were assembled and distributed to the students. Six messages containing combinations of motivational and volitional messages were prepared. For the "bundled" group, all six messages were assembled into a booklet and sent by email to the learners in that group shortly after the first test was given. For the second group, the 'distributed' group', the messages were sent at intervals based on the researchers' expectations of the kinds of motivational and volitional support the students might benefit from at those times. Finally, a set of placebo messages was prepared and distributed to the control group, the 'placebo' group together with the bundled and distributed groups.

After the second test was given, which concluded the treatment period for this study, the students in the bundled and distributed groups were asked if they opened the study tips attachments to look at them. An unexpected

result was that fewer than half of the participants did so. Therefore, the researchers decided to add an ad hoc independent variable which was study tip use with two levels consisting of those who looked at the study tips and those who did not. Since the means of the two groups were almost identical ($M_{bundled}$ = 1.68; $M_{distributed}$ = 1.67) with respect to how many opened the study tips (1 = yes; 2 = no) the distinction between bundled and distributed was not used in the analyses of this independent variable.

The first dependent variable was Study Time. Based on the self-reported data in the participant logbooks which were submitted by weekly email, the study time prior to the first test was compared to the study times from the first to the second test. Participants reported time spent studying the text and time spent on a special project assigned to the class. These were summed to compute total study time.

The second dependent variable was measured by using the attention, relevance, and confidence subscales from the Course Interest Survey. The satisfaction scale was not used because it was not pertinent to this particular study. This CIS is a situation-specific survey which has satisfactory reliability estimates as measured by Crohbach's alpha formula ($r_{attention}$ = .84, $r_{relevance}$ = .84, $r_{confidence}$ = .81). Each of these subscales was used as a separate measure. The third dependent measure was test grade on Test 1 compared with Test 2. These tests were those used by the instructor in the normal process of teaching and assessing. The researchers did not modify the tests and were not present when they were administered.

All of these analyses were conducted with repeated measures using the general linear model to control for differences in the pre-treatment scores and to determine whether there were significant shifts within and between groups. Even though there were multiple dependent variables, MANOVA was not considered given that this was an exploratory study and the number of participants would not support it. Also, for these same reasons, a confidence interval of .10 was chosen in place of the customary .05. The findings of this study will provide a basis for future, more tightly controlled studies.

Materials

The materials used in this study for collecting data consisted of weekly logbooks that were sent to the participants by email and which were returned via email by the participants to the researchers. The researchers set up a second course website using Blackboard, which is the system used by this university. It was identical to the instructor's primary website except that she did not have access to it. Thus, the participants were assured of confidentiality in their responses. The lead researcher had access to the instructor's website in order to get copies of grades.

Study tips were created in accordance with the motivational and volitional strategies that were selected for use with these participants. These decisions were based upon audience information obtained from interviews with the course instructor and her graduate student, as well as the researcher's knowledge of relevant research and direct experience with similar audiences. A total of six strategies were produced. Each of these consisted of two or more pages of information and graphics. All of them were put together into one package for the bundled group and kept separate for the distributed group. The only other difference between the two groups was that in the emails that contained these strategies there were slightly different comments due to the bundled versus distributed situations. The titles, motivational and volitional focus, and brief explanatory comments are contained in Table 1.

Procedure

On the first day of class, the researchers and two additional persons attended to pass out and collect a survey of study habits and attitudes and course-specific motivation. Participation was voluntary. If students filled out and returned the questionnaires, it indicated their willingness to participate. These measures were not used in the present study. Also, this was the only time the researchers had face-to-face contact with the class.

Beginning immediately after Week 1, logbooks were sent to students each week. The contents always included questions about time spent studying. Some logbooks contained other questions pertaining to motivation and other attitudes.

The logbook that was distributed at the end of the third week class asked for study times and also asked about motivational attitudes (interest, relevance, and confidence). These served as the pre-measures for this study. The first test was given during the following (fourth) week of class.

The logbook that was distributed at the end of the seventh week class once again asked for study times and also asked about motivational attitudes (interest, relevance, and confidence). These served as the post-measures for this study. The second test was given during the following (eighth) week of class.

One week after the second test, all students in the class, including the placebo group and non-participants, were informed about the study tips and how to access them on the website. This was to control for the potential ethical problem of one group receiving a favored treatment and to assist interested students in preparing for the final

two tests and term project.

Table 1 Study tip descriptions, focus, and comments

Study Tip Titles	Motivational/Volitional Focus	Comments
The Stages of Learning	Motivation (helping to stimulate interest, establish relevance, and build confidence) Volition (pre-actional planning, anticipating action control requirements, and pre-reflection)	This was a motivational document that covered the key elements of motivation and volition in a way designed to stimulate learner interest and provide guidance on how to sustain it.
Future Wheel: The Issue of Relevance	Relevance	This was a primary motivational challenge (gap) among the students.
Making a Plan that Works!	Volition (pre-actional planning, environment control, emotion control, and motivation control)	Concrete guidance for how to plan for an effective study environment, develop attitudes of commitment, and manage emotions to maintain study commitments.
Tips for Studying Text	Volition (selective attention, environment control, encoding control, parsimonious information processing)	This study tip includes concrete advice on how to study complex textual material, especially when it is not intrinsically interesting.
Overcoming Discouragement	Volition (selective attention, encoding control, and maintaining motivation)	This tip addresses the problems students face from being overloaded, procrastinating, or both.
Making Anxiety Work for You	Motivation and volition (rebuilding or maintaining expectancies, emotion control, motivation control, and environment control)	Building confidence and reducing anxiety caused by fear of failure.

Results

There were two sets of analyses. The first was based on the first independent variable which was message type. Based on the repeated measures analyses, there were no significant differences among the three message type groups with respect to study time, interest, relevance, or test scores. With respect to confidence, there were no significant differences between groups, but the mean confidence level decreased significantly, $F(1,76)= 6.80$, $p=.011$.

In the study tips usage groups, there were several significant differences between the participants who opened the study tips attachments and those who did not. First, with regard to study time, there was a significant interaction effect, $F(1,25)= 8.04$, $p=.009$, such that those who opened the study times increased while those who did not open them decreased in time spend studying.

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Figure 1 Study time differences between study tip groups

There were no differences between the two groups in interest or relevance, but there was a difference in confidence. There was a significant interaction, $F(1,38)= 3.43$, $p=.072$. Those who opened the study tips scored lower on the pre-measure than those who did not open them, but their confidence increased slightly on the post-measure while the scores of those who did not open the study tips decreased dramatically (Figure 2).

Figure 2 Confidence differences between study tip groups

There was also a significant difference in test scores, $F(1,38)= 9.00$, $p=.005$, in that both groups scored higher on Test 2 than Test 1. The interaction was not significant even though the magnitude of improvement in the "opened study tips" group was greater than the "did not open" group (Figure 3).

Figure 3 Test score differences between study tip groups

Discussion

Results indicate that the combined set of motivational and volitional strategies contributed to improving students' study habits, attitudes toward the course, and learning performance. This indication is supported by the results that students in the treatment group who opened the study tips had spent more time studying, had increased confidence, and performed better in the test than students who didn't open the study tips. Although confidence dropped overall in the three message-type groups, this is probably due to the fact that people were overconfident at first and it was not surprising that the confidence would drop after taking the first test and discovering that their grades were not as high as they had, perhaps, hoped. According to the instructor, some students choose to take this course for one of their general education requirements because they expect that it will be an easy course, and maybe they think it will be exciting like watching the action adventure movie, "Raiders of the Lost Arc," which has a strong archaeological theme. But, the students find that it is not easy and that it is filled with highly technical detail. The first measure of confidence was taken before the first test when students just started this course and were, apparently, over confident. The second measure was taken right before the second test when confidence would be low due to the students' experience of the first test results. Worthy of mention is those students who chose to open the study tips have maintained and slightly increased their confidence. This further confirmed that the combined set of motivational and volitional strategies can have a positive impact on maintaining students' motivation.

In contrast to the expectations of this research, there were few differences among message-type treatment groups concerning study habits, interest, confidence, relevance, and grades. One reason might be the limited participation—relatively few number of students opened the study tips of containing combined sets of motivational and volitional strategies. The limited participation can be due to several reasons: 1) Students got confused about various emails—email from instructors, other people, etc. 2) Some students won't open the attachment if it's not important or crucial to them. 3) Some students may be afraid of opening the attachment because of bugs or virus. Future research could consider getting more control over the situation—a situation where it is assured that students will receive and examine the sets of study tips. Future research could also improve the implementation of the treatments (sometimes there were time gaps that were too long). Besides, future research should adopt better ways to deliver study tips and messages rather than simply sending them through emails. Even so, the results of this study support the feasibility and effectiveness of incorporating combinations of motivational and volitional messages into packages of information that are distributed in the form of "motivational messages."

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The Effects of Critical Reflection Thinking On Learner's Metacognition

Aaron Kim
Florida State University

Abstract

The purpose of this study is to examine the effects of critical thinking prompts on learners' metacognition. In this study, a critical thinking prompt is defined as a learner support that stimulates reflection upon comprehension, reading process and strategies, purpose of reading, progress of learning, and other aspects of reading comprehension. Critical thinking prompts used in this study are embedded questions in the text for critical thinking. Metacognition of the students is defined as the use and awareness of reading strategies.

The effects of critical thinking prompts on learner's metacognition

Contemporary views on reading agree that reading is a multifaceted activity that involves various aspects of learning, many of which are now considered metacognitive (Garner 1987, Cross 1988). For example, metacognitive aspects of reading and comprehension can include activation of a learner's prior knowledge, knowledge of the reading process, monitoring and evaluation of one's comprehension, and strategy use. Historically, many in the past recognized these strategic activities long before the term metacognition was coined and introduced (Brown, 1987). For instance, Dewey (1933) introduced the concept of reflection and reflective reading that involves "active monitoring,' "critical evaluation," and "seeking after meanings and relationship." Brown (1987) argues that "there is considerable historical agreement that reading and learning from texts involve metacognitive skills" among early educational psychologists including Thorndike (1917) and Baldwin (1909).

Since Flavell (1979) introduced the term metacognition, for more than two decades, it seems that many have believed that more understanding about metacognition and its role in learning would provide us very useful insights and answers to many of our questions regarding learning. Immediately, research on reading comprehension employed the concept of metacognition because reading was regarded as a primary pathway to learning. Garner (1987) claimed that metacognition research "has enormous explanatory power for descriptions for the reading process." For that reason, over the past several decades, metacognition has become a hot issue in the area of reading comprehension because a reader is not a passive receiver of information conveyed by text but an active learner who regulates his or her own cognitive resource to learn from text.

Metacognition is in general defined as thinking about thinking or cognition about cognition. It consists of knowledge and regulatory skills that are used to control one's cognition and to enhance learning and performance (Schraw 1998, Pintrich 2002, Falvell 1979, etc.). As to reading with focus on the regulatory skill part of metacognition, metacognitive reading skills include activities such as: establishing the purpose for reading; modifying reading strategies due to variations in purpose; identifying important ideas; activating prior knowledge; evaluation of the text for clarity, completeness, and consistency; compensation for failures to understand; and assessing one's level of comprehension (Baker & Brown 1981).

Due to the function and nature of metacognition in learning, it is believed that being more metacognitive affects learning positively. Actually some studies have shown that metacognitive awareness or metacognitive knowledge and skills are important for students' achievement, and development of metacognition is desirable for better learning (Garner, 1987; Schoenfeld, 1989; Sternberg, 1985). Thus, metacognition can be seen as an important factor for facilitating learning and should be promoted in order to enhance learning. For better learning, reading comprehension should be enhanced. One possible way of doing that is promoting metacognition by providing metacognitive support during the reading process.

An important principle of promoting metacognition is to give learners enough opportunities for reflection. In other words, in order to promote metacognition for better reading and learning, one can offer metacognitive supports that help learners think and reflect more and deeper. For example, metacognitive support incorporated in instructional strategies and design can serve as the learner supports that enable more thinking and reflection. Lin and others suggested four types of instructional design features that provide metacognitive supports for reflective thinking (Lin, Hmelo, Kinzer, & Secules, 1999). The supported reflective thinking in their study involved frequent reflection on the quality of the learners' understanding and the attempt to go beyond what they know (Brown, Bransford, Ferrara, & Campione, 1983). One of the four types of design features is providing process prompts. It is, in their definition, prompting students' attention to specific aspects of learning processes while learning is in action. In other words, process prompt is, for example, helping learners go through monitoring, evaluating, and resolving the process over their own learning and understanding. What process prompt can we use to help learners

reflect on their understanding and learning process? Or more generally, what kind of metacognitive support for reflection can we use?

One promising way of facilitating reflection on a learner's understanding and learning processes is providing embedded prompts or cues that help the learners do critical thinking. Critical thinking is generally defined reasoning and judgment that involves processes of interpretation, analysis, evaluation, explanation, and inference of a given matter (Facione,1990; Kuiper, 2003). Critical thinking that leads to reflection is one of the strategies for deeper understanding and meaningful learning along with planning, monitoring, and self-regulation (Pintrich & Schrauben, 1992).

Actually, in some studies, critical thinking prompts were identified to be promoting reflection of learners. For example, a study investigated patterns and levels of reflection of college students who had different design features and critical thinking learner supports over two semesters(Whipp, 2003). Based on data analysis from e-mail discussion threads, student survey, and portfolio papers, researchers found that the students, who received a number of critical thinking learner supports during the second semester, wrote e-mails and assignment papers at higher levels of reflection than the other group who did not have learner supports. And then, the researcher identified four important supports for higher level of reflection: tailored questioning, general questioning, use of critical reading, and threads of online discussion at higher level of reflection (Whipp, 2003). Tailored questioning and general questioning served here as the critical thinking prompts so that the students had more time for reflection on various aspects of their learning.

Thus, in summary, critical thinking allows learners more opportunities to reflect upon their understanding, to monitor the cognitive activities, and to choose and apply proper skills, which are clearly metacognitive. Therefore, providing critical thinking prompts to the learners may stimulate the reflection, and in turn lead learners to go through metacognitive activities if the learners reflect on their quality of understanding, learning process, and other related aspects. The metacognitive activities are what is referred to as metacognitive experience in earlier studies. Through these activities, learners can increase their metacognitive awareness and develop metacognition over time (Flavell, 1987).

Even though many reported that critical thinking is closely related to reflection and metacognition and speculated that critical thinking supports promote metacognition, there are only limited number of empirical research on the association between critical thinking and metacognition, especially experimental research. In other words, most studies in the past did not experimentally examine the association between critical thinking and metacognition. Therefore, it may be valuable to conduct an experimental study focusing on how critical thinking affects metacognition.

Thus, the purpose of this study is to examine the effects of critical thinking prompts on learner's metacognition. In this study, critical thinking prompt is defined as a learner support that stimulates reflection upon comprehension, reading process and strategies, purpose of reading, progress of learning, and other aspects of reading comprehension. Critical thinking prompts are embedded questions for critical thinking. Metacognition of the students in this study is defined as the use and awareness of reading strategies. It was measured by a self-report instrument, the Metacognitive Awareness of Reading Strategy Inventory, developed and validated by Mokhtari and Reichard (2002). The inventory was administered after the treatment to assess the students' actual use of reading strategies and awareness of them.

In this study, it was expected that critical thinking learner supports would stimulate the students' metacognitive activities and consequently promote metacognition. More specifically, it was expected that metacognition activated by the students during the instruction would be greater among the students who studied the instructional material with the critical thinking prompts embedded in it. Since the critical thinking prompts are tailored questions and general questions regarding the important points of the given materials, they are expected to provide more opportunities for reflection. As stated earlier, reflection upon various aspects regarding reading processes and comprehension are metacognitive activities or experience and are promoting awareness of metacognition and developing metacognition (Flavell, 1987; Lin, 2001; Lin et al., 1999; Schraw, 1998).   Since metacognition is defined as the use and awareness of reading strategies in this study, critical thinking prompts were expected to help the students use more reading strategies and be aware of strategies that they used during the instruction.

Method

Participants

Participants were 47 college freshmen in a southeastern university. 39 of the participants were female and all of them are 19 and 20 years old. Participants' general ability for academic tasks was considered above the average of general population. The course the participants were enrolled in was an introductory American history,

which was a required one. The participants did not know they were involved in an experimental process.

Task and Materials

A series of very short articles about diversity and social justice in text format were used for classroom activity as the instructional materials. Each article was under 400 words and instructional activity took about 45-50 minutes each time including writing exercise, which was responding to the given questions in essay format. The purpose of the instructional material was to teach the learners to understand and to reflect upon diversity and social justice related events, their impacts on people and society, and meaning. The goal of the course that the students were enrolled was to build on and promote the idea of diversity and social justice. The materials consist of two parts, short article and a set of questions. Structure of the material is straightforward that the learners read the articles and responded to the given questions.

Independent Variables

The independent variable used for this study was the learner support. The level of independent variable was simply whether the learner support is absent or present. The learner support employed was critical thinking prompt, which was provided to the students as the learner support. Treatment group received the instructional material that included embedded critical thinking prompts within the text, while the control group studied the material that had only text. The prompts were placed within the text, where the relevant contents were described and discussed. Each prompts was put in a rectangular box, and bold font used in order to distinguish the prompt from the content text. The control group had only stories without any learner support.

Dependent Measures

There is one dependent variable in this study, which is metacognition. As defined earlier, metacognition is the strategies that the students used during the instruction and awareness of those strategies. As a result of the learner supports, the students were expected to use more strategies, and to be aware of them. For example, students may underline or circle the key information in the text in response to a critical thinking prompt, which is a question about the main points of the article. Students also may go back and forth in the text to articulate differences among ideas in it because of a given prompt. Thus, this current study measured what kind of strategies that the students used during the instruction and the awareness of those strategies by using a self-report survey. The survey is developed and validated by a study of Mokhtari and Reichard (2002). It is called the Metacognitive Awareness of Reading Strategy Inventory. The inventory was administered after the treatment to assess the students' actual use of reading strategies and awareness of them. It originally consists of 30 items, which are categorized into 3 strategies. Three strategy categories are global reading (13 items), problem-solving (8 items), and support reading strategies (9 items). However, some of the items are not relevant to this current research. For example, there is an original item "I use tables, figures, and pictures in text to increase my understanding", which is not relevant in this study because the material did not have any tables, figures, and pictures. Thus, those irrelevant items were deleted from the survey, and final survey had 28 items. In order to ensure the accuracy of the responses and to specify the responses to the instructional material they studied for the last three classes, the tense of the each item had been changed to the past tense. In addition to that, the instruction for the survey specified the instructional material they studied as a focus of the survey. The internal consistency reliability for the measurement was determined to be 0.79.

Procedures

The students participated in the experiments for three class meetings. Each of the class meetings was about 90 minutes and two days apart from another class meeting. Participants studied the instructional material for about 50-55 minutes each time and joined the regular class lecture. After the last class, the reading strategy inventory was handed out as homework, which is due by next class meeting two days later. They completed survey and scoring rubric, and turned in. The directions for the survey specifically mentioned about what you did when you read short stories handed out during the last three classes, in order for the students to focus on the instructional materials used for the experiment. The instructor for the course distributed randomly to the students two different material packages that had been numbered serially. Odd numbered material was for control group and even numbered on was for treatment group.

<center>**Result**</center>

The dependent variable in this study was the learner's metacognition, which was defined as the use and the awareness of various reading strategies. It was measured by a 28-item self-report questionnaire, the Metacognitive Awareness of Reading Strategy Inventory, administered at the end of the last class of the three classes, in which the

experiment was conducted. Table 1 presents the means and standard deviations for both control and treatment group on the questionnaire. Reliability of the instrument was .91 standardized item alpha. Preliminary analysis of the data did not indicate any serious violation of the normality and equal variance. To analyze the data, simple t-test comparing means was employed. With alpha set at .05, and with 21 for the control group and 25 for the treatment group, the probability of detecting a small difference between means was .65. Results of the t-test indicated that there was an insignificant main effect for critical thinking prompts on metacognition, $t(44) = -1.8$, $p = .08$.

Table 1 Mean scores and standard deviations on the questionnaire

Treatment	N	Mean	SD
Text and critical thinking prompts	25	81.5	15.3
Text only	21	73.4	15.0
Overall	46	77.8	15.5

Note: Maximum score was 140. It was measured by 28-item questionnaire. Each item was scored by 5-point likert scale and rated from 1—"strongly disagree" to 5—"strongly agree".

Discussion

The purpose of this study is to examine the effects of critical thinking prompts on learner's metacognition. There was no significant difference in mean of the scores of the questionnaire between the control and treatment groups. The reason may be that the material was too short and easy to read and understand. It described stories about actual people or interesting events that some people experienced, which may be interesting to the readers or easy to follow. For example, one story was about a woman who grew up in small Caribbean island and what she has experienced coming to the U.S. Other articles used were also comprised with brief arguments and thoughts. Thus, the overall difficulty of reading those stories was not so high that students had to use various strategies for reading and following the focus and the theme of the stories.

Another possible reason for the results may be that some items are not directly relevant to the actual strategies that they used or would use if necessary. Particularly, five items were identified irrelevant based on the score on the questionnaire and the nature of the instructional materials. They are: "I take notes while reading to help me understand what I read."; "When text becomes difficult, I read aloud to help me understand what I read."; "I discuss what I read with others to check my understanding."; "I underline or circle information in the text to help me remember it."; "I use reference materials such as dictionaries to help me understand what I read." In other words, in terms of the nature of the tasks, the students did not need to use some of the strategies. For example, the short stories were no technical documents or textbooks, which may require concentration and higher recall rate of specific information. Stories used in the material were just short stories aiming for conveying the ideas about diversity and the themes of the articles, as stated earlier. Thus, the students did not have to "take notes" or "circle or underline information in the text" to point out some key information as they did while preparing for an exam. Moreover, the students did not need to "discuss with others" or "read aloud" because they were not allowed to do such actions as a rule or courtesy in classroom.

As a result, the scores for those five items are the lowest of all in both control and treatment group. Additionally, it is suspected that the insignificant result stems from various sources such as the lack of the treatment power, the design of the instructional materials, the prior level of metacognition of the students, and so forth.

Despite the insignificant results, the review of the scatterplots and statistical test indicated noticeable difference between two groups. The most observations for the control group are distributed wider and lower than the treatment group. Without one particular observation, there is even more clear difference. The group that had critical thinking prompts reported higher questionnaire scores in total, and higher maximum and minimum scores within similar variance than the control group that had only text. The outstanding observation scored 17 points higher than the maximum score of the control group while the difference between the lowest and the second lowest score is only 7 points. It is 2.35 standard residual, which is slightly below the criteria of outlier. Without it, there is significant difference between the groups $t(43) = -2.29$, $p < .05$, which could mean that there is the main effect for critical thinking prompts on metacognition as hypothesized.

In summary, the overall results seem to indicate that there are expected effects of critical thinking prompts on students' metacognition as found in earlier studies (Whipp 2003). Therefore, the implication of this study for many different educational and training settings is the role of the critical thinking prompt as a simple and easy-to-apply learner support in various formats. Instructional designer and teacher can embed this type of learner supports within the learning material as the first step he or she can easily take in order to promote and develop the learners' reflection, metacognition, and possibly achievement. Especially with the current trends that there are growing needs of self-study and of learning for one's lifetime, it is important to utilize various learner supports in learning

materials.

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Using Motivational and Volitional Messages to Promote Undergraduate Students' Motivation, Study Habits and Achievement

ChanMin Kim
John M. Keller
Huei-Yu Chen
Florida State University

Abstract

This study investigated what kind of supportive information can be effective in improving the situation where there were severe motivational challenges. Motivational and volitional messages were constructed based on a integrated model of four theories and methods, which are Keller's ARCS model (Keller 2004), Kuhl's (1987) action control theory, the Rubicon model of motivation and volition (Gollwitzer 1999), and Visser & Keller's (1990) strategy of motivational messages, and distributed via email with personal messages created based on audience analysis to a large undergraduate class. In order to examine the effects of the messages on motivation, study habits and achievement, the motivational and volitional messages were sent to thirteen students (Personal Message Group: PMG) with personal messages and to seventy one students (Non Personal Message Group: NonPMG) without personal messages. Results indicated that PMG showed more positively increased motivation, especially in regard to confidence than NonPMG. With regard to achievement, the mean test scores of PMG jumped so that the initial differences between the two groups significantly decreased. However, there was no difference between two groups in study habits. These findings suggest that personal messages addressing specific individual problems raise the positive effects of the motivational and volitional messages constructed based on the integrated model.

Introduction

One of the difficulties in motivating students in large undergraduate lecture classes is that it is difficult to establish personal contact with them, or to make them feel that their individual needs, interests and goals are being addressed by the instructor. One potential way of improving upon this situation would be to use the Internet as a means of sending supportive information directly to each student. However, in order to do this, it is necessary to determine what kind of supportive information to send.

In an attempt to investigate what kind of supportive information can be effective in improving this kind of situation where there are threats to motivation are, this study constructed motivational and volitional messages based on an integrated model of four theories and methods, which are Keller's ARCS model (Keller 2004), Kuhl's (1987) action control theory, the Rubicon model of motivation and volition (Gollwitzer 1999), and Visser & Keller's (1990) strategy of motivational messages, and distributed the messages via email.

Specifically, one important feature of this study is the expansion of the ARCS model to include motivational and volitional strategies. Recently, Keller (2004) has described the problems of sustaining learner motivation and suggested that the ARCS model be expanded to include volitional concepts and strategies such as those in Kuhl's (1987) action control theory, and Gollwitzer's (1999) theory of motivation and volition. In addition, McCann and Turner (2004) recommend volitional strategies as a way of maintaining students' motivation, protecting against distractions, and developing their positive study habits.

Another important feature of this study is the process of creating those messages based on a systematic motivational and volitional design process that includes audience analysis and guidelines for message development. This process builds on one introduced by Visser & Keller (1990) in a situation where there were severe motivational challenges. That class was small in size and conducted on-site where the participants were employed. The content of the messages pertained to the four motivational categories defined within the ARCS model (attention, relevance, confidence, and satisfaction) (Keller 1987) and there were three types of messages. The first type was preplanned based on a-priori analyses of anticipated motivational problems, the second was sent to the whole class based on unexpected events, and the third was individually distributed based on specific individual problems.

The setting of this study is different from Visser & Keller's since the instructor has a general knowledge of the motivational challenges faced by the students but she does not likely have a close relationship with the students or personal knowledge of events in their lives that might adversely affect their studies, and also, she is not able to personally distribute messages. In addition, the messages distributed via email are somewhat impersonal compared to the previous study; however, considering the widespread use of this medium, students might view such messages

as a type of personal attention.

Therefore, it is necessary to determine whether a similar technique to Visser & Keller's to address students' motivational problems can be useful in a large undergraduate course; that is, it is necessary to examine whether personal messages addressing specific individual problems in addition to the motivational and volitional messages created to concern general motivational and volitional problems can be useful in the course.

Thus, the purpose of this study is to investigate whether the motivational and volitional messages constructed based on the four theories and methods and distributed via email with personal messages created based on audience analysis can be used to promote students' motivation, study habits and achievement.

Research questions

In this study, the following research questions were addressed:

Can the motivational and volitional messages constructed based on the four theories and methods and distributed via email with personal messages created based on audience analysis result in:

a positive effect on participants' motivation?

a positive effect on participants' study habits (study time)?

a positive effect on participants' achievement (grade)?

Method

Participants

The sample consisted of 101 undergraduate students enrolled in an archeology course at a Southeastern public university. The participation was voluntary so that 50 students among the total enrollment of 151 chose not to participate. Some of the participants were interested in majoring in this area and others were taking it as a general education requirement. The submission of logbooks answering survey questions was a required activity and they received credit for class participation.

The participants were assigned to one of two groups: one (Personal Message Group: PMG) received the motivational and volitional messages with personal messages, and the other (Non Personal Message Group: NonPMG) received the motivational and volitional messages without personal messages. The participants who indicated a low level of satisfaction with their grades in a survey following the second test in the course were assigned to the former. Their satisfaction levels were extremely unsatisfied, moderately unsatisfied, or moderately satisfied. The participants who indicated the high level of satisfaction with their grades of the most recent test in the pre-survey were assigned to the latter. Their satisfaction levels were very satisfied or extremely satisfied.

Materials

Pre-survey. The pre-survey assessed two dependent variables: motivation with the course and study time. In addition, it included a scale assessing the participants' satisfaction with their grade of the most recent test.

Post-survey. The post-survey which was administered after the third test assessed the same dependent variables in the pre-survey.

Motivational and volitional messages. The motivational and volitional messages (see Keller, Deimann & Liu, 2005) distributed via email were constructed based on the integrated model of four theories and methods, which were Keller's ARCS model (Keller, 2004), Kuhl's action control theory (Kuhl, 1987), Rubicon model of motivation and volition (Gollwitzer, 1999), and Visser & Keller's strategy of motivational messages (Visser & Keller, 1990). In addition, the motivational and volitional messages sent to Personal Message Group (PMG) included the personal messages created based on individual audience analysis (See Figure 1).

Measures

The following dependent variable measures were used:

Motivation with the course: three 5-point Likert scale item; interest, relevance and confidence (Reliability for these scales as assessed by Cronbach' alpha was >.70.)

Satisfaction with grade: one 5-point Likert scale items

Study habits (study time): the total study hours of the week before or after receiving the motivational and volitional messages

Achievement (grade): twelve scales from A (12) to F (1)

Procedure

The pre-survey and the post-survey were conducted before and after sending the motivation and volitional messages, respectively. Each survey took approximately five minutes to complete. The motivational and volitional

messages were sent to the Personal Message Group (PMG: n=30) with personal messages and to the Non Personal Message Group (NonPMG: n=71) without personal messages between the pre-survey (after the second test of the semester) and the post-survey (after the third test of the semester).

Attention: Calling the student's name raises her arousal and curiosity and directly relates this message to her.

Relevance: Information based on individual audience analysis personalizes this message and make it directly related to her.

Confidence: This part encourages her to believe she can achieve her goal.

Volitional strategies: This part informs that she needs strategies to control environment and to make decision on maintaining active

Confidence: This part encourages her to believe she can achieve her goal.

From: jkeller@fsu.edu
Sent: Wednesday, March 09, 2005 12:22 PM
To: jamie@fsu.edu
Subject: [ANT3141-01.sp05_research]

Dear Jamie,

In the previous logbook you said that you were not completely satisfied with your grade on Test 2, and I also noticed that you want to earn higher grades than you have earned so far. I have some suggests, in the form of Study Tips and messages such as this one, that might help you raise your grades on the two remaining tests.

Recently, a group of students in the class received these Study Tips in attachments, and a small group of students used them. The grades went up for eighty-two percent of the students who used the Tips, and their average improvement was two/thirds of a grade (for example, form a C to a B-). Some went up more, some less, but the evidence tells us that these Tips can be very helpful. In contrast, the overall class average on the second test was the same as the first one.

If you would like to take advantage of this opportunity, here is what to do.
1. Go to Blackboard (http:// campus.fsu.edu) and open the course titled: WORLD PREHISOTRU ANNEX [ANT3141-01.sp05_research].
2. Click on "Study Tips" in the menu on the left.
3. Open the "Stages of Learning" file and read it carefully to get a better understanding of the process that one goes through to establish effective learning habits.
4. Then, open the "Making a Plan that Works" file. This is an extremely important file! Read it carefully and make the kind of plan that is described there. Also, pay careful attention to the parts about how to deal with distractions and procrastination. And, notice that these tips require COMMITMENT and EFFORT from you. I can not, of course, guarantee that your grade will go up, but you can have confidence that if you do the things that are described here and in other strategies that I will tell you about, it is highly probable that you will increase your grade.
5. After you do this planning, I would appreciate it if you give me a quick reply to this message to let me know if you are finished.

I realize that you might not even see this until after spring break. That is okay. There is still time to use the Study Tips effectively to improve your grade. After a few days, or as soon as you reply to his message, I will send another one that describes the next set of steps to follow.

If you do not want me to send you any more messages, just send me a reply in which you ask me to stop.

Sincerely,
John Keller

Figure 1. One example email with personal message (The student's name is a pseudonym.)

Data analysis and Design

To determine if there were significant differences between PMG and NonPMG in motivation, study habits (study time) and achievement (grade), MANOVA, ANOVA and repeated measure ANOVA (split plot design) were employed, respectively.

Results

Following (Table 1) are the means for each condition. Following Table 1 is a presentation of results for the three research questions.

Table 1. Means and standard deviations for the dependent variables (and SD)

		PMG (n=30)		NonPMG (n=71)	
		Before message Means (SD)	After message Means (SD)	Before message Means (SD)	After message Means (SD)
Motivation	Interest	2.80 (0.89)	3.01 (0.72)	3.10 (0.76)	2.79 (0.88)
	Relevance	2.27 (0.73)	3.65 (0.94)	2.74 (0.90)	3.28 (0.93)
	Confidence	3.44 (0.61)	2.56 (0.71)	3.76 (0.80)	2.03 (0.90)
Study habits (Study time)		4.17 (2.77)	3.61 (1.50)	3.57 (2.51)	3.90 (1.91)
Achievement (Grade)		7.17 (2.21)	7.89 (2.65)	9.57 (2.22)	8.96 (2.48)

1. Can the motivational and volitional messages constructed based on the four theories and methods and distributed via email with personal messages created based on audience analysis result in a positive effect on participants' motivation?

The MANOVA for motivation indicated that there was an overall effect of the motivational and volitional messages on the motivation, Wilk's Lambda = .913, $F(1, 99) = 3.089$, $p < .05$. Univariate results revealed a main effect of the messages on motivation, where those received the messages with personal messages reported significantly more confidence (M = 2.56, SD = 0.71) compared to those who received the messages without personal messages (M = 2.03, SD = 0.90), $F(1, 99) = 8.051$, MSE = 5.787 , $p < .05$, $\eta^2 = .075$.

2. Can the motivational and volitional messages constructed based on the four theories and methods and distributed via email with personal messages created based on audience analysis result in a positive effect on participants' study habits (study time)?

The ANOVA for study time revealed that there was no significant difference in study habits between those who received the messages with personal messages (M = 3.61, SD = 1.50) and those who received the messages without personal messages (M = 3.90, SD = 1.91), $F(1, 99) = .506$, MSE = 1.649 , $p > .05$.

3. Can the motivational and volitional messages constructed based on the four theories and methods and distributed via email with personal messages created based on audience analysis result in a positive effect on participants' achievement (grade)?

A 2×2 repeated measures ANOVA on the data on the tests before and after messages were sent showed a significant interaction between the two factors of time and intervention methods [$F(1, 99) = 5.355$, MSE = 18.883, $p < .05$, $\eta^2 = .051$]. This result indicated that students' test scores depended on time (before personal message and after personal message) according as they were in PMG or Non PMG. In other words, PMG and NonPMG's test scores were significantly different before personal message and after personal message such that the means for NonPMG were always superior to PMG (See Table 1). But, the means of the two groups moved closer together after the personal messages. The significant interaction occurred because the mean of the NonPMG grades decreased while the mean of the PMG group increased. (See Figure 2).

Estimated Marginal Means

Figure 2. Difference in the grade changes between PMG and NonPMG

Discussion

The results indicate that participants who received the motivational and volitional messages with personal messages showed more positively increased motivation, especially in regard to confidence, and achievement than those who received the motivational and volitional messages without personal messages. These findings suggest that the motivational and volitional messages constructed based on the four theories and methods and distributed via email with personal messages addressing specific individual problems be useful support for improving the situation where there are threats to motivation.

Increased motivation might have resulted from the personal messages where the words and sentences concerning participants' attention, relevance and confidence were embedded in (See Figure 1). Particularly, more increased confidence than interest or relevance also might be explained by the fact that there were more parts facilitating confidence than the others.

With regard to achievement, the initial differences in test scores between the two groups significantly decreased (See Figure 3). This pattern of development of achievement shows an ideal direction that is often hoped to be observed by researchers when conducting interventions that are purposely designed to enhance motivation.

Contrary to what were found in motivation and achievement, there was no positive effect of the personal messages with embedded motivational and volitional elements on study habits. Perhaps, the messages did not significantly impact study habits because the participants did not have enough time to utilize the volitional strategies suggested. In other words, the motivational and volitional messages with personal messages were given only for one month between the two tests. During this time period, the participants might not have successfully transformed from the stage of "commitment" to the stage of "formation of implementation intention" so that they might not have been ready to move from "pre-actional phase" to "actional phase" (Gollwitzer 1999). Positive effects might have been found in study habits if the personal messages had been constantly provided throughout the whole semester.

In conclusion, future research could include long-term use of personal messages along with the motivational and volitional messages and particularly determine if students' study habits are positively improved. Future research could also consider that the instructor of a course construct and send personal messages with assistance from the researcher who actually designs the motivational and volitional messages. In that case, the findings might be improved because students' would perceive those messages as being more personal because they were sent by the instructor whom they interact with in class rather than a researcher whom they are not familiar with. However, this study gives preliminary evidence that personal messages created according to individual audience analysis can raise the positive effects of the motivational and volitional messages constructed based on the four theories and methods.

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The Relationship Between Preservice Teachers' Perceptions of Faculty Modeling of Computer-Based Technology and Their Intent to Use Computer-Based Technology

Kioh Kim
Landra Rezabek
Guy Westhoff
John Cochenour
University of Wyoming

Abstract

Based on Bandura's (1997) social learning theory, the purpose of this study is to identify the relationship of preservice teachers' perceptions of faculty modeling of computer-based technology and preservice teachers' intent of using computer-based technology in educational settings. There were 92 participants in this study; they were enrolled in "Teaching with Microcomputers" class at a major university in Rocky Mountains.

Two survey instruments were used in this study. The first instrument was Preservice Teachers' Perceptions of Faculty Modeling Survey (PTPFMS). The second instrument was Intent to Use Computer-based Technology Survey (ITUCTS). The results showed that preservice teachers' perception of faculty modeling of computer-based technology significantly affected their intent to use computer-based technology; results were similar for the use dimension and its sub dimensions, but on the dimension of role of technology and its sub dimensions the interaction was insignificant. The paper concludes by stating the limitations and implications of this study.

Introduction

Will the trilogy of Matrix come true? We have not even completed the first decade of the 21st century and advancements in computer-based technology are so great that we rely on it more than any other species on this planet. Every sword has two faces, one good another bad. One good application of computer-based technology is within educational settings. Using computer-based technology in educational settings helps students in their learning (Sahin, 2003; Stinson, 2003; Whetstone, & Carr-Chellman, 2001). There are studies that indicate learners have positive attitudes towards using technologies in their classroom (Kurubacak,& Baptiste, 2002; Lee, 1996; Norby, 2002; Okinaka, 1992). In addition, teachers also improve their instruction by using a variety of technology resources such as the Internet, multimedia CD-ROMs, audio and graphics (Jao, 2001). There is evidence that suggests teaching with technology provides more benefits for both teachers and students than teaching without any technology.

There has been a scarcity of researchers exploring the ways in which preservice teachers can be taught to effectively integrate computer-based technology within their instruction. According to the National Center for Education Statistics (2000), teacher preparation for technology integration is minimal, and in 1999 most teachers reported feeling less than well prepared to use computers and the Internet for instruction. Thus, an appeal to amplify attention to this topic in teacher preparation programs has been issued by numerous organizations including the International Reading Association (2002), the National Council for the Accreditation of Teacher Education (2004), and the U.S. Department of Education (1996).

"To realize any vision of smarter schooling by using technology… college education must prepare teachers to use the technology. Adequate teacher preparation is probably the most important determinant of success" (Hancock, & Betts, 1994, p. 29). To effectively integrate computer-based technology in their teaching practice, it is pertinent that prospective teachers develop appropriate teaching styles which incorporate computers to impact student learning. Teaching with computers requires a shift from the traditional teaching practice. "Technology affects the way teachers teach, students learn, and administrators operate. Roles and teaching and learning strategies are changing because technology fosters the use of more student-centered learning strategies" (Norum, Grabinger, & Duffield, 1999, p. 189).

Teacher's attitudes toward the use of technology can significantly affect their students' opportunities to learn about technology (Norby, 2002; Okinaka, 1992). In order to help K-12 students, training preservice teachers is the most direct and cost-effective way (Fasion, 1996). Universities and colleges are the places to train preservice teachers to comprehensively integrate instructional technology into their future classroom instruction. It is necessary for preservice teachers to be trained using instructional technology so that they can use the technology skills and be confident in using technology in their classroom as classroom teachers. There is a great concern about the

prospective teachers' perception of the role of the computer in the learning process.

The literature shows that there is a need for better training to preservice teachers to integrate computer-based technology while they teach. Can this lack in training be fulfilled by proper modeling from faculty of preservice teachers? This study will explore the relationship between preservice teachers' perceptions of faculty modeling in the use of computer-based technology, and preservice teachers' perceptions of their intent toward using computer-based technology when they become teachers.

This research is based on social learning theory. The social learning theory originated by Albert Bandura (1977) emphasizes that learners learn by what they observe from modeling, attitudes, and emotional reactions of their teachers. Therefore, this research argues that preservice teachers are going to use computer-based technology in ways similar to the ways their college/university instructors' modeled computer-based technology when they become teachers in the future. Many researchers mentioned that technology must be modeled by college/university faculty to produce new inservice teachers to use technology properly (Cassady & Pavlechko, 2000; Duhaney, 2001; Krueger, Hansen, & Smaldino, 2000; Laffey & Musser, 1998; Luke, Moore, & Sawyer, 1998; Persichitte, Caffarella, & Tharp, 1999; Schrum & Dehoney, 1998; Stetson & Bagwell, 1999; Wetzel, Zambo, & Buss, 1996; Yidirim, 2000).

There is research literature that identified that many professors use computers in their classroom to teach (Carlson & Gooden, 1999; Frey & Birnbaum, 2002; Nelson, 2004; Simmons & Macchia, 2003). The computer-based technologies that professors use include word processing, database, spreadsheet, desktop publishing, presentation software, World Wide Web, and email. All the computer-based technologies mentioned above should be used in K-12 schools by teachers (Nelson, 2004). In order for teachers to use computer-based technology effectively in their classroom, preservice teachers should be trained in how to use computer-based technology while they are in college/university courses. These courses provide a model of what computer-based technology their college/university instructors used within their teaching. It is these models that preservice teachers use when they become teachers in the future.

Social Learning Theory

The social learning theory of Bandura (1977) emphasizes the importance of observing and modeling, the attitudes, and emotional reactions of others in learning. Social learning theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences. Bandrua's view of the social learning theory is that "human behavior is the result of a continuous interactive process involving cognition, behavior, and environmental factors" (Rezabek, 1987, p. 3). Rezabek also stated that "Social learning theory suggests that people can learn by observing the behaviors of models" (p. 53).

Social learning theory has numerous implications for classroom use. Rutledge (2000) presents the following educational implications of social learning theory:
1. Students often learn a great deal simply by observing other people.
2. Modeling provides an alternative for shaping new teaching behaviors. Instead of using shaping, which is operant conditioning; modeling can provide a faster, more efficient means for teaching new behaviors. To promote effective modeling a teacher must make sure that the four essential conditions exist; attention, retention, motor reproduction, and motivation.
3. Teachers should expose students to a variety of other models. This technique is especially important to break down traditional stereotypes (p. 5).

According to Rutledge (2000) the roles of teachers as well as parents are important to model appropriate behaviors to their students and children. This shows that the concept of social learning theory underlies the variable-faculty modeling in integrating computer-based technology.

Instructional Technology Modeling

One of the applications of Social Learning theory is instructional technology modeling. Higher education faculty must model technology use to prepare new teachers to use technology as a part of their future curriculum (Cassady & Pavlechko, 2000; Duhaney, 2001; Krueger, Hansen, & Smaldino, 2000; Laffey & Musser, 1998; Luke, Moore, & Sawyer, 1998; Persichitte, Caffarella, & Tharp, 1999; Schrum & Dehoney, 1998; Stetson & Bagwell, 1999; Wetzel, Zambo, & Buss, 1996; Yidirim, 2000). According to Smith, Frey, and Tollefson (2003), preservice teachers stated that the modeling conducted by the collaborative faculty made significant difference in their attitude towards and understanding of what collaboration was and what it took to be successful. More importantly, respondents expressed an understanding of how this team building would lead to meeting the needs of a variety of students in a specific classroom.

Instructional modeling in higher education institutions is an important tool in training preservice teachers.

The instructional modeling done by faculty provides the foundation from which preservice teachers use these same or similar teaching models when they become teachers (Lever-Duffy, McDonald, & Mizell, 2005). In order for preservice teachers to be comfortable in using computer-based technology as future inservice teachers, university and college instructors should model computer-based technology in their teaching.

Current research identifies that "good technology mentoring is only achieved through role modeling, ongoing evaluation, constructive criticism, and coaching" (Carlson & Gooden, 1999, p. 12). In another case, teachers modeled the use of PowerPoint and the Internet through a Preparing Teachers to Use Tomorrow's Technology (PT3) grant (Simmons & Macchia, 2003). The preservice teachers who saw professors modeling PowerPoint and the Internet are now making the effort to utilize various instructional technologies to support class projects within their classrooms (Simmons & Macchia, 2003).

In one case, K-12 teachers with less experience in using technology in their own teaching began to use technology after observing more experienced teachers use technology (Mills & Tincher, 2002). In another study, modeling technology as a professional development model in technology integration showed that there were changes in preservice teacher beliefs and practices (Ross, Ertmer, & Johnson, 2001). Therefore, modeling the use of many types of hardware and software is the primary method for modeling technology use for preservice teachers.

Intent to Use Computer-Based Technology

Today, students have grown up with and become accustomed to the visual stimulation of television, computers, and video games, and they expect technology to be used effectively as part of their learning experience by their teachers in school (Frey & Birnbaum, 2002). Thus, teachers who have a positive intent to use technology and the technology skills are more likely to integrate technology into their own teaching practices.

There is research that suggests that the more experience preservice teachers have with computers, the less anxiety and the more positive level of intent they will have towards using instructional technology (Downes, 1993; Koohang, 1989; Savenye, 1992). It is important for preservice teachers to experience technology integration in college before they become inservice teachers so they have less anxiety and a positive level of intent to use technology in their classroom in the future. Preservice teachers "envision the computer primarily for word processing and as a means to do administrative tasks" (Mower-Popiel, Pollard, & Pollard, 1994, p. 138). Preservice teachers who feel comfortable in using computers have positive intent toward integrating computers in K-12 schools (Troutman, 1991).

One of the major goals of this study is to find what role preservice teachers' perceptions of faculty modeling in the use of computer-based technology plays in preservice teachers' intent to use computer-based technology when they become teachers.

Statement of the Problem

In this study the researcher is interested in identifying a relationship between preservice teachers' perceptions of faculty modeling of computer-based technology use and preservice teachers' intent toward computer-based technology use in the classroom.

Research Question

Given this research problem, the guiding question of the study is: Do preservice teachers' perceptions of faculty modeling in the use of computer-based technology have any relationship with the preservice teachers' perceptions of their intent toward using computer-based technology?

Based on the literature review, it is hypothesized that subjects' scores on intent to use computer-based technology survey can be predicted by their scores on preservice teachers' perceptions of faculty modeling.

Methodology

This research aims to identify the relation between preservice teachers' perceptions of faculty modeling of using computer-based technology and preservice teachers' intent to use computer-based technology when they become teachers. In order to collect data from the participants quantitative procedures were used. This section includes a description of the sample, pilot study, data collection procedures, instrumentation, and data analysis methods.

Sample Description

The participants in this study were preservice teachers who were enrolled in "Teaching with Microcomputers" class at a major university in Rocky Mountains.

The course has five sections which have a total of 100 students. The course is a required instructional

technology courses for education majoring students. Since the participants are taking the course on campus, the researcher requested the instructors for their permission and then researcher administered the survey for the research in each classroom for all five sections. Overall 92 students participated in the study, out of which 62 were females and 30 were males, and 43 students had elementary education and 49 students had secondary education as their major. The age of participants was between 18 years and 62 years.

Procedure

Data were collected in "Teaching with Microcomputers" course which was taught by three different instructors. All three instructors of the course allowed the researcher to be in their classrooms for collecting data from the students enrolled in the course. The researcher distributed the questionnaires to each section during the same week of the semester. The participation of subjects was voluntary in nature.

Instruments

For the study, two survey instruments were utilized to collect the data from the participants. They are described as follows:

a) Preservice Teachers' Perceptions of Faculty Modeling Survey (PTPFMS). The first instrument to be used was the Preservice Teachers' Perceptions of Faculty Modeling Survey (PTPFMS). This PTPFMS was used to measure preservice teachers' perceptions of their university instructors' modeling of using computer-based technology in their classroom. This instrument was created by the researcher. In the pilot study the overall reliability of PTPFM was found to be 0.92. The PTPFMS instrument used a Likert scale from (1) Never to (5) Always and consisted of 24 questions divided into two main sections: Use of computer based technology and Role of instructor. The two sections are each divided into two focuses with six questions being student-centered and six teacher-centered. PTPFMS includes three demographic question items pertaining to the participants' gender, age and major. Major includes two categories; elementary education and secondary education.

b) Intent to Use Computer-based Technology Survey (ITUCTS): The second instrument was the Intent to Use Computer-based Technology Survey (ITUCTS). ITUCTS was adopted from the writings of Bichelmeyer, Reinhart, and Monson (1998) and Wang (2001).

The ITUCTS instrument is divided into two sections, each section has 12 questions. The first section addresses the preservice teachers' perceptions of their future role in a classroom equipped with computer-based technology (Role). Role of the teacher in the classroom was defined as the manner or style in which the teacher engages during classroom instruction, having a spectrum from, the teacher as an authority figure (Teacher-Centered Role) to the teacher as a learning facilitator (Student-Centered Role). The second section addresses the preservice teachers' perceptions of how they will use computer-based technology specifically when placed in a computer-based technology enhanced classroom (Use). Use of computer-based technologies in the classroom is defined as either the use of computer-based technology by the students for learning activities (Student-Centered Use) or use of computer-based technology by the teacher in ways that enable the teacher to more easily manage his or her classroom and instruction (Teacher-Centered Use). Both the sections used a Likert scale from (1) Never to (5) Frequently with 12 questions in each section.

The reliability of the section measuring teacher-centered role is .94, the section measuring student-centered role is .93, the section measuring teacher-centered computer use is .86, and the section measuring student-centered computer use is .93 (Wang, 2001). The overall reliability of this questionnaire in this study was found to be .83 and the reliabilities on the sub-scales were found to be similar to the study of Wang (2001).

Data Analysis

Data from PTPFMS and ITUCTS were organized in SPSS 11.5 statistical software to analyze. This study used regression analysis to determine the relationship between PTPFMS and four dimensions of ITUCTS. Independent variables were four dimensions of preservice teachers' perceptions of faculty modeling of using computer-based technology, gender, age and major. Dependent variables were four dimensions of preservice teachers' intent to use computer-based technology survey. The analysis was also conducted on overall scores of preservice teachers' perceptions of faculty modeling of using computer-based technology and preservice teachers' intent to use computer-based technology survey.

In the pilot study, none of the interactions were significant at 0.05 level. Therefore, in order to have more significant interactions, 0.10 level was used while analyzing the results in the main study. But 0.05 level was also used for results significant at that level.

The table below shows the means of 92 participants on all the four dimensions of Preservice Teachers' Perceptions of Faculty Modeling and four dimensions of Intent to Use Computer-based Technology (Table 1).

Table 1 Means of participants on all the four dimensions of PTPFM and ITUCT

PTPFM				ITUCT			
Teacher-centered		Student-centered		Teacher-centered		Student-centered	
Role	Use	Role	Use	Role	Use	Role	Use
16.84	19.82	16.28	18.11	23.03	23.86	21.38	19.52

Further regression analysis is conducted to evaluate the relationship between four dimensions of Preservice Teachers' Perceptions of Faculty Modeling with their corresponding dimension on Intent to Use Computer-based Technology.

Relation between Preservice Teachers' Perceptions of Faculty Modeling and Intent to Use Computer-based Technology Analysis of data showed that overall scores on Preservice Teachers' Perception of Faculty Modeling of Computer-based Technology Survey significantly predicted subject's overall score on Intent to Use Computer-based Technology (Table 2).

Table 2 Relation between Preservice Teachers' Perceptions of Faculty Modeling and Intent to Use Computer-based Technology

Predictor Variables	Criterion Variables	β	T	p	R^2
Preservice teachers' Perception of Faculty Modeling	Intent to Use Computer-based Technology	0.182	1.759	0.082*	0.033

  * significant at 0.10 level

Analysis of the best fitting line when data were entered graphically showed that as subjects' score on Preservice Teachers' Perceptions of Faculty Modeling Survey increased, their score on Intent to Use Computer-based Technology Survey also increased (Figure 1).

Relation between Preservice Teachers' Perceptions of Faculty Modeling (Use) and Intent to Use Computer-based Technology (Use)
Analysis of data showed that overall scores on use of Preservice Teachers' Perception of Faculty Modeling of Computer-based Technology Survey significantly predicted subject's overall score on use of Intent to Use Computer-based Technology (Table 3).

Table 3 Relation between Preservice Teachers' Perceptions of Faculty Modeling (Use) and Intent to Use Computer-based Technology (Use)

Predictor Variables	Criterion Variables	B	T	P	R^2
Preservice teachers' Perception of Faculty Modeling (Use)	Intent to Use Computer-based Technology (Use)	0.398	3.948	0.000**	0.148

** significant at 0.05 level

Analysis of the best fitting line when data were entered graphically showed that as subjects' score on overall use of Preservice Teachers' Perceptions of Faculty Modeling Survey increased, their score on overall use of Intent to Use Computer-based Technology Survey also increased (Figure 2).

Relation between Preservice Teachers' Perceptions of Faculty Modeling (Teacher-centered Use) and Intent to Use Computer-based Technology (Teacher-centered Use)
Analysis of data showed that overall scores on teacher-centered use of Preservice Teachers' Perception of

Faculty Modeling of Computer-based Technology Survey significantly predicted subject's overall score on teacher-centered use of Intent to Use Computer-based Technology (Table 4).

Table 4 Relation between Preservice Teachers' Perceptions of Faculty Modeling (Teacher-centered Use) and Intent to Use Computer-based Technology (Teacher-centered Use)

Predictor Variables	Criterion Variables	β	T	p	R^2
Preservice teachers' Perception of Faculty Modeling (Teacher-centered Use)	Intent to Use Computer-based Technology (Teacher-centered Use)	0.402	4.167	0.000**	0.162

** significant at 0.05 level

Analysis of the best fitting line when data were entered graphically showed that as subjects' score on overall teacher-centered use of Preservice Teachers' Perceptions of Faculty Modeling Survey increased, their score on overall teacher-centered use of Intent to Use Computer-based Technology Survey also increased (Figure 3).

Relation between Preservice Teachers' Perceptions of Faculty Modeling (Student-centered Use) and Intent to Use Computer-based Technology (Student-centered Use)
Analysis of data showed that overall scores on student-centered use of Preservice Teachers' Perception of Faculty Modeling of Computer-based Technology Survey significantly predicted subject's overall score on student-centered use of Intent to Use Computer-based Technology (Table 5).

Table 5 Relation between Preservice Teachers' Perceptions of Faculty Modeling (Student-centered Use) and Intent to Use Computer-based Technology (Student-centered Use)

Predictor Variables	Criterion Variables	β	T	p	R^2
Preservice teachers' Perception of Faculty Modeling (Student-centered Use)	Intent to Use Computer-based Technology (Student-centered Use)	0.252	2.469	0.015**	0.063

** significant at 0.05 level

Analysis of the best fitting line when data were entered graphically showed that as subjects' score on overall student-centered use of Preservice Teachers' Perceptions of Faculty Modeling Survey increased, score on overall student-centered use of Intent to Use Computer-based Technology Survey also increased (Figure 4).
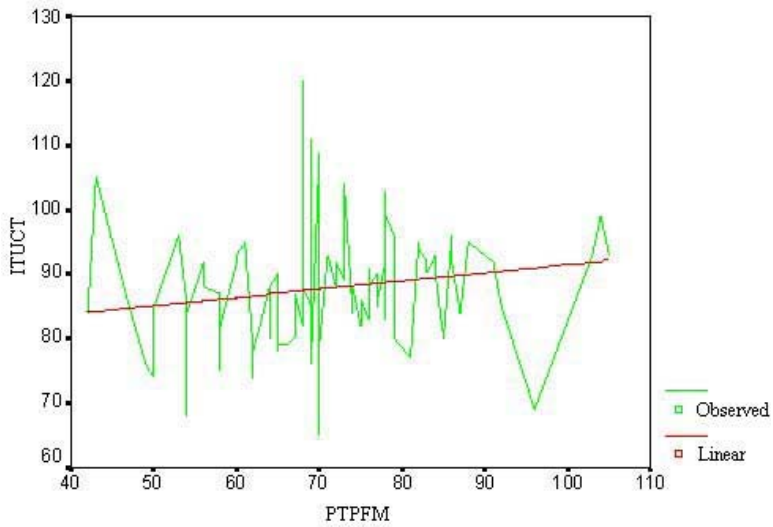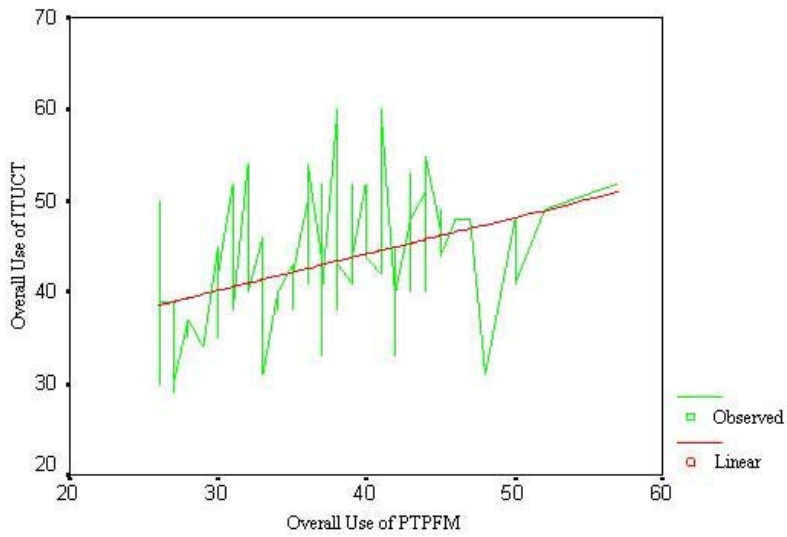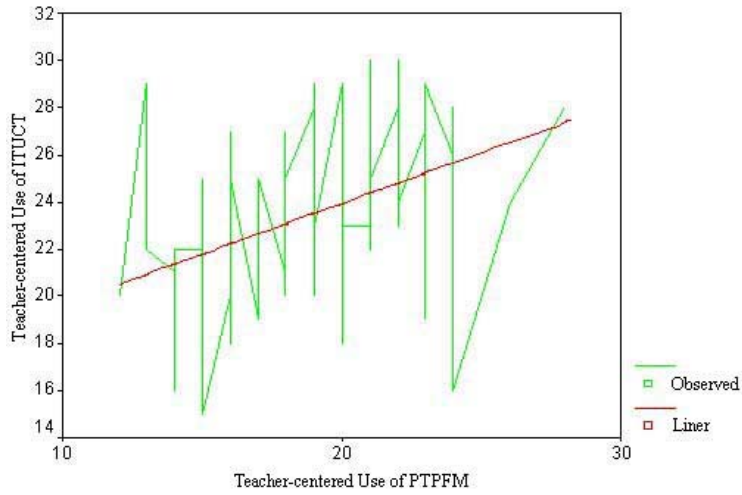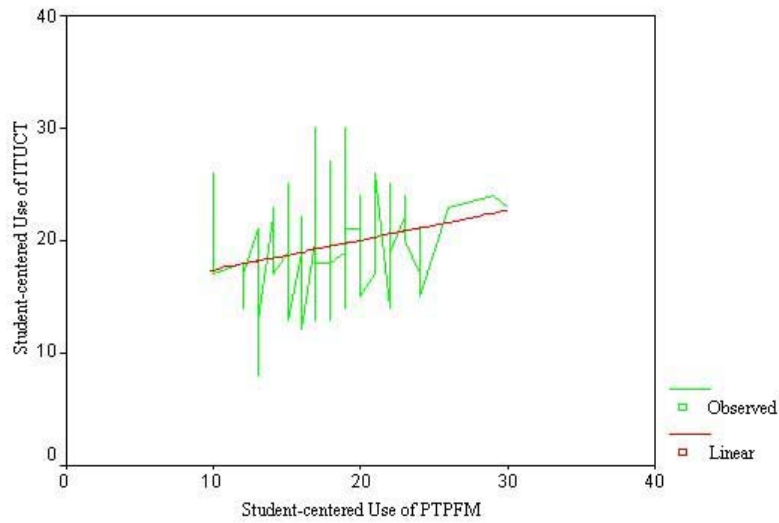
Relation between Preservice Teachers' Perceptions of Faculty Modeling (Role) and Intent to Use Computer-based Technology (Role)
Analysis of data showed that Preservice Teachers' Perception of Faculty Modeling on role of computer-based technology for delivering course information does not significantly predicted subject's score on Intent to Use of Computer-based Technology based on its role for delivering course information, results were similar for both teacher-centered role and student-centered role.

Discussion
Students today have experienced much technological advancement and are accustomed to the visual stimulation of television, computers, and video games. Hence, they expect technology to be used effectively as part of their learning experience. Many studies have shown that using computer-based technology in educational settings helps students in their learning (Sahin, 2003; Stinson, 2003; Whetstone, & Carr-Chellman, 2001). So it is pertinent for preservice teachers to effectively learn integration of computer-based technology in real life teaching scenario. So how can they experience such learning process in their training? This study analyzes the relationship of preservice teachers' perception of faculty modeling of computer-based technology with their intent to use computer-based technology when they become teachers.

Conclusion
Inspired by various researchers that shows teaching with technology provide more benefits for both

teachers and students than teaching without any technology (Sahin, 2003; Stinson, 2003; Whetstone, & Carr-Chellman, 2001) and that teachers can improve their instruction by using a variety of technology resources such as the Internet, multimedia CD-ROMs, audio and graphics (Jao, 2001); this research explores the relationship of preservice teachers' perceptions of faculty modeling in computer-based technology use with their intent of using computer-based technology in educational settings.

Universities and colleges are the places to train preservice teachers to comprehensively integrate instructional technology into their future classroom instruction. This research, based on Bandura's (1977) social learning theory, hypothesized that preservice teachers' perceptions of faculty modeling in computer-based technology use will affect preservice teachers' intent of using computer-based technology in educational settings when they become teachers in the future.

The results showed that preservice teachers' perception of faculty modeling of computer-based technology significantly affected their intent to use computer-based technology; results were similar for the use dimension and its sub dimensions, but on the dimension of role and its sub dimensions the interaction was insignificant.

Limitations

This study has some limitations as follows:

First, the sample in this study is limited to one specific course and specific university. Hence, these results can not be generalized as the sample is not representative. Second, there is limited research on the relationship between Preservice Teachers' Perceptions of Faculty Modeling, gender, age, major and Intent to Use Computer-based Technology. However, there is research in the literature that examines each of these five variables individually. So it is difficult to evaluate the results of this research in light of this earlier research.

The participants of this study are enrolled in other courses simultaneously, so modeling by faculty of those courses may influence their scores on Preservice Teachers' Perceptions of Faculty Modeling and Intent to Use Computer-based Technology surveys also their previous experience with the use of computer-based technology may also influence their scores on those surveys.

In future researchers may improve and add to the results of this research by taking a more representative sample and conducting the research in a more controlled setting.

Implications

Over the course of the last decade technology has been gaining more importance in teacher education programs but most programs still have a way to go before they can accurately prepare their graduates to use technology to its fullest potential in their teaching and administrative activities (Moore, Knuth, Borse, & Mitchell, 1999). This research shows the importance of preservice teachers' perceptions of faculty modeling of computer-based technology in influencing their intent to use computer-based technology. This study is significant since college-level instructors must be competent users of computer-based technologies in order to influence the full development of preservice teachers who use them as role models. So the assessment of competencies of preservice teachers' instructors should be authentic and indicate whether the competencies instructor's posses are adequate to support the vision of learning in actual classroom settings.

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Figure 1. Relation between Preservice Teachers' Perceptions of Faculty Modeling and Intent to Use Computer-based Technology

Figure 2. Relation between Preservice Teachers' Perceptions of Faculty Modeling (Use) and Intent to Use Computer-based Technology (Use)

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Figure 3. Relation between Preservice Teachers' Perceptions of Faculty Modeling (Teacher-centered Use) and Intent to Use Computer-based Technology (Teacher-centered Use)

Figure 4. Relation between Preservice Teachers' Perceptions of Faculty Modeling (Student-centered Use) and Intent to Use Computer-based Technology (Student-centered Use)

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Exploring the Vision of Technology Integration Research: Scholars' Thoughts on Definitions, Theories, and Methodologies

Tiffany A. Koszalka
Kerstin Mukerji
Syracuse University

Abstract

Scholarship in educational technology integration is diverse in definition, theory, and methodology. This research is rich, complex, and contradictory. As a whole, the reliability, validity, and usefulness of such scholarship is questionable. A panel of educational technology scholars will share insights and answer questions on this research and how AECT may help address such issues. It is our hope that this dialogue will help inform future directions of scholarship and practice in educational technology integration.

Introduction

"The use of technology for teaching and learning has evolved ...we are just beginning to comprehend the potential for technology to help students construct meaning for themselves ...and learn in multiple modalities and across multiple domains..." (Mills & Tichner, 2003, p. 382)

The proliferation and diverse trends of educational technology integration in our society presents many research opportunities for instructional designers. As a result, the scholarship on educational technology integration is abundant in both research and practice literature. Such literature represents research conducted on multiple topics, addressing a variety of questions in many different contexts, and using a variety of theoretical frameworks and research methodologies. The field of educational and instructional technology research and development is, as Richey (2000) describes, a "complex enterprise with a more complex knowledge base (p.16)." Although rich, the abundance of scholarship in technology integration makes it challenging to interpret findings that are often conflicting and difficult, at best, to compare. A clearer understanding of, and direction for, technology integration research as it applies to instructional design, implementation and evaluation is required.

Definition and Multiple Contexts

Technology itself can be defined as a tool used within human activity and interaction (Matheson, et al, 1999; Wilson, 2004). The term technology integration, therefore, can be used to describe how tools are incorporated into a specific activity or series of activities. The term educational technology integration is often used in a variety of ways; from describing computer use in educational settings to describing types of resources used in online courses to defining levels of immersion in virtual reality learning environments (Koszalka & Grabowski, 2003). Technology integration is also used in the literature to describe stages of educational technology use and adoption (Wilson et al., 2002), suggesting progressive levels of technology inclusion based on levels of training and competency development, availability of support mechanisms, types of technology usages, and other systems variables affecting technology use in educational settings (Koszalka & Grabowski, 2003). Thus, the definition of technology integration varies greatly within our community.

Studies on technology integration may focus on one or many specific types of technology, e.g., computers, telecommunications or multimedia (Blanton et al., 2001). These educational technologies are studied in K-12, higher education, government, non-profit, and business contexts as well as in a variety of content areas, e.g., science, skills development (Koszalka & Wang, 2002), information processing (Bishop & Cates, 2001), critical thinking (Choi et al., 2001), community building (Lowell & Persichitte, 2000), and competency development (Nadolski et al., 2001). And, it serves to note that integration efforts and research teams are often multidisciplinary in nature including instructional design, content, technology, communication, technology, anthropology, sociology, and other specialists. Thus, working in technology integration research generally implies a need to create a multi-dimensional organizing matrices that outline media choices, design criteria, learning goals, environmental characteristics, and more within the learning environment in order to manage what is being studied (Koszalka & Grabowski, 2003). The theoretical frameworks and research methodologies surrounding the study and assessment of technology integration are equally complex.

Theoretical frameworks and research methodologies

Past, ongoing, and proposed studies in technology integration are based in many different theoretical frameworks ranging from educational technologies within the context of cognitive development processes to more holistic investigation of relationships among the elements present in technology integration activities (Blanton et al., 2001; Choi & Jonassen, 2000; Hill & Hannafin, 1997; Jonassen & Rohrer-Murphy, 1999; Koszalka & Grabowski, 2003; Koszalka & Wu, 2004; Peal & Wilson, 2001). Researchers have also explored technology integration using change and adoption of innovation models (Ely, 1990; Rogers, 1995). Research methodologies being employed include qualitative, quantitative, or mixed methods using quasi-experimental, naturalistic observation, case studies, meta-analyses or other protocols to gather data (Koszalka & Grabowski, 2003; Reigeluth, 2003). Such research often yields recommendations for technology interventions and instructional design strategies for integrating such technologies to enhance teaching and learning. Yet, the findings, outcomes, and recommendations from such studies, although insightful and beneficial, are often complex and conflicting.

Problem Statement & Proposed Panel Session

A major issue currently being discussed in the AECT community, and in other related fields, is the reliability, validity, and usefulness of the current scholarship in educational technology integration. In a jungle of topics, contexts, frameworks, and methodologies, how do ID researchers and practitioners interpret and add to our understanding of educational technology impacts and practices? How can we, as researchers and practitioners, help provide a theoretical framework that is generally accepted when discussing issues of technology integration? The purpose of this panel is therefore to call upon recognized scholars and active researchers in the field to help us navigate and make sense of this research by addressing the following questions:

- What is *your* working definition of *technology integration*?
- What *theoretical framework* do you use, or recommend using, to study technology integration?
- What technology integration *research questions* do you think are most worthy to pursue?
- What *research methodologies, instruments or tools* have you found most helpful in understanding technology integration?
- How can associations like AECT help promote and support better scholarship and interpretation in technology integration research and practice?

Initial responses from panel members to the definition question range in scope from views of technology integration as (i) a combination of understandings, behaviors, and attitudes surrounding what technologies do well and how technologies enhance teaching and learning to (ii) the abilities to combine people, processes, and devices to (iii) creating effective solutions to learning and instructional problems to processes and (iv) the results of using technologies to support work that is done in the classroom. Other definitions suggest that technology integration is a measure of human and tools interaction within relevant instructional contexts, e.g., the dynamic relationships among subjects, objectives, community members, and tools to accomplish teaching or learning goals. Still other definitions include process characterizations that address access, training, and preparation to use technologies.

Theoretical frameworks and critical research questions are just as varied as the definitions of technology integration. Common among the frameworks are change, adoption, stages, and systems theories. Others mentioned by panelists include behavioral and constructivists approaches to teaching and learning. Some frameworks maintain specific and narrow theoretical foci, while others are holist and systemic in their approach. These frameworks spawn questions that aim at investigating the (i) characteristics, affordances, and flexibility of specific technologies; (ii) effects of technologies on teaching and learning processes or stakeholders; (iii) differences in uses of technologies in varying instructional settings; (iv) differences in the use of technologies by different stakeholders; (v) abilities of technologies to facilitate learner's attainments, support learners' learning decision making, foster student learning, and assess the level of student learning; and (vi) examination of how technologies can mediate, afford or disturb learning within a formal and informal learning context. And, there are many other questions currently under investigation or recommended.

Such diverse frameworks and questions command diverse research methodologies, measures, and instruments. Panelists suggest both quantitative and qualitative measures are necessary. Specific research methods indicated by the panelists follow Concerns-Based Adoption, Diffusions of Innovations, design-based research (formative research), ethnography, and community narratives methodologies. Cultural Historical Activity Theory (CHAT) research methodologies are also called for that focus on the interaction of human activity and human thought within its relevant environmental context. Since it is assumed that learning is not a precursor to, rather it emerges from activity, research this research approach examines the individuals(s) involved in the activity and

activity elements such as the product of the activity, mediating tools, community members, and guiding rules while the individual(s) is/are acting on and attempting to produce an outcome. Some panelists also call for traditional quasi-experimental pre- and post- tests designs as well as survey (cross-sectional) and case study research. All these methodologies can provide rich data and encourage deeper understanding of technology integration in context. Comprehensive meta-analysis that include summaries and more global interpretations these studies may also provide stronger insights needed to better understand the diverse data and results to better inform the scholarships and practices of technology integration.

AECT can play a significant role in helping our field, and sister fields (e.g., education, communication, information technologies, anthropology, sociology, etc.), better understand and practice in the realm of technology integration. It is suggested that AECT members rally to provide clearer and accepted definitions of technology integration and related terminology. Through its communication, publication, and outreach networks AECT can also provide databases and summaries or current scholarship in these areas, encouraging scholars to share results, collaborate, and communicate synchronously and asynchronously to discuss previous, current, and future research and practice in technology integration. AECT members also have strong networks with people in our sister fields who are also challenged by technology integration. Collaborating with scholars from outside our field can widen our perspective and provide new and important clues about the practices of technology integration.

Through sharing of prepared responses by our panelist, followed by an open question and answer session, we are beginning to unpack the complexities of educational technology integration scholarship. The invited guest panelists (M.J. Bishop, Ikseon Choi, Barbara Grabowski, Tiffany Koszalka, Kay Persichitte, Charlie Reigeluth, Rita Richey, and Brent Wilson) represent a wealth expertise and insight in current design issues, practice strategies, theoretical and conceptual frameworks, educational technology research and design areas, research and practice methodologies, current technology innovations, and overarching themes in the field of instructional and educational technology. This dialogue will help to inform the future direction for research in educational technology integration and enhance the quality of scholarship in this area.

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Scaffolding Reflection on Everyday Experiences: Using Digital Images as Artifacts

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KyoungNa Kim
The Pennsylvania State University

Recent efforts to support student reflection have used technology to help learners reflect upon and organize ideas and make thinking more explicit and "visible" (Linn, 2000). Guzdial (1994) proposed several roles that technology can play in providing scaffolding to learners, including helping learners to articulate what they know, thus encouraging reflection. Strategies for supporting reflection can take on many forms and functions, some of which include: (a) *facilitating articulation* by helping learners to externalize their ideas; (b) *supporting explanation and hypothesis building*; and (c) *structuring opportunities for learners to organize, reflect upon and revise* artifacts or products of their understanding (Land & Zembal-Saul, 2003; Quintana et al.2004; Schwarz et al., 1999).

Most of the research related to supporting learners to reflect involves students reflecting on activities that are constrained to the classroom. That is, students are scaffolded in the inquiry processes of sense-making, process management, and articulation and reflection during classroom experimentation (Quintana et al., 2004). However, little work has been done to use technology to help students to reflect upon experiences in their everyday world that can be used as a centerpiece or anchor for learning about important ideas that impact their lives. For instance, students might learn how physics principles apply in a classroom learning environment, but neglect to make that connection to the playground equipment they use in their everyday life. For many classroom-based concepts, it is possible to support learners to have direct experiences with them in their everyday world. Furthermore, when school-based concepts have implications for choices students make in their lives (e.g., biology or nutrition concepts), this connection between everyday experiences and transfer becomes even more important. Making connections to everyday contexts guides students to integrate schooling and life experiences and to develop meaningful, long-lasting understandings (Brickhouse, 1994).

Although making connections to individuals' everyday experiences sounds simple and intuitive, prior research shows otherwise. Compared to the somewhat controlled setting of the classroom, the real world is fraught with complexity and ambiguity. Students who are new to a domain neither have the observation skills nor the deep understanding to be able to (a) make accurate observations in their everyday world; and (b) explain them (Bransford, Brown, & Cocking, 2000). Furthermore, although links to everyday contexts may enhance the potential for transfer (Brown et al., 1983), they also increase the likelihood that learners may draw upon incomplete or inaccurate understanding which form the basis of faulty theories. It is well documented that learners often have intuitive or everyday experiences that may be contradictory to formal, accepted explanations (Carey, 1986). Intuitive theories that are connected to everyday experience are extremely resilient to change. Without opportunities to address these theories directly, learners can potentially strengthen powerful generalizations that are not readily transferable. To illustrate, Brickhouse (1994) studied how children linked concepts of light and shadows with everyday experiences at home. Although students did make connections to everyday experiences, their observations outside the classroom were imprecise and unpredictable. Students often inaccurately remembered events and missed important details of their experiences. Furthermore, their partial understanding of light could not be easily disconfirmed given the imprecise nature of their observations, so they often used them to justify a naïve theory. Brickhouse notes: "Because their experiences with light outside the classroom were not constrained in the same way as they were in classroom experiments, they reported observations that their developing theory could not yet explain." (p. 651). Given that learners have limited knowledge structures (Gick, 1986), grounding learning in everyday contexts may be challenging, and at times, counter productive. However, relying exclusively on classroom contexts where investigations are constrained and ambiguity reduced, may lead to understanding that is "inert' and limited to school contexts.

If it is commonly accepted that enhancing links to real-world experiences is an important component of enhancing meaningfulness, then support mechanisms or "scaffolds" are needed to help learners observe, interpret, and make connections to everyday experiences. Since it is challenging for learners to spontaneously make links to their everyday life during learning, it might be useful to support them to bring their rich, authentic, everyday world

into the classroom. One way to help bring the everyday, experiential world of individuals into the classroom is by capturing it through digital imaging (e.g, video; photography). Use of digital imagery can serve to capture specific "acts" that students experience in their everyday world and turn them into "artifacts" for reflection. For instance, students studying social studies can take photos of local historical sites and important people in the community as data for reflection and discussion. As tools, those historical images might coexist with narratives that carefully explain what learners should gain from them. As objects or data, learners are responsible for interpreting meaning from the visual materials. Similarly, when studying geometry, students can photograph objects in nature that illustrate geometric shapes and properties (Cavanaugh & Cavanaugh, 1999).

The purpose of this paper is to propose a design framework for capturing learners' everyday experiences through digital imaging and using them as "data" for reflection. Our goal is to help individuals to visualize the connection between everyday actions, experiences, or choices with ways of conceptualizing those experiences. In this paper, we present an example of a current project that uses digital photography to help children reflect upon their everyday experiences and actions.

Design Framework to Support Reflections on and Connections to Everyday Experiences

Learning opportunities come in many forms, but our efforts are focused on experiences that routinely occur in everyday life. By *everyday*, we are referring to experiences from an individual's everyday life that are familiar, and often tacit, and offer the potential to be "captured" and used to affect learning. Anchoring learning in real-world experiences enhances the likelihood for transfer and for discovering the relevance of how and why knowledge is useful (Bransford et al., 2000).

Numerous sociocultural studies have tried to characterize differences between the types of learning that occur in formal educational contexts and the world outside of schools (Brown, Collins, & Duguid, 1988, Lave, 1988). Donald Schön studied professionals revising their practices through trial and error, a process he called *reflection-in-action* (Schön, 1983). Reflective activities allow people to think about how and why they are engaging in tasks and to focus on tacit understandings, beliefs, and ways of performing. Schön used jazz improvisation and architectural design as examples of tasks requiring reflection-in-action because their participants are engaged in a process of redefining their performances as they unfold. In contrast, many tasks requiring expertise can be performed automatically by using *knowledge-in-action*, tacit knowledge that has been constructed through practice to allow skillful and automatic task execution. Knowing-in-action requires minimal effort once routines are learned:

Reflection-in-action requires the conscious consideration and reorganization of behavior as tasks are performed.

Coupled with reflection-*in*-action is reflection-*on*-action, the thinking that occurs after performance. For instance, architecture students often receive feedback about their designs in critique sessions with peers and mentors. Musicians may record their performances and listen to them later to identify good and bad aspects of their play. Reflection-on-action allows individuals to explore routines after their enactment to facilitate future improvements. Recalling past performances can be easier if they are captured in some form—audio, video, written diaries or logs— and used as conversational props, concrete examples that facilitate shared argumentation, discussion, and reflection.

Based on what we know about reflection and the importance of everyday contexts for learning, we generated three design strategies for capturing and for reflecting on everyday experiences: (a) Identify everyday contexts for learning that involve collecting, using, and reflecting on data collected from everyday events; (b) Capture everyday acts and transform them into artifacts for reflection; and (c) Facilitate articulation and revision of understanding by helping learners to externalize and build upon ideas.

Strategy 1: Identify everyday contexts for learning that involve collecting, using, and reflecting on data collected from everyday events.

Increased attention has been placed on the use of problem contexts that immerse learners in activities that are rooted in "real world" practices. The framework of "anchored instruction", for instance, emphasizes use of highly contextual and everyday experiences to "anchor" learning, relying upon video-based stories or challenges to represent them (see for instance, Jasper Woodbury Series [CTGV, 1992] and the STAR.legacy project [Schwartz et al., 1999]). Stories, contexts, and problems that are rooted in everyday situations guide learners to make connections to prior knowledge, a process that is needed to meaningfully integrate new knowledge, discover relevance and interest in the topic, and enhance the potential for transfer (Brown, et al., 1983).

Recently, with the advent of new, mobile computing platforms, educators have been able to expand the contexts for learning to include those that allow learners to collect data about their everyday experiences, and use them as objects for reflection. In the BioKIDS curriculum, for instance, students explore their schoolyards collecting

and observing various animals in order to develop basic understandings of organisms, environments, and interactions between the two. Similar biodiversity concepts could be studied with simulations, video clips, and other media, but the use of local, familiar environments and animals may help students better grasp the relevance of the biological theories.

Strategy 2: Capture everyday acts and transform them into artifacts for reflection.

In order for students to reflect on their everyday experiences, these acts must first be captured and then displayed in a way that allows for analysis and reflection. Technology tools, particularly mobile computing tools, are being increasingly used by individuals in their everyday lives as a seamless part of their real-life experiences. For instance, handheld computer devices (such as Palm pilots), in conjunction with palm-enabled probeware, can be used to allow learners to collect and analyze data from the field, which could include their own backyards, parks, ponds, or swimming pools. Cell phones, PDAs, and similar tools have the technological capabilities for capturing photos, videos, or other data outside formal work and educational environments.

Allowing learners to engage in rich, everyday experiences can provide learning opportunities, but the results of the explorations need to be captured for later analysis and reflection. Captured behaviors and experiences allow for reflection-on-action. But experience capture may also lead to reflection-in-action. Learners may need to decide which aspects of their experiences are worth capturing, forcing them to consider their experiences through the questions and hypotheses they are pursuing at the time. For instance, individuals who used photography to document their health-related behaviors occasionally said that they changed their routines because they became more conscious of them while taking pictures (Smith et al., 2005). Asking people to deliberately capture aspects of their experiences often leads them to reflect on observed events as they unfold.

Strategy 3: Facilitate articulation and revision of understanding by helping learners to externalize and build upon ideas.

The active, thought-demanding process of constructing and re-constructing understanding is considered vital for meaningful learning and understanding (Perkins & Unger, 1999). In essence, understanding evolves in response to new experiences and observations that prompt learners to re-evaluate, re-organize, or refine existing explanations. Explanation building is a dynamic process that involves generating tentative theories or explanations and refining them based on confirming or disconfirming evidence (Lajoie, Lavigne, Guerrera, & Munsie, 2001). It is not presumed that this active process of explanation building can be pre-packaged to learners externally by a teacher or other instructional materials. Rather, learners must be supported in the process of articulating, reflecting upon, and refining meaning.

Previous research has shown that learners do not always engage the process of constructing and refining understanding in ways anticipated. It is well documented that learners are not always adept at improving or refining existing understanding independently (de Jong & van Joolingen, 1998). In some cases, learners may lack organized knowledge structures to begin with, and thus attempt to build upon existing understanding that is already limited, tacit, or naïve. Land and Hannafin (1997) found that some learners actively attempted to integrate their developing theories with everyday knowledge, but in ways that were not systematic and thus interfered with the development of more scientifically-valid explanations. Instead, learners misapplied everyday experiences and used them inappropriately as evidence to confirm a naïve position.

Technology-based tools have been used to help learners articulate and organize their evolving ideas by making learners' thinking more explicit and "visible" (Linn, 2000). Most of these tools and projects have been applied to classroom contexts, but the same approach is applicable to everyday contexts. The KIE project, for instance, used the "*SenseMaker*" interface to scaffold learners to articulate theories about properties of light and connect them with video- and other photographic evidence (Bell, 1998). Similarly, the "*Progress Portfolio*" tool is a content-neutral software environment that allows teachers to customize their own scaffolding prompts or templates that can be used to help learners articulate their understanding and to incorporate evidence generated from digital cameras or micro-computer-based laboratories. Land and Zembal-Saul (2003) used Progress Portfolio to generate different computer-based "experiment" and "explanation" pages to help learners to organize their data and to articulate explanations to the driving question. Similarly, *Animal Landlord*, provides computer-based tools to investigate digital film clips of lion hunts. Students use *video as data* (Smith & Reiser, 2005) to develop explanations of animal behavior. The software provides a computer interface that guides students toward systematic observations and analyses by making investigation tasks explicit and by constraining the order of progression through the task. These same types of tools could be useful in contexts that involve reflecting on everyday experiences, with student-collected data being organized into an artifact that can be reflected upon, shared with

others, and elaborated further.

A Case Study Illustrating Captured Everyday Experiences: Using Digital Photography to Capture Children's Everyday Experiences of Health Concepts

Overview of the Case Study

Nine first-grade students participated in the project (4 female; 5 male). Each was a Caucasian, in the 6-7 year age range, and from a rural, mid-Atlantic, Title I school with over 35% of the population qualifying for free or reduced lunch. Participants were students in the same first-grade class and volunteered to participate in the study after school hours supervised by their teacher and the investigators.

The nutrition intervention consisted of three 60-minute sessions that formed an instructional unit that sought answers the question: "How healthy is the food that I eat?" These sessions met after school in the students' own classroom with the teacher and the investigators present. A variety of instructional activities were used in the course of the three sessions: direct instruction, collaborative learning, and self-reflection all played central roles. At the heart of the instructional unit, however, were students' own food choices and understandings of healthy eating. Instead of treating an objective set of nutrition guidelines as the center of study, student food choices, and student representations of those choices became central.

The Lesson Plan and Procedures

The initial session consisted of an introduction to the over-arching question of the project; "How healthy is the food that I eat?" Previous student understandings were elicited through whole group discussion and students were introduced to the assignment of taking pictures of everything they ate for the next five days. Cameras were distributed to each of the participants and several practice meals were set up to allow them to practice taking clear, detailed pictures of foods. Students were able to view downloaded examples of their photos and make any adjustments in the photography before the session ended. Students also received a small memo pad in which they were asked to record any foods that they ate but forgot to take pictures of.

After five days, the students returned their cameras to the classroom teacher and the pictures were collected and imported into a pre-designed food template by the investigators. This work was done by the investigators due to the young age of the participants- with older participants, the students could be quite capable of quickly adding their photos to the electronic template. The second session began with an exploratory activity in which small groups of 4-5 students used color-coded food flash cards and blank food pyramid posters to organize various foods into groups and to name each of the groups. This knowledge of food groups was essential to their ability to analyze their personal photographs in the next activity. Un-coded food flash cards and brief presentations by each of the small groups served as assessment before moving on to their personal food templates. The students were extremely motivated to see their own pictures in the food templates as they were distributed. With some help from the investigators, they analyzed one full-day's meals by counting the number of servings of each of the food groups present in each meal.

The third and final session began with a demonstration on guidelines for calculating serving sizes. Everyday objects were used to represent the correct portion of various foods (i.e. a deck of cards is one portion of meat, a quarter measures one serving of spaghetti, and a tennis ball approximates a serving of rice). The task of assigning portion sizes is known to be a challenging one, and student responses from the previous session had verified this. Students were able to apply these new approximation techniques to their food templates and correct any previously made errors. In returning to their templates, students took the output of session two (food group totals for each meal of a single day) and created a table that contrasted a one-day sample of their eating against the USDA's recommendations for children of their age. Students assessed which food groups they had not eaten the correct amount of and offered written suggestions on how to come into compliance with USDA's recommendations.

Analysis of the Student Artifacts

The artifacts developed by the students were analyzed according to a scoring rubric for accurateness of assigning food categories and the reasonableness of suggested dietary changes made by the students. In this way, each of the artifacts was scored on a scale that ranged from 16 down into negative numbers depending on the number of student errors. An example of part of a student's artifact is provided in Figure 1. Students created artifacts similar to the one shown in Figure 1 for selected meals and snacks. The right side of the figure illustrates an example of a student's written food diary of his meals for the day, which was useful in interpreting the photos. The artifacts students created included a photograph of the meal or snack, along with a series of analyses they conducted about that meal. Students determined the various food groups, serving sizes, and characteristics of each meal that

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were relevant to addressing the driving question of, "how healthy is the food that I eat"? Students presented calculations for each day of the number of servings for each food group (according to USDA guidelines), and generated claims and rationales for the healthiness of their food choices. They then proposed changes they would make to their diet, based on their total analyses.

Figure 1. A Example of Student Artifact

Table 1 provides a summary of the scores for four of the students' artifacts, based on a set of criteria developed by the authors. Two different sets of raters scored each artifact. Any discrepancies between the raters of assigned values were discussed and an adjudicated score was used. The criteria fell into 4 major categories: (a) correctness of food group picture analyses; (b) correctness of calculation of recommended daily allowances; (c) assessment of suggested changes to dietary choices, based on analyses and calculations of recommended daily allowances; and (d) evaluation of overall assessment related to the driving question.

Table 1 *Food template scores*

Scoring Criteria:	Mean of Score	Mean of % score	(SDEV)
Food Group Picture Analysis:			
Identified correct food group for Breakfast (10points)	8	83%	(0.2)
Identified correct food group for Lunch (10points)	8	77%	(0.1)
Identified correct food group for Snack (10points)	6	64%	(0.2)
Identified correct food group for Dinner (10points)	7	70%	(0.2)
Identified correct portion size for Breakfast (10points)	9	90%	(0.5)
Identified correct portion size for Lunch (10points)	8	77%	(0.2)
Identified correct portion size for Snack (10points)	7	73%	(0.3)
Identified correct portion size for Dinner (10points)	7	67%	(0.4)
Accuracy of overall calculation for the day (10points)	10	97%	(0.0)
Total (10points)	8	75%	(0.1)
Calculation of Recommended Daily Allowances from USDA:			
Accuracy of overall calculation of differences between USDA recommendations and actual (9points)	8	92%	(0.8)
Suggested changes to dietary choices:			
Suggested the correct change in food group (7 points)	6	82%	(0.8)
Suggested the correct change in portion size (7 points)	5	75%	(0.4)
Total (14 points)	11	79%	(0.7)
Overall Self-Assessment on healthiness of food choices for the day:			
Identified aspects about food groups in his/her assessment (1points)	0.8	75%	(0.4)
Identified portion size in his/her assessment (1points)	0.3	25%	(0.5)
Identified at least 2 unhealthy foods from their diet (1points)	0.8	75%	(0.4)
Identified at least 2 foods that were healthy from their diet (1points)	1	100%	(0.0)
Total (4 points)	0.8	75%	(0.7)

Table 1 shows that the mean total % score of students' analyses of food groups is 75% with a SD of 0.1; The mean correctness of calculation of recommended daily allowances is 92% with a SD of 0.8. The mean for assessment of students' suggested changes to dietary choices is 79% with a SD of 0.7, and the mean for overall assessment related to the driving question is 75% with a SD of 0.7. During the rating process, it was observed that most errors in students' analyses occurred in situations where a food crossed many different food categories (e.g., an ice cream cone, which has dairy, fat, and sugar) and where determination of serving sizes was complex. For instance, sometimes students would correctly identify that the bread from a sandwich belonged in the grain food group, but would neglect to list it as 2 servings, one for each piece of bread (instead identifying 1 serving). Overall, we observed that students were very excited about and engaged in this activity.

Conclusions

In sum, this paper proposed a design framework for capturing learners' everyday experiences through digital imaging and using them as "data" for reflection. Using photographic records of daily behavior and tools to help students to analyze them, our goal was to help individuals to visualize the connection between everyday actions, experiences, or choices with ways of conceptualizing them. In this case, we were interested in the extent to which use of past experiences influenced learning of formal educational (health) concepts, but also future decision making. Our current and future research agenda centers around use of ubiquitous computing tools, like digital cameras, hand held computers, etc, to capture everyday experiences and behaviors and use them as objects for reflection. This line of research has relevance to both academic and non-academic worlds, as other prior research has shown (Smith et al., 2005). One of the major implications for design and research that became obvious from this pilot study is the question of how to help people benefit from large repositories of experiential data. This falls on the designer to identify tools that can help to organize that data in ways that can be managed and reflected upon, but in scalable ways. Our future goals are to develop specific technology tools to assist in that endeavor.

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Influence of Electronic Text Presentation Mode on Student Understanding and Satisfaction; An Empirical Study in Korean Context

Hye-Jung Lee
Jeong-Won Woo
Seoul National University

Abstract

The purpose of this research is to identify the influence of electronic text presentation mode on student understanding and satisfaction. For this research, text, e-text, and compression as a technology were first reviewed theoretically. And for empirical data, four electronic instructional programs using four different text presentation modes - full description mode (not compressed, with full sentence), compressed mode (itemized mode, table mode, concept map mode) - were developed with same contents. From the implementation of these programs at high school level, student achievement, reading time and recall time, satisfaction level, were collected and analyzed. Findings indicated that compression technology showed similar, even better effect in student achievement and satisfaction. Also compression saved reading and recall time especially for unskilled and poor student. Results and implications were discussed and recommendations for further study were suggested.

Introduction

Text has been most typical and powerful tool to communicate knowledge and information in literate society. We learn most of our school knowledge from the text written with letters that we've learned since childhood. So it is hard to say teaching-learning without text.

Traditionally text has been shown as printed book in teaching and learning environment since print technology was invented. But the advent of computer and network technology makes us experience another type of text presented in computer monitor, which is called 'electronic text'. We contact electronic text in CAI(Computer Assisted Instruction), WBI(Web-based Instruction), and Mobile learning as well in recent digital age.

Electronic text is able to engage hypertext using link and node and to be shown with non-text materials such as image, graphic, sound, video clip, etc., which were not available in traditional printed text. In spite of these capabilities, electronic text is said to be less effective in reading compared with printed text. Because it is on the screen, it makes our eyes feel tired easily and this leads to lower legibility. So it is said that people show different pattern in reading electronic text. According to Neilsen(1997), 79% of learners tend to take skimming mainly with highlighted headings rather than intensive careful reading when they read electronic text. And reading electronic text is said to be about twice slower than reading printed text. In addition, people accept information 25% less in electronic text than in printed text and they even tend to think reading electronic text as wasting of time(Rha, 1999).

To overcome these limitations, researches for better legibility has been reported. Most of researches on electronic text have been to improve legibility, mainly focusing on font, color, arrangement, highlight, and space of the text on screen. Another approach to improve legibility is about text density(Ipek, 1995). Text density is dependent on the ratio of word count and space occupied by the text. What matters in text density research is how to design text with low density without loss of contents; they need to keep quality in spite of less quantity.

Low text density without contents loss is becoming a critical issue in instructional design of electronic text. This is the need for text compression. Kim(2000) also indicated that strategies for text presentation with compression without contents loss should be researched in educational technology. However, it is not easily found which type of compression is effective in learning, how learner accept contents in different presentation mode.

The purpose of this research, therefore, is to identify the influence of electronic text presentation mode on student understanding and satisfaction. For this research, text, e-text, and compression as a technology were first reviewed theoretically. And for empirical data, four electronic instructional programs using four different text presentation modes - full description mode (not compressed, with full sentence), compressed mode (itemized mode, table mode, concept map mode) - were developed with same contents. From the implementation of these programs at high school level, student achievement, reading time and recall time, satisfaction level, were collected and analyzed. Results and implications were discussed and recommendations for further study were suggested.

Theoretical review

Text technology

The proposition of 'Text is a technology', in a respect, is more concretely talking about text design

technology. Text design concerns about how to write text for better understanding, for more effective and impressive delivery of message. The following is about previous literature on how to design text.

Text design In instructional text, we need to design it not just for reading, but for understanding and learning. So text should be designed in consideration of attention, comprehension, and retention. Stewart(1998) proposed that text design should consider topic analysis, objectives, hierarchic relationsip, inserted question, verbal cueing, structure. Structure here included typographical cueing, verbal cueing, legibility and layout. In addition to this explicit structure, there are researches on implicit structure. Researches on text structure indicate that there is a hierarchy in text structure and super-structure is better to remember than sub-structure. Likewise, people are reported to recall super-proposition better than sub-proposition(Meyer, 1975). Kintsch and Dijk(1983) similarly persisted that macrostructure, composed by microproposition, played a critical role in overall understanding of text, because macrostructure could be a basis of message summarization. Cognitive scientists also persist that we need meta-cognitive strategy for abstracting, schematizing, organizing, elaborating of contents to receive, memorize, and recall easily. So instructional text should be designed considering these factors, and how to do is the very technology.

Literacy nature, orality strategyText is basically an artifact in literacy. It is shown, not heard, in written language. So text has the nature of literacy. It can be compressed and structured with title, headings, summary, key words, and chapters, which are features of literacy. But it is said that text also should have orality for better learning. Early distance educators suggested that text should be written in 'orally spoken language' instead of literate written language in distance learning material. According to Holmberg(1983), teachers must imagine that they are speaking to someone when writing teaching texts, and this is supposed to make them use a spoken language wherever possible. He suggested that teachers should use a 'clear, somewhat colloquial language', write in a personal style and appeal to students' emotions as well as their intellect, avoid great density of information, draw their attention to important points. Indeed, he asserted that text in distance learning material should be 'guided didactic conversation'. And it is also reported that using spoken language can improve social presence in distance learning so students are more satisfied with learning, not feeling isolated(Gunawardena & Zittle, 1997). These researches implicate the need of careful instructional design in e-text writing to improve legibility, social presence and to decrease cognitive overloading and feeling isolation. And they suggest orality in text as a technology to meet this need.

Electronic text

Electronic text has different characteristics from printed text. Electronic text is able to represent hypertext using link and node and to be shown with non-text materials such as image, graphic, sound, video clip, simulation, etc., which were not available in traditional printed text. In spite of these capabilities, electronic text is said to be less effective in reading compared with printed text. Because it can be seen by emission of light on CRT(Cathode-Ray Tube) screen, the resolution is not as clear as one in printed format. So it makes our eyes feel tired easily and this leads to lower legibility. Many researches on electronic text indicate that e-text has low legibility. The legibility is primarily dependent on visibility, recognizability, readability. And e-text is said to have limitations on visibility and recognizability(Kim, 1991). So we need careful design strategy, considering some factors such as leading/line spacing, heading, directive cues, line length, justification, color and font, text density, etc., to improve legibility in e-text design.

*Secondary orality?*Ong(1982) indicated that electronic technology brought us into the age of 'secondary orality'. Orality is an untouched culture by any knowledge of writing or print(Ong, 1982). According to Ong(1982), there are essential differences between literacy and orality, and we need to understand this different features for better comprehension of language and communication. He took this word, 'secondary orality' to characterize electronic text, because he thought our electronic age has great resemblances to primary orality. Although Ong named it as 'Secondary orality'(we're not sure whether this term is really appropriate for e-text), however, electronic text seems to have orality, literacy, and the third new trait as well.

Firstly, e-text is basically text so it has the nature of literacy. Apparently it is written on the screen, and it is rather visual than audile because it is expressed by text not voice, so it looks like an artifact in literacy. The older generations tend to write electronic text just like a literate text in printed format. Indeed, most of official instructional e-texts are just like printed publication.

Nevertheless, e-text is also a lot close to orality. Computer and network technology allows us synchronous dialogue as well as asynchronous communication so people communicate just like in oral culture even though they use written (more exactly, typed) text. This is the orality of electronic text. In computer chatting or discussion,

people feel strong group sense, namely groupminded, just like in primary orality as Ong(1982) mentioned. According to Ong(1982) and Lee & Yu(2004), literacy leads people to individual space; individual activity like individual reading, individual reflection, individual understanding. However, orality is said to be rather social, interactive, and interpersonal(Ong, 1982). This feature of e-text is recently elevating interests in CSCL(Computer Supported Collaborative Learning). Orality is additive, aggregative, contingent, situational, and group-minded according to Ong(1982). Likewise, CSCL has those features. One of the papers presented at CSCL conference reported(Stahl, 2000) that students learn socially rather than individually in CSCL. According to Stahl(2000) and Lee(2004a, 2004b), students' knowledge building process include social reflection, shared understanding, and social externalization, which were intrinsically differentiated from individual reflection, individual understanding, and individual externalization. They assert that electronic environment is greatly appropriate for social learning and knowledge construction. Contrary to the nature of print-'closed'(as Ong mentioned, print confines people to individual room), electronic text is opened to networked world. That is, electronic text is leading individual learning with printed text to social CSCL.

However, there is some part that cannot be explained by orality and literacy considered as typical traits of traditional language. New generation grows up with computer technology and they perceive computer communication natural almost like mother tongue. Even though it is expressed by text on screen, they don't write it but type it with keyboard. Their typing is much faster than their writing. Even they think better not in writing but in typing. They can coin new words(destroying and transforming alphabet as well as grammar, called ET(extra-terrestrial) word in Korea) or new signs like emoticons with combination of keystroke. This keystroke influences on our thinking process. This phenomenon from computer is going to mobile. We have 36 million registered mobile numbers in Korea as of August, 2004. This is a formidable number, considering around 47 million people living in South Korea now. Except very little kids and babies, almost everybody in Korea has mobile phone. Nobody asks phone number at home or at office. We just ask mobile phone number for contact. It is not surprised that even most of K-12 students have one. They are called rather 'Thumb generation' than 'N-generation'. N-generation is for generation with *N*etwork and computer. But in mobile age, people use only *T*humb to type text message on mobile phone, whereas they use several fingers to type on computer keyboard. Recently mobile phone in Korea is used more often to send text messages by thumb than to call with voice. In that text shown on the screen of mobile device as well as computer, there are many new words and new signs, which were never seen in traditional literacy or orality. Therefore, we need to consider literacy, orality, and the third new trait(called whatever) as well in electronic text shown on the screen of either computer or mobile device.

Text compression; e-text design technology

In regard of e-text design for effective and efficient learning, we can get some implications from traditional orality and literacy. As Ong(1982) indicated, it was redundant, additive in orality. And there must have been too many things to remember to be a good speaker. However, it was not by rote, but by contextual memory using many strategies. In oral culture, people should think memorable thoughts, using mnemonic patterns, rhythmic balanced patterns, repetitions, antitheses, alliterations, assonances, epithetic, formulary expression, for retention(Ong, 1982). This gives us a meaningful implication for instructional text design even though we can take a note what to memorize, because note taking doesn't mean knowledge internalization. People in oral culture use those strategies to remember easily and longer. Likewise, we can use those strategies in writing text for students to remember what they learned more easily and longer. But at the same time, we need to decrease learner's cognitive overloading from the text. In orality, when you listen, redundancy and additive feature is natural and these are not perceived as overloading. But in literacy, when you read, redundancy leads to cognitive overloading. So conciseness is virtue, especially for instructional text. One strategy to consider both orality and literacy is text compression with a pattern.

For clearer understanding and better retention, Kintsch and Dijk(1978) proposed text compression strategies such as deletion of minor statements, generalization by using super-concept, selection of critical words or statements, and construction of several separated statements to a comprehensive one. Brown and Day(1983) also persisted that trivial minor sentence should be deleted, and redundant statements, even though they are major contents, should be deleted.

These researches are related to a study on text density especially in electronic environment. According to Ipek(1995), text density is dependent on the ratio of word count and space occupied by the text. Ipek(1995) reported that readers prefer well-designed e-text and they save studying time with low density e-text. This implicates that compression would be a useful strategy in e-text design. Kim(2000) also indicated that strategies for text presentation with compression without contents loss should be researched in educational technology. However, it is not easy to find whether, if so how, compression is effective, which type of compression is effective in learning, how learner accept contents in different presentation modes. In this context, we conducted this empirical research to

identify the influence of text compression on learning in electronic environment.

Terminology; Operational definition

- **Electronic text (e-text)**: text shown in computer monitor screen. (Although electronic monitor include CRT(Cathode-Ray Tube), TV, VDU(Video Digital Unit), and mobile phone screen, the experiment in this research was on computer screen.)
- **Non-compressed full description mode**: full description text with non-compressed full sentence. See Figure 1.
- **Compressed mode with item**: itemized text. Compressed with items like headings, but excluding full sentence. It's like note-taking with key words. Text was compressed around 43% ~ 47% in regard of word count, but no contents loss. See Figure 2.
- **Compressed mode with table**: text that was summarized, restructured and reorganized by using tables. Around 43% ~ 47% number of words got compressed without contents loss. See Figure 3.
- **Compressed mode with concept map**: text that was summarized and restructured by using concept map. Around 43% ~ 47% number of words got compressed without contents loss. Concept map is a summary diagram showing hierarchical relationship between concepts by link and node. Contents details appear when clicking a hyperlinked concept. See Figure 4.

Research method

Program development

In order to investigate the influence of electronic text presentation mode on student learning, four electronic instructional programs using four different text presentation modes were developed with same contents. The subject was 'General social science' for high school student, written in Korean. All texts were typed with 12 point, black, double space, and regular font. These format and layout was one of the most typical formats in Korea. Text presentation modes used in this research were a full description mode and three compressed modes(see Figure 1, 2, 3, 4); a full description mode(Group 1) was not compressed, written with full sentence. And three compressed mode included itemized mode(Group 2), table mode(Group 3), and concept map mode(Group 4), which were most commonly used compression styles in e-text in Korea. Text was compressed around 43% ~ 47% in word count, but no contents loss. Three experts in instructional design practice verified the text material on and off throughout the development process.

Learners

One hundred and thirty-nine students of tenth grade at S high school in Korea, randomly assigned to four groups, were required to read web contents provided in this research for around 30 minutes and to take an exam after studying it. Students were assigned randomly after pre-test. There was no significant difference between groups on pre-test(F=.17, p> .05), so each group(N=35 for group 1, 2, 3, and N=34 for group 4) was found to be homogeneous in terms of prior knowledge level and computer literacy. All students, like most other students in Korea, were familiar to computer environment and electronic text.

Procedure

In this research, dependent variable was student understanding, satisfaction, and time taken for reading and recall. Independent variable was electronic text presentation mode. Research procedure was as follows; text material development / → pre-test → grouping students → program implementation and time measurement → achievement test and time measurement → satisfaction survey. It was recorded in each group how long it took for reading electronic text and for taking an exam after reading it. The exam mainly included recall of the text contents. Also satisfaction survey as well as cognitive achievement test was carried out. Satisfaction survey consisted of 5 items including reading usability, comprehensibility, accuracy, attraction, and preference. One-way ANOVA was conducted to analyze data.

Results and Discussion

Influence of electronic text presentation mode on student achievement

In regard of student achievement, there was significant difference between groups (F=2.89, *p< .05) as seen in Table 1 and Table 2. But the result of multiple comparisons test (Post Hoc=Tukey HSD) to know which group showed difference, reported that there was no significant difference between non-compressed format(group 1) and compressed format(group 2, 3, 4). The difference was only among compressed groups (See Table 3). This finding indicated that reading with compressed format was not inferior to reading with full description in student

understanding. This result supports some of previous researches. According to Reder & Anderson(1980), 'teaching with text' was not superior to 'teaching with only text-summary' in student understanding, and even teaching with text-summary showed better retention in a while. There are also some researches saying that especially poor and unskilled students have difficulties to grasp what is important and to reorganize the text for comprehension(Rainski, 1985; Winograd, 1984). Students with lower achievement are said to be poor at summarizing and compression of the text. So it is suggested that poor unskilled students should get text with compressed format rather than detailed full description format as long as there is no contents loss.

However, among compressed groups, group 2(compressed with table) showed significantly higher achievement than group 4(compressed with concept map). This implicates that learning effect could be influenced variously by compression strategy. In this case, 'compressed format with table' seemed to provide well-organized structured text by dividing headings and contents so it could be engaged in cognitive schema more appropriately. On the other hand, compressed format with concept map was not found to be good for learning in this research. This seems to be because of the contents exposure time. Students only could see contents when they click hyperlinked key concepts in this case, otherwise they couldn't see the contents except their headings. Also if they clicked another hyperlinked word, the previous contents disappeared in this case. This design style could lead to short exposure time of contents resulting in lower achievement. This case implicates that we need to be more cautious in text compression using concept map.

Consequently, strategy for text compression helps text information process in learning. Compressed e-text rather than non-compressed full description text shows similar, even better effect in learning, and this compression strategy could be a good way to overcome limitations of electronic text.

Table 1. Results of Student achievement in various e-text presentation modes

e-text presentation mode	N	Mean	St.dev
Non-compressed full description mode	35	12.68	3.59
Compressed mode with items	35	11.51	3.49
Compressed mode with table	35	13.45	4.21
Compressed mode with concept map	34	11.11	3.51
Total	139	12.20	3.79

Table 2. Results of one-way ANOVA; e-text presentation mode and student achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	119.85	3	39.95	2.89*	.026
Within groups	1864.50	135	13.81		
Total	1984.35				

(*p< .05)

Table 3. Results of Post Hoc(Tukey HSD)

Dependent variable: Student achievement	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	Group 1	Group 2	1.17	.88	.55
		Group 3	-.77	.88	.82
		Group 4	1.56	.89	.30
	Group 2	Group 1	-1.17	.88	.55
		Group 3	-1.94	.88	.13
		Group 4	.39	.89	.97
	Group 3	Group 1	.77	.88	.82
		Group 2	1.94	.88	.13
		Group 4	2.33*	.89	.04*
	Group 4	Group 1	-1.56	.89	.30
		Group 2	-.39	.89	.97
		Group 3	-2.33*	.89	.04*

- The mean difference is significant at the .05 level. (*p< .05)
- Group 1(non-compressed full description mode), Group 2(compressed mode with item), Group 3(compressed mode with table), Group 4(compressed mode with concept map)

Influence of electronic text presentation mode on reading time and recall time

In regard of time taken, it was found that there was no significant difference in reading time and recall time between groups with different electronic text presentation modes. However, there was a difference in time range; from the shortest time to the longest time. The time range in group 2(compressed with table), group 4(compressed with concept map) was 13 minutes. And it was 15 min. in group 3(compressed with item) and was 20 min. in group 1(non-compressed mode) as shown in Table 4. Indeed, the time deviation was decreased in compressed mode than in non-compressed full description. And the distribution diagram said that unskilled poor student, rather than good skilled student, showed wide deviation from compression mode to non-compression mode. This means that either expert students or poor unskilled students take similar time in reading compressed text, whereas unskilled students would take more time than expert students in reading non-compressed full description. This implicates that compressed text is especially helpful for poor and unskilled student. This is the result supporting some previous researches(Rainski, 1985; Winograd, 1984). According to Rainski(1985) and Winograd(1984), poor and unskilled students tend to depend on a certain part or a certain information which is related to personal interest. And they are poor at grasp of what is important and what is not. Moreover, it takes longer for poor students to understand and grasp as good students do. So text compression is useful strategy especially for poor and unskilled student. Because compressed text saves time to search topic, grasp the meaning, and its structure is corresponding to comprehension schema so it is helpful for understanding, memorizing and retention.

Meanwhile, there was also no significant difference in average recall time(time taken for exam) between groups. But like reading time range, time range (from the shortest time to the longest time) showed differences in recall time. In regard of recall time range, group 3(compressed with item) took 10 min., group 4(compressed with concept map) took 11 min., group 2(compressed with table) took 17 min., and group 1(non-compressed full description) took 20 min (See Table 5). This indicated that compressed text shortened recall time of poor students. This can be explained in relation to cognitive science. According to information processing theory in cognitive psychology, people use 'long-term memory' to store and to recollect information. To recollect information, it is important how to organize information systematically for storage in long term memory. Kim(1991) suggested that the process of recall should be similar to the process of storage for easy recollection. So we suppose that text compression way in this research could be similar to the process of recall so it is helpful to recall rather easily. Besides, it could be associated with externalization in learning process. Compressed mode with item was just like note-taking format. Note-taking of students is activity for externalization of what they understand. According to Lee(2004b) and Lee & Yu(2004), externalization is one of the critical steps in learning process. Through externalization of what they understand from individual reflection, knowledge is eventually internalized to personal comprehension schema. So it can be supposed that if a text is presented in externalization way, it could be received more easily.

Table 4. Text reading time in various e-text presentation modes

e-text presentation mode	Text reading time		Minimum time(min.)	Maximum time(min.)
	Average(min.)	St.dev.		
Non-compressed full description mode	10.88	5.15	3	20
Compressed mode with items	9.04	3.66	5	20
Compressed mode with table	10.85	3.75	4	17
Compressed mode with concept map	11.86	3.46	3	16
Total	10.61	4.16		

Table 5. Text recall time in various e-text presentation modes

e-text presentation mode	Text recall time		Minimum time(min.)	Maximum time(min.)
	Average(min.)	St.dev.		
Non-compressed full description mode	10.54	5.25	3	22
Compressed mode with items	9.43	2.92	5	15
Compressed mode with table	11.64	4.55	4	21
Compressed mode with concept map	9.93	2.65	4	16
Total	10.32	3.86		

Influence of electronic text presentation mode on student satisfaction

Analysis results of satisfaction said that there was significant difference in student satisfaction between

groups with different electronic text presentation modes as seen in Table 6 and Table 7. Compressed mode showed higher satisfaction level than non-compression mode (F=3.74, p< .05). That is, students were not satisfied with full description text on the screen. They said that it was hard to concentrate on the text that was just like printed format but only shown on the screen. It made our eyes tired easily. Consequently, text presentation mode influences on student satisfaction as well as cognitive achievement.

Table 6. Student satisfaction with each e-text presentation mode

e-text presentation mode	Satisfaction level	
	Average	St.dev.
Non-compressed full description mode	9.94	3.38
Compressed mode with items	12.45	3.72
Compressed mode with table	10.60	3.27
Compressed mode with concept map	11.73	3.21
Total	11.19	3.51

Table 7. Results of one-way ANOVA; e-text presentation mode and satisfaction level

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	130.57	3	43.52	3.74*	.012
Within groups	1533.06	132	11.61		
Total	1663.63				

(*p< .05)

Summary and Recommendation

This research implicitly supports that text writing and presentation way is a technology. Although we are not aware of it, it is. As Ong(1982) indicated, it is difficult to consider writing as a technology because we have so deeply interiorized writing. But he said, Plato was thinking of writing as an external, alien technology, as many people today think of the computer. Inversely, if computer technology is interiorized someday later and it becomes as so much part of ourselves, we shall possibly confuse whether computer is a technology, just like Plato's writing or glasses; because glasses are just a part of our body, we often forget that we wear a certain external technology.

But more meaningful significance of this research is that text compression is found to be a useful technology to improve legibility and to save time especially for unskilled poor student. Findings in this research are summarized as follows; 1) Compressed text is able to lead similar or even better student understanding than non-compressed full description is in electronic environment. 2) Compression strategy can influence on student understanding. 3) Compressed text is able to save learning time with same effect. 4) Compressed text is helpful especially for unskilled poor student. 5) Students are satisfied with compressed text rather than with non-compressed text in electronic learning environment.

Nevertheless, there are some aspects that this research couldn't cover. Followings are recommendations for further study to complement limitations in this research;

1. The text used in this research was described in written language, not spoken language. That is, the text in this research was a lot more like literacy, not orality. Keeping the text in literacy, we took only presentation mode as a variable in this research because we wanted to see influence of presentation mode, not disturbed by other factors. But whether the text trait is literacy or orality could be critical variable as Ong(1982) implicated.
2. Characteristics of the text used in this research were hierarchical, declarative, social science. But other case experiment with different contents might possibly give us different findings and this would enrich our understanding on text technology.
3. A research on learner characteristics can be recommended for future investigation. It is inferred from the results of this research that text compression strategy is especially useful for poor students. So it will be very useful to investigate how various compression strategies influence on learners' characteristics, intelligent level, prior knowledge level, etc., to articulate the effect differences on learner variables.
4. We used just one text compression strategy in each group. But we usually use combinational strategies in teaching field. So it would be worthwhile to examine how combinations of text compression strategies influence on student learning and which combination is the best effective.

5. Learner's own compression strategy as well as instructional strategy can be a good theme to understand meta-cognitive area more comprehensively.
6. The text used in this research was written in Korean. It can be applied to English as well. And its comparative study(e-text compression effect between Korean and English) could be an interesting topic. This comparative study will tell us whether the results in this research can be applied to other language in general or just language specific.
7. Also we can compare electronic text with printed text on compression effect. Then we can find whether the results mainly depend on media technology, or writing technology. Compression is kind of writing technology and electronic/print is media technology. If we get similar results in same experiment but with printed text, we shall conclude that compression strategy(writing technology) can be applied same either in printed text or e-text. And the reason of the compression effect can be explained not because reading e-text is not easy as reading printed text so the compression is helpful to read, but possibly because compression strategy is more acceptable to cognitive schema whatever the media technology is. However, if we get different results, we shall suggest the results in this research are electronic media specific.

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Appendix

Figure 1. Non-compressed full description mode

Figure 2. Compressed mode with item

Figure 3. Compressed mode with table

Figure 4. Compressed mode with concept map

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Learning to Collaborate, Collaboratively: An Online Community Building and Knowledge Construction Approach to Teaching Computer Supported Collaborative Work at an Australian University

Mark J.W. Lee
Ken Eustace
Lyn Hay
Geoff Fellows
Charles Sturt University
AUSTRALIA

Abstract

The subject Computer Supported Collaborative Work (CSCW) immerses students into social, philosophical and psychological aspects of working online, and the technology issues associated with being an online workgroup participant. This paper describes, in the context of relevant literature, the teaching, learning and assessment strategies, as well as the open source groupware framework used to build a successful online community for collaborative learning and knowledge construction amongst students of diverse backgrounds and interests, separated by the barriers of time and distance. Student evaluation results and future plans are also discussed.

Introduction

Each of the authors has been involved in team teaching a subject called *Computer Supported Collaborative Work (CSCW)* at Charles Sturt University. The subject introduces students to contemporary social and technology issues as participants in online communities. Its enrolment comprises a wide array of undergraduate and postgraduate students, studying both on-campus and via distance education, throughout Australia and overseas, hailing from a diverse range of disciplines. It provides a focus for discussion and application of CSCW in fields such as professional development, information technology, library science, education, teacher librarianship, health care or policing. The four major outcomes of this subject are:

1. to understand the need for a multidisciplinary approach to learning and workflow within online communities;
2. to work effectively within a collaborative community;
3. to understand through negotiation the issues linked to computer supported collaborative work (CSCW); and
4. to demonstrate an understanding of the processes required to design, build, use and evaluate online communities using groupware tools.

Students explore various cognitive frameworks used in CSCW, and learn how to select and tailor a framework appropriate to specific collaborative situations and tasks. They study the principles underpinning the design and building of workgroup specific infrastructures to support successful workflow and human interaction. A mandatory component of the subject requires students to collaborate regularly with others using a variety of software – By integrating literature and other subject content about CSCW, students and instructors employ information environments and groupware tools such as e-mail, forums, Z Object Publishing Environment (Zope), Yahoo! Groups, weblogs (blogs) and MOO to facilitate collaborative learning and knowledge construction, and to capture artefacts resulting from these processes.

In addition, CSCW has a broader, underpinning aim of helping to nurture community-minded individuals, consistent with the views expressed by Peck (1987):

> We human beings have often been referred to as social animals. But we are not yet community creatures. We are impelled to relate with each other for our survival. But we do not yet relate with the inclusivity, realism, self-awareness, vulnerability, commitment, openness, freedom, equality, and love of genuine community. It is clearly no longer enough to be simply social animals, babbling together at cocktail parties and brawling with each other in business and over boundaries. It is our task – our essential, central, crucial task – to transform ourselves from mere social creatures into community creatures. It is the only way that human evolution will be able to proceed. (p. 165)

Rationale

The subject was first initiated when Eustace and Hay (2000) reflected on their own discourse as University teachers and researchers, in which they and their students were expected to use a myriad of Internet services and tools to communicate and share data. They thought it timely to develop a subject to teach both *about* and *using* such

tools to help professional workgroups operate effectively online, based on a community building approach or theme.

Since its genesis, the subject has evolved at the hands of other academics at CSU, including Mark Lee and Geoff Fellows, and through the active participation and contribution of a number of student cohorts. This paper describes how the above objectives were achieved in the subject's Spring (July-November) offering in 2004, in addition to outlining plans for refinement and improvement in future iterations.

CSCL and online learning communities: A brief literature review

Collaborative learning (CL) evolved from the work of Piaget (1926) and Vygotsky (1978). It is based on the social constructivist view that learners learn best through positive, cooperative interactions with one another. There is certainly no shortage of literature supporting the benefits of collaborative learning in traditional, face-to-face settings. Closely related to this are the positive effects that the social phenomenon of community can have on learning and knowledge construction, as highlighted by the work of Dewey (1929), Vygotsky (1978), Bruner (1986, 1990, 1996), Kafai and Resnick (1996) and Cunningham (1996).

Research into *computer supported collaborative learning (CSCL)* reveals that the benefits of CL can be further enhanced through the employment of appropriate supporting technology (Kaye, 1992; Alavi, 1994; Hiltz, 1995; Veerman & Veldhuis-Diermanse, 2001). Following in this vein, modern information and communications technologies can be put to use in the development of online learning communities (Bonk & Wisher, 2000; Hiltz, 1998; Palloff & Pratt, 1999; Rovai, 2002).

However, the use of a suite of elaborate technological tools or cutting-edge delivery media will do little good to enhance teaching and learning without the presence of well-planned and effective strategies (Clark, 1983). For example, it is a well-known fact that active involvement of the learner dramatically increases the effectiveness of the learning. Strategies must be devised to ensure each learner is engaged and involved, and given the opportunity to process and apply his/her newly acquired knowledge.

It is also a widely accepted view that learners must take ownership and responsibility for their learning. As such, the role of the teacher or lecturer has shifted, in recent decades, to one of a guide, or facilitator. In fact, not only do learners, as newcomers to a community of practice, engage in "legitimate peripheral participation" (Lave & Wenger, 1991) to develop mastery of knowledge and skills through interaction with "old-timers" or experts (such as their instructors, in the case of an academic environment), they also have a responsibility – an obligation – to play a part in the continued evolution and advancement of the community's existing body of knowledge, as they move toward full participation in the socio-cultural practices of this community. The three case studies of telelearning innovation presented by Eustace et al. (2001) and the Teletop development (see Teletop B.V., 2004) by Collis (2002) are amongst the plethora of examples that stand as a testament to the merits of a learning paradigm in which instructors focus their efforts on creating a conducive online environment for students to build content and take responsibility for learning.

The authors have attempted to work towards a re-usable technology model and a set of strategies for facilitating collaborative learning and knowledge construction that takes these factors into consideration, as well as accounting for Salmon's (2004a) five stages of e-Moderating, together with Gunawardena, Lowe & Anderson's (1997) five phases of social construction of knowledge in the online environment (Fig. 1).

Groupware framework

The CSCW groupware framework is centred around five main tools, as illustrated in Fig. 2.

The CSU Forums are asynchronous, Web-based, threaded discussion boards. The system used is one that was developed in-house by the University's Division of Information Technology.

Z Object Publishing Environment (Zope) (see Zope Corporation, 2005b) is an object-oriented web application development and publishing system, written in the Python programming language (Fig. 3). It is free and open source, and available for multiple operating systems. Though functionality of the system can be dramatically extended through the use of Python scripts, a number of sophisticated server-side tasks can be accomplished with little or no programming knowledge, thanks to Zope's Document Template Markup Language (DTML). The content on a Zope server can be managed via a web browser or through WebDAV (Whitehead, 2005), the latter of which allows files to be uploaded directly from within supporting software. For example, Microsoft Office documents can be saved on Zope via WebDAV, as if it were simply another folder on the local network.

Multi-User Dungeon, Object-Oriented (MOO) was used as the vehicle for delivering synchronous online classes (Fig. 4). Specifically, the enCore system developed by Holmevik & Haynes (2004) was used. A MOO server and object-oriented core database, is a network-accessible, multi-user, programmable, interactive system originally designed for the construction of text-based adventure games, conferencing systems, and other collaborative software. Participants (usually called players) have the appearance of being situated in an artificially-

constructed place (social space) that also contains those other players who are connected at the same time. MOO facilitates polysynchronous communications, that is it allows for a hybrid communication model comprising both synchronous and asynchronous elements. For example, players can interact and chat in real-time when they are logged in to the MOO simultaneously. In addition, their actions can impact and have a lasting effect on the state of the objects in the MOO, even after they have logged out – Notes can be left on notice boards and signs erected which will allow messages to be left behind for other players; objects such as furniture and office equipment (eg. whiteboards, slide projectors) can be created, used, moved and otherwise manipulated; etc.

Yahoo! Groups (Yahoo! Inc., 2005) is a free, web-based service with which students are able to set up and manage their own discussion groups. Yahoo! Groups works on a "push" based model in which postings to the group are automatically sent to each member's e-mail address, by default. In addition, a rich set of ancillary services are included, such as synchronous chat facilities, file and photo sharing repositories, shared databases and calendars (Fig. 5).

COREBlog (*Central Core*, 2004) is a Zope-based, open source web logging (blogging) system. Although originally intended to allow individuals to maintain their own personal journals and make these available for public viewing, blogs have found numerous applications in educational spheres. The easy-to-use nature and informal, journal entry style have lent themselves to ready adoption by instructors, who create blogs for purposes ranging from providing content, commentary and study hints, to disseminating subject-related announcements. Learners, too, benefit from creating their own blogs, be they for use as online learning portfolios and reflective journals, or simply as "soapboxes" for personal self-expression. Shared or group blogs also exist, which can serve as a powerful collaboration and shared publishing tool (Fig. 6).

The abovementioned tools are supplemented with regular e-mail contact between students and instructors, as well as amongst the students themselves. Furthermore, students are encouraged to investigate and explore various alternative tools to add to their groupware "toolkit". In fact, students were required to develop their own, personal taxonomy which to classify and evaluate groupware tools as they encountered them throughout the semester.

Teaching and learning strategies

Like Waddoups and Howell (2002), the authors believe that the hybridisation of on and off-campus student cohorts is possible, and in many cases, even favourable. In CSCW, the diversity is leveraged to afford students exposure to working in multi-disciplinary teams, with members situated in physically separate locations and disparate time zones. This is, in many ways, an accurate reflection of what is required of today's knowledge workers, who operate in what is truly a global economy dependent on the Internet. In the famous words of Gertrude Stein (1937): "…there's no there, there."

The teaching and learning strategies in CSCW therefore address the challenges of creating social presence, interaction and a "sense of place" (Coate, 1996) in a virtual environment, by using the groupware tools discussed earlier to provide shared and private workspaces for learners.

Subject content

In Spring 2004, the subject content consisted of five core topics:
1. Underlying principles of an online community: The CSCW framework
2. How to create online communities: Workgroups and collaborative styles
3. CSCW citizenship: Belonging to an online learning community
4. Supportive tools for CSCW
5. Case studies in CSCW

Students were provided with an online schedule of commentary, readings and exercises for each topic on the subject Zope site (*CSCW/online communities groupspace*, 2004). Exercises in the topic schedule were marked with an [OLR] tag to notify students that evidence of completion of the task was to be published on Zope in the student's personal folder, which contributed to his/her own Online Learning Record (Fig. 7).

Meetings and workshops

Although a resource-based approach was adopted in the presentation of web-based instructional material and other CSCW content to students via Zope, weekly synchronous online meetings were held in Learning Communities MOO (*LC_MOO*, 2004), maintained by the Internet Special Projects Group at CSU. To accommodate both on and off-campus students, three one-hour MOO sessions were run each Thursday, at 11:00am, 2:00pm and 8:00pm Australian Eastern Standard Time (AEST). Students were welcome to participate in any or all of the sessions. The daytime sessions were facilitated by instructors physically present in the University's computer labs; in the case of the evening session, both students and instructors attended MOO tutorials via university or home

Internet connections.

A seminar/workshop style was adopted for the MOO sessions in the earlier weeks of the semester. These covered general orientation to the subject and its groupware framework, in particular basic MOO training and familiarisation with Zope. Many online instructors find that interactivity is preferred over the one-way information flow of lectures. As such, in later weeks, MOO time was dedicated to open discussions and debates on topics related to the subject content, including contemporary CSCW and groupware issues.

Logs of all sessions were saved in the form of log objects in the MOO. Since the web-based representations of MOO objects are accessible via URLs (Fig. 8), hyperlinks to the logs and lesson slides (contained slide projector objects) were able to be placed on Zope for easy access.

Learning to use and program a MOO, exploration, R&D and prototype development of worlds and groupware, were also available using a second, "sandbox" MOO called K9MOO (*K9 campus and theme park, 2004*). Both MOOs were available throughout the session for students to hold their own meetings outside of regular class times. Most students were able to build their own personal and group "home" rooms, as well as populating these rooms with their own MOO objects such as log recorders, slide projectors and notice boards, to enhance the collaboration environment. Many took advantage of the programmability of the MOO by scripting their own verbs (methods, or operations) to add to the functionality and interactivity of their objects.

In addition to synchronous online sessions, face-to-face meetings were held for on-campus students. The format of these meetings was largely informal and discussion-based; they simply offered opportunities for those located at the University to convene and discuss/report on their progress in the subject. Short lectures delivered by the instructors on alternate weeks were intended to generate discussion, the notes for which were published on Zope for the benefit of all students.

Forum-facilitated discussion and additional support

The subject forum was used by the instructors to post announcements on subject-related matters, and by students to obtain general administrative and technical support. Students were also encouraged to participate in a continual class dialogue via the forums, sharing their reading, experiences, ideas and questions with their classmates. For issues of a more "personal" nature, such as matters relating to a student's own assessment, e-mail was the preferred means of communication.

In addition to the above, e-mail was used for informal interactions between students, particularly in relation to the project work and to support the stages of group formation.

Pools of Online Dialogue (PODs)

A key component of the subject was the requirement for students to form and participate in small workgroups called *Pools of Online Dialogue* (PODs). This was to allow them to explore the dynamics of the creation and maintenance of a such a workgroup, and to be part of a supportive group structure that allowed them to explore a deeper understanding of the subject content/readings and collaborative practice in general.

Each student was allocated to a POD group consisting of four members. Differing views exist on how groups should be formed – Some contend that random assignments work best to maximise group heterogeneity (Smith, 1985; Fiechtner & Davis, 1991), while others favour a more deliberate, manual process in the interest of ensuring fairness of group composition (Walvoord, 1986; Connery, 1988). Still others prefer to allow students the flexibility of selecting their own workmates. However, in CSCW, to leverage the diverse characteristics of the individuals in the class, a deliberate attempt was made to achieve a mixture of students studying in different modes and locations in each POD group. This was driven by the desire for students to meet and work with others from backgrounds and interests that could be vastly different to their own. It also served to ensure that the collaborative work was in fact performed online. Many groups also intentionally consisted of members studying different courses (programs) in various faculties of the university, encompassing both undergraduates and postgraduates.

The POD activities began in Week 3 of the session, when students used the subject forum as an initial meeting point to exchange e-mail addresses with their group members. One POD activity was assigned for each of the five main topics in the subject. Activities were posted on Zope by the instructors each fortnight, and was to be completed before the posting of the next activity.

Although each POD group was assigned a number, students were encouraged to select a name for their POD that reflected its identity and purpose. Even-numbered PODs were required to use Yahoo! Groups to complete their POD activities, whilst the odd-numbered PODs used COREBlog. (Each POD was also assigned their own shared workspace on Zope, whose use was optional.) The purpose of this was to afford the students exposure to, as well as encouraging them to reflect on the differences between, contrasting types of tools and how they affect workgroup collaboration. To this end, the fourth activity required each POD group to send a member representative,

or "agent", to participate in a group using the other tool. The fifth and final activity saw the agents returning to their original, "home" groups to report on their observations.

Many believe that assessment imposes barriers on effective discussion and the sharing of ideas in an online learning community (eg. Chen, 2004). As it was felt that grading the POD activities might inhibit students' willingness to express ideas openly and freely, the decision was made not to assess these activities directly. Instead, evidence of having completed the POD activities, together with reflective comments on the experiences, were to be incorporated into each student's individual Online Learning Record (OLR), which accounted for a substantial portion of the subject's formal assessment.

In fact, instructors actively participated in PODs only where invited to do so by the members, as "guests". When this was the case, the guests were to be told the purpose of their input a given a briefing of their role. They had to be made familiar with the guidelines regarding group processes, provided with technology support and supplied with feedback on their performance.

<div align="center">Assessment strategies</div>

There were four assessment items for this subject. All four items were compulsory, available online and subjected to further analysis and evaluation. These are listed below in order of submission:
1. Project proposal
2. Assignment 1: Online Learning Record (OLR)
3. Assignment 2: Project report
4. Subject evaluation

The two major assignments – the OLR and project report – were formally assessed, and each carried a 50% weighting of the student's final grade. The project proposal and subject evaluation did not carry a weighting but were required for successful completion of the subject.

Students were advised to read through all assessment instructions at the very beginning of the session as involvement in online community building exercises began in the first week of session and was ongoing throughout the semester. They were also required to work out a personal plan in preparation for the completion of weekly readings, written exercises, practical lab activities, and collection of evidence of participation in, and evaluation of, online community activities based on a supplied framework.

Online Learning Record (OLR)

The Online Learning Record (OLR), after Syverson (1995), was the vehicle used to support knowledge building and sharing of concepts, artefacts and experiences throughout the CSCW subject. Students could also use the OLR framework as a checklist to monitor their progress in completing core content. They were encouraged to document or diarise their journey throughout the semester by capturing evidence of all activities undertaken, and critically reflecting on their learning. This may have included non-mandatory activities undertaken in their own time, such as wide reading of websites and journal/magazine articles.

Each student was provided with a Zope folder or web space in which to create his/her OLR. The format of the OLR was not stipulated but was left to each student's discretion and creativity – The process culminated in a rich collection of artefacts that may have included responses to the prescribed weekly OLR tasks, blogs containing reflective comments on the POD activities, MOO session logs, project deliverables, annotated bibliographies of CSCW resources, links to relevant websites and copies of e-mail interchanges with instructors and other students, to name but a few.

While the OLR was not formally assessed until the end of session, students were required to develop the framework of their OLR in Week 2 and record progress on a weekly basis from Week 2 through to Week 12 of the session. This required diligence on the part of students to keep their OLRs up to date and not fall behind.

Students' OLRs were graded against a set of assessment criteria, based largely around a weighted five-point Likert scale. An excerpt from the marking sheet used is shown in Appendix A.

Project proposal and report

The project was applied in nature and required students to work alone, in pairs, or groups of three to report on, either the design and implementation of a unique online community; or to develop a case study based on the practical application of an online community model and/or groupware to enhance collaborative practice within a workplace, educational or entertainment setting. The assignment submission consisted of a project report (with supporting documentation, artefacts, additional software, etc.), and required the synthesis of ideas and issues relating to course content, as well as the analysis and evaluation existing theories, models and practices relating specifically to their chosen project.

The actual project topic was negotiated on a one-on-one basis with a supervisor. For those having trouble selecting a topic, a list of additional ideas was provided on Zope (Appendix B). The instructors and a number of other academics at the School of Information Studies, CSU agreed to act as "sponsors" for students wishing to undertake these projects.

Prior to commencing the project, students were required to complete a Project Proposal form (Appendix D), which was reviewed by the supervisor and appropriate feedback provided via e-mail. The form was scripted in DTML and deployed on Zope. In many cases this was an iterative process, with students refining and submitting several versions of the proposal until both the student/group and the supervisor were satisfied and ready to move on will the actual project execution. Continuous mentoring and feedback via e-mail continued following the approval of the proposal, throughout the duration of the project. The supervisor was also available at the end of each scheduled MOO session to offer additional assistance.

Students were asked to document the refinement process of their chosen topic and the subsequent development of their project in their OLRs, but were reminded that the OLR itself was to be assessed separately from the project. Students who worked in groups were also required to submit a Division of Work statement so that the contribution of each member could be assessed. The assessment criteria from the marking sheet appears in Appendix C.

Subject evaluation

The final assessment item was the completion of an online survey form evaluating the content, outcomes, tools and processes used in the delivery of the subject through a series of open-ended questions. Like the project proposal form, the survey form was mounted on Zope. This assessment item was also allocated a 0% weighting, but submission was required for successful completion of the subject. Two copies of student submissions were generated – one stored on the Zope server for analysis, and a second compiled and e-mailed automatically to the instructors and respondent. In addition to eliciting feedback on the tools and strategies used in the subject, the survey also served to prompt students to reflect summatively on their experiences over the semester.

Analysis of student evaluations

Methodology

A simple thematic content analysis approach was used to analyse the survey data. For each question, all responses were first read at face value to produce a preliminary (candidate) list of themes or issues. This list was gradually refined as subsequent passes were made through the data, with the content being reviewed in greater detail and common strands factored out. As part of this iterative process, categories were added, deleted, renamed, combined and divided as necessary.

Eventually, each response was categorised according to the themes/issues identified, to reveal those themes/issues that appeared to be the most pertinent, or worthy of mention. It should be noted that the categories were not mutually exclusive; some responses did not fall neatly into a single category, but rather spanned two or more categories. Conversely, other responses did not fit into any of the categories at all and were thus assigned the category "OTH" (Other).

These "distilled" themes/issues were then reported on in the sections that follow, with excerpts/quotes from the actual survey data included to provide richer insight. The spelling, grammatical and punctuation errors in these excerpts/quotes have deliberately not been rectified.

All in all, the aim of the process was to attempt to present a broad, overall or "birds' eye view" picture of student attitudes and reactions towards the CSCW subject, as seen in the feedback submitted.

Subject strengths

Table 1 shows the categories that emerged from an analysis of the subject strengths listed by students in response to Question 1 of the survey.

Table 1. *Summary of responses to Q1: "List what you consider to be the three strengths of the subject." (N=30)*

Cat. code	Category description	N	%
COM	Community-orientedness, collaboration and friendliness of atmosphere amongst students and between students and teachers	13	43.33
LEA	Learning knowledge and skills related to CSCW, group and groupware tools/technology	11	36.67
PRO	Project	9	30.00
DIV	Diversity of student cohort and POD workgroups	8	26.67

MOO	Online practical sessions (held in MOO)	8	26.67
GRO	Opportunity to work in groups and develop teamwork/collaboration skills	7	23.33
NOV	Novel/unique experience	6	20.00
FLE	Flexible, online nature of subject (ability to work from home, self-paced)	6	20.00
LEC	Helpfulness and enthusiasm of lecturers	6	20.00
DIS	Networking/interacting with other students from the same discipline	4	13.33
OLR	Online Learning Record (OLR)	4	13.33
POD	POD activities	4	13.33
REL	Relevance and ability to apply learning to work situation	3	10.00
TOO	Effectiveness of groupware suite/tools	3	10.00
IND	Self-directed learning / learning at an individual level	3	10.00
CHA	Challenging (eg. requiring self-motivation)	2	6.67
DED	Inclusivity for distance education students	2	6.67
EXA	No exam	2	6.67
NON	None listed	0	0.00

The "COM" category had the largest number of responses associated with it (13 out of 30 students), indicating that these students particularly enjoyed the collaborative, community-oriented nature of the subject, and the high levels of interaction with their instructors and classmates:

"bring students together via a different medium"
"Friendly atmosphere between the students and lecturers."
"Gobal discussions and view exchange"

It was also apparent that the subject content was well-received by the students, who highly valued learning about the theory and practice of CSCW and groups, while being exposed to some of the many groupware options available and being given the opportunity to learn how to use some of these tools. The project was the specific learning activity that received most mention, with many students appreciating the ability to contextualise their learning and apply it to their current and/or future vocations:

"The ability to base the project work on real work activities - makes it more meaningful and relevant…"
"Doing a project that was directly linked to something I was already involved in."

Another one of the issues that spoke the loudest in the survey responses was the fact that students highly valued the experience of interacting with others in the diverse cohort and workgroups:

"Not letting students chose their pod groups this was a great chance to meet students in the same situation as yourself. Especially students from abroad."
"Developing online communities with students from diverse backgrounds."
"Networking with studints from different cultures and backgrounds"

At the same time, they benefited from interacting with those with similar interests, or from like disciplines.

A number of respondents commented on the novel learning experiences facilitated by the subject, in particular the confluence of the human and technological facets of CSCW and online communities:

"introduction of unique learning opportunities/techniques"
"A bit of mystery as to where the subject was heading and the air of experienmentation"

This included the chance for them to work in teams, and to develop their "soft" skills to this end.

While students particularly enjoyed the collaborative, community-oriented nature of the subject, its flexible, online features were also applauded:

"…the subject can be wholly completed online"
"Learn at your own pace"
"Flexibility with some deadlines/ongoing tasks(CSCW) so can reallocate time where needed."

Another strength of the subject from the point of view of students was the helpfulness and enthusiasm of the instructors, which helped create a supportive, community-oriented learning environment. This was further underscored by the issue of inclusivity for distance education students.

There were also positive comments about the groupware tools used, including the level of innovation and the variety of technologies explored. MOO, especially, was perceived by many as a strength, in terms of its ability to provide an effective yet enjoyable means of facilitating synchronous collaboration and learning.

Hung & Nichani (2001) propose a constructivist framework that suggests e-learning environments should be situated in both the social community of practice and in the individual minds of learners. For example, one student listed learning how to collaborate using groupware tools and interacting with others from diverse backgrounds as major strengths of the subject, but also pointed out that he benefited from the personal reflection afforded by the OLR:

"You learn to create an online learning record, which in turn is learning at an individual level."

Subject weaknesses

The categories of subject weaknesses identified are presented in Table 2.

Table 2. *Summary of responses to Q2: "List what you consider to be the three weaknesses of the subject." (N=30)*

Cat. code	Category description	N	%
TEC	Technical issues/difficulties	11	36.67
POD	Difficulty in coordinating POD groups and managing group dynamics/conflict	10	33.33
ACT	Learning activities (eg. number of practical activities and case studies, volume and content of readings)	8	26.67
CLA	Clarity of assessment requirements / activity instructions	6	20.00
INT	Internal lectures (appropriateness, schedule, attendance, content, etc.)	5*	16.67
FAC	Lack of face-to-face contact	4	13.33
OTH	Other	4	13.33
TIM	Timing/scheduling issues related to online activities (eg. differences in time zones)	4	13.33
DIV	Diversity of student cohort and POD workgroups	3	10.00
MOO	MOO session organisation (chaotic, too much gossip, participants straying off topic)	3	10.00
ORG	Organisation and structure of subject content	3	10.00
WOR	Workload / time commitment required	3	10.00
FOR	Lack of formative assessment and feedback/advice on project work	2	6.67
NON	None listed	1	3.33

* 16 of the 30 respondents were enrolled in the subject in internal (on-campus) mode

The most commonly identified theme in the responses to this question pertained to technical issues/difficulties, such as login problems and issues which arose from the high level of dependence of this subject on the reliability of server and network infrastructure. The user-friendliness of one or more of the groupware tools was criticised in some instances.

The technical problems were closely followed by the difficulty in coordinating and communicating with POD group members. In many cases this seemed to be directly related to scheduling problems, possibly due to differences in time zones. A number of groups were faced with members who failed to make adequate contributions:

"…after the first week we lost two of our POD group members, so their was [there were] only two of us that completed the tasks by task 4, I think it was only me left in the group."
"POD members who do not bother to reply or participate are a big problem."

Although diversity was valued by some as a subject strength, others saw the mixture of students from different disciplines within a single cohort in general, and within their POD groups in particular, as a disadvantage:

"Working with other students from different content/skills(backgrounds) less motivated and less helpful."
"…the cohort was very diverse and were starting from very different knowledge bases and interest - this had some advantages but I think more disadvantages"

It could be argued that many of these issues mirror the demands of computer-mediated communications and collaborative groupwork in the real world, which was one of the original intentions of the subject. In fact, it was hoped that students would document and reflect on these issues in their OLRs, bearing in mind they would not be directly assessed on the effectiveness or activity level of their POD groups themselves. This having been said, more support could be provided to students in the way of strategies for effective scheduling and organisation of online meetings. There may also be a need to provide more motivation and encouragement to what appears to be the minority of students, who failed to actively participate in the POD groups. Like O'Reilly and Newton (2002), the authors believe that imposing requirements through assessment is not the only way to have students perceive importance in online interaction and discussion.

A significant number of responses highlighted the fact that students sometimes found themselves unsure of what exactly was required of them in certain activities and assessment tasks, and in general. This is a reminder of the importance of clear, detailed and unambiguous instructions and guidelines, especially in an online/flexible delivery subject. For on-campus students this can be alleviated to some extent by providing additional classroom-based support, although the ideal level of face-to-face contact for students studying the CSCW subject is unclear. Some students suggested that there was a lack of face-to-face support:

"…I realise this is an online subject but often not all problems can be answered online."

On the other hand, others felt there was little point in holding face-to-face lectures:

"Internal lectures seemed silly for a subject where practicals and content were delivered online."

A number of students listed the workload and time commitment required, in particular the large amount of reading required, as a subject weakness. However, it should be realised that the nature of the subject is such that in order to be successful, students must work consistently throughout the semester. To use a computing analogy, students need to operate in "interactive mode" – Attempting to complete the required tasks just before the assignment due dates, in "batch mode", is simply not feasible! One student admitted:

"...the weaknesses I found in the subject were more related to my lack of discipline that problems in the actual subject."

Difficulties faced by students

The third question in the survey asked students to list the aspects of the subject they found most difficult. The categories that emerged from the responses appear in Table 3.

Table 3. *Summary of responses to Q3: "List what aspects of the subject you consider to be most difficult." (N=30)*

Cat. code	Category description	N	%
POD	Coordinating POD groups	11	36.67
SCH	Adhering to the subject schedule	11	36.67
TEC	Resolving technical issues/difficulties, including learning/using one or more groupware tools	8	26.67
MOO	Participating in and adjusting to MOO sessions (chaotic, too much gossip, participants straying off topic)	5	16.67
OLR	Maintaining the OLR and completing the [OLR] exercises	5	16.67
REA	Completing the prescribed readings (due to the number, length, academic language and/or format of the readings)	5	16.67
CLA	Understanding the assessment requirements / activity instructions (due to lack of clarity, vagueness and/or missing information)	4	13.33
PRO	Completing the project	4	13.33
OTH	Other	3	10.00
DIV	Working with the diversity of the student cohort and POD workgroups	2	6.67
NON	None listed	1	3.33

Once again, the resounding issue in terms of the aspects of the subject students found most difficult, had to do with the organisation of POD groups. Students experienced difficult including initiating and maintaining constant communications with members, scheduling meetings, encouraging participation, eliciting contributions and reaching a consensus on topics of discussion. One student attributed his/her difficulties to:

"Having to work with people that had completely different goals and responsibilities"

Another student lamented:

"… Whilst everyone completed their work, we were often a member down when it came to discussing responces."

One student reported that his group managed to overcome the difficulty of ensuring regular contact by exercising good communication skills:

"…I also found it a bit difficult to catch up with my group members regularly due to the fact that the group ha internal and external students. However, good communication skills that's shown by every member of our group, solve that problem."

Concerns in relation to the size of the workload were also reiterated in this section, with many students finding it difficult to work constantly to stay up to date with the schedule amidst other personal, work and study commitments:

"I found that checking the forum and my group page on a regular basis was the most difficult thing to do in this subject"

"The aspects… that i found most difficult were trying to find the time to complete every task on a weekly basis.. All i needed was a big assignment and i fell behind having to catch up all the time"

"The most difficult thing, was staying in constant communication with my POD group, while trying to study for other subjects and work."

As mentioned earlier, discipline is required on the part of students to be consistent in completing the weekly activities. Moreover, students found it challenging to multitask or simultaneously manage the various strands of activities in the subject. Amongst the difficulties listed were:

"Juggling the streams of work - POD, OLR, Project whilst learning about MOO and ZOPE."

"Unable to concentrate on a couple of items moving between POD activities, CSCW tasks, MOOs and project. Trying to familiarise oneself with learning new computer skills and also compete tasks that require reading…"

Although the opportunity for real-time interaction in the MOO was previously identified as one of the subject's strengths, one student described her experience "mooing with over 20 students" as "chaotic learning". This had a lot to do with the overwhelming attendance in the evening session, particularly in the later weeks of the semester, which a large proportion of the on-campus cohort began attending from home or the University's on-campus residences instead of, or in addition to, the daytime sessions.

Suggested improvements

Table 4 summarises the responses to Question 4, "List what improvements could be made to the subject."

Table 4. *Summary of responses to Q4: "List what improvements could be made to the subject." (N=30)*

Cat. code	Category description	N	%
OTH	Other	7	23.33
MOO	MOO sessions – Make changes to the number of scheduled MOO sessions, change the topics covered in MOO sessions, better organisation and more order/control in MOO sessions	6	20.00
ORG	Improve organisation and structure of subject content and resources	6	20.00
POD	Make changes to POD group setup and administration (group size, group composition, closer monitoring/intervention by instructors)	5	16.67
TOO	Changes to the groupware framework/tools	5	16.67
NON	None listed	4	13.33
OLR	Make changes to and/or update the content and/or focus of the [OLR] exercises	3	10.00
TEC	Cater better for technical knowledge/skills gaps	3	10.00
WOR	Reduce the workload size of the subject	3	10.00
ASS	Provide more assistance and feedback with assessment work	2	6.67
CLA	Provide clearer instructions/guidelines and criteria for activities and/or assessments	2	6.67
PRA	Increase the number of hands-on practicals	2	6.67
REA	Make changes to the prescribed readings (number, length and content)	2	6.67

As can be seen from Table 4, a large number of responses to this question were unable to be classified into any of the identified categories and were therefore placed in the category labelled "OTH" (Other). However, a noteworthy number of students made suggestions related to the scheduled MOO sessions Many students highly valued this component of the subject, but expressed the need for more order to these sessions.

In this and preceding questions, there were complaints about the time and effort required to rationalise the subject content and assessment requirements and organise them into a more manageable construction. This added an unnecessary overhead, particularly at the beginning of the semester. Many expressed a need to improve the organisation and structure of the content and resources, and take steps to ensure the consistency completeness and accuracy of information. A degree of frustration was evident in some students' responses:

"...Pertinent pieces of information were left off so that you spent hours doing trial and error to achieve what could have been done in the first half hour if the instructions were correct…Old information on webspace that was incongruent with what we had to work with in a practical session."

"…I think I didn't have sufficient time at beginning of course to extensively read before realising POD groups were going to demand considerable time allocation."

A number of students mentioned specific ways in which some of these concerns could be addressed to improve the subject. Amongst these were recreating the (Zope) webspace so that it is in line with professional learning areas, and developing a more informative and comprehensive subject outline to provide a learning "roadmap" and an overview of the various resources.

The difficulty in organising POD groups arose again, with students calling for closer monitoring of POD groups and lecturer intervention to facilitate the initial group setup. Some students also stated they would like to see more technical assistance provided, particularly for the benefit of those from a non-Information Technology background. For example, additional tuition or simpler, step-by-step instructions could have been provided for the more complex tasks, such as Zope management and MOO building/ programming. One student said he/she would like to see the use of less technical language in the documentation.

Reductions to workload and volume of prescribed readings were amongst the improvements suggested:

"OLR topic work needs to be reduced whilst the project is on – its a big work load…I am still catching up."

"Need to rationalise course by deciding which computer skills/tools…to develop and what is to be learned."

"…it took quite some effort and time to get through all the readings, and it got a little repetitive towards the end of the subject"

Further comments

It made little sense to quantitatively analyse the responses to the final question in the survey, "Further comments to add?" due to the extremely broad scope of this question. Many responses received here suggested a sense of accomplishment and fulfilment by students in having completed the subject and achieving the intended learning outcomes:

"...it was satisfying to complete the major project and my olr. Pod and olr activities provided sound challenges"

"Overall a nicely structured subject, with good teaching strategies, By studying this subject i clearly understood the principles of CSCW, and how it can be applied in real time situations."

"…I enjoyed completing each OLR and POD tasks. In the beginning it took some time for contacting each group members for completion of tasks, but at the end we all understood each other very well and contributed our efforts. Thus this subject indeed teaches us how to work in a group and also introduces us with new ways of communication…"

The unique learning opportunities and techniques of the subject received strong compliments again:

"I did really enjoy this subject and learnt alot. It intorduce me to a whole new learning experience through online collaboration."

"…you don't even feel like you are completing a subject…"

"I took on this subject mainly out of interest – it sounded fascinating and it truly has been. Not only is it a new way of communicating and working, but the subject is presented like no other…I have thoroughly enjoyed my time here."

Specifically, the more technically oriented students benefited from the socio-cultural emphasis, and the opportunity to hone their interpersonal and other non-technical skills. One student found the subject:

"…really enjoyable and completely left field from anything else I have done."

Last but not least, the role of socialisation and friendship building in the success of the subject was given mention in a number of instances:

"This is one subject that really allows students to come out of the class rooms and complete the subject with other fellow students in a more friendly way."

"I have learnt a lot from this subject and also made a lot of new friends which is very important. Collaboration and communication is what this subject, is all about, after all!"

Further work

The students of CSCW play an important role in the knowledge generation for the rest of the class as well as for and future cohorts. They therefore have a direct influence on the evolution of the subject and its content and are encouraged to play an active role to this end. For example, the artefacts published by them on Zope remain available to students who will study the subject in the future; the objects they have created in the MOO persist after they have completed the subject.

The authors plan to further refine the groupware framework by experimenting with and evaluating other tools and technologies. For example, a number of alternatives exist to cater for the subject's content management (*Content Management System*, 2005) needs; even Zope 3 (Zope Corporation, 2005a), is somewhat different from the version used in the subject. Plone (Plone Foundation, 2005) is a powerful, user-friendly open source Content Management System based on Zope.

The authors are also investigating the integration of *Wiki* into to further encourage collaborative knowledge generation and sharing, by allowing students to annotate and contribute to the web-based lecture materials and online subject content. Collaborative writing software may be introduced to assist groups of students working on their project reports. Finally, the authors are exploring the dissemination of text and audio content through the use of *Really Simple Syndication (RSS)*. Most blogging systems, as well as Yahoo! Groups, are capable of generating RSS feeds to syndicate XML data to subscribers. RSS 2.0 with enclosures allows for the syndication of audio content, a technology known as *podcasting*. It will hoped that the use of RSS and podcasting will make mobile learning (m-Learning) possible by catering for the delivery of instructor) as well as student-generated content in the form of small, "bite sized" learning moments viewable on handheld devices such as portable music players, mobile phones and personal digital assistants (PDAs). For example, on-campus lessons and face-to-face discussions may be captured in MP3 format and podcast for the benefit of all students. Students will be given the opportunity to engage in collaborative activities using their personal mobile devices.

Furthermore, the authors will investigate the possible application of the online learning community building framework proposed by Brook and Oliver (2003) in future offerings of the subject.

Conclusion

The authors believe that the CSCW groupware framework, as well as the teaching, learning and assessment strategies, can be replicated or adapted for most computer education scenarios that will benefit from an online community building and knowledge construction approach. They may have broader implications such as contributing to best practice in this area.

Both the authors' own observations and the student feedback received supply convincing evidence that the subject and its organisation were well received by students. A detailed analysis of forum and MOO log data will be carried out in order to determine the degree to which the role of instructors as active participants played an integral part in building group harmony and confidence. In addition, the authors plan to study the importance and nature of mentoring relationships in the building of an online learning community. It is envisaged that this will entail discourse analysis of e-mail, MOO, forum and POD group data.

According to Delahoussaye (2001, cited in Differding, n.d.) online education is "an isolating and lonely

experience". However, as one distance education student aptly observed:

"Studying via DE can either be an isolating experience or a real online community connection."

The framework and strategies employed in CSCW go a long way towards building an inclusive learning environment that causes students – both on-campus and distance education – to collaborate and connect, and encourages them to evolve from social animals into true community creatures.

Acknowledgements

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Appendix A: Assessment criteria / marking sheet for OLR

1	2	3	4	5	6	7

Readings and exercises
1. Level of conceptual understanding
2. Use and evaluation of CSCW tools
3. Object oriented design and programming
4. Evidence of effort and improvement in skills

Collaborative practice
5. Knowledge sharing and action
6. Contribution to community building
7. Management of workflow

Presentation
8. Original ideas, comments and artefacts
9. Evidence of reflective practice
10. Structure, style, logical flow and referencing

Your final score out of 50 points

Appendix B: List of "sponsored" project topics

1. Multimedia interface upgrade for LC_MOO and K9MOO

Re-development of graphics and other multimedia elements which form the interface for LC_MOO (http://ispg.csu.edu.au:8800) as well as K9MOO (http://ispg.csu.edu.au:9000), including MUD maps for both environments. Sponsors are Mark Lee and Ken Eustace.

2. Q&A project

Building a question and answer Web site for first year IT undergraduates, using a collection of newspaper articles in XML format. Sponsors are Geoff Fellows and Ken Eustace.

3. Archiving policy

An investigation into the policy of archiving data and back-up procedures over time in an organisation eg a school, business or government department. The sponsor is Prof. Ross Harvey.

4. Wiki as a collaborative learning tool

Wiki is a relatively new technology, used to facilitate collaborative web authoring. The most well-known Wiki implementation is Wikipedia (http://en.wikipedia.org). This project will involve an exploration of the use of Wiki as a collaborative learning tool in higher education. This involves some technical implementation as well as research. Sponsor is Mark Lee.

5. 3D MOO development

Design and development of a 3D MOO using ActiveWorlds (http://www.activeworlds.com) to support collaborative work in a particular field such as business or education. Sponsor is Mark Lee.

6. Open source groupware tools

An investigation of one or more open source groupware tools and/or the development of a framework using these tools, to support a particular type of workgroup or community. Sponsor is Mark Lee.

Appendix C: Assessment criteria / marking sheet for CSCW project report

1	2	3	4	5	
					Multidisciplinary approach and problem domain
					1. Purpose, plan & timeline are consistent with outcomes
					2. Use & evaluation of CSCW tools
					3. Analysis & evaluation of related theories, models & practices
					4. Evidence of application/synthesis of CSCW principles into project
					Collaborative practice and workflow
					5. Evidence of individual contribution to the report
					6. Evidence of individual contribution to community building
					7. Observed management or communication with others
					Presentation
					8. Original ideas, results/findings/recommendations & conclusions
					9. Quality of the product, study or outcomes
					10. Structure, style, content, logical flow & referencing

	Your final score out of 50 points

Appendix D: CSCW project proposal form items

　　　1. Proposed title of project:
State a proposed title for your project, subject to change following consultation with your lecturer.
　　　2. Group size:
How many students in your group? MAX size = 3
　　　3. Group name:
What name would your group like to be identified as (leave blank if you will be working alone)?
　　　4. Group members:
Provide the details of each member in your group. You are also required to nominate ONE member as the team leader, who will be responsible for liaising directly with the lecturer.
　　　5. Groupware tool(s):
List the groupware tools you plan to use and/or explore as part of your project - e.g. MOO, Zope, COREBlog, Yahoo! Groups, BSCW, CoBrow,...
　　　6. Ethics in my/our research:
Include a brief discussion of the ethical issues related to your research (e.g. privacy) and how you plan on addressing these issues (approx. 100 words).
　　　7. Project description:
Include a brief description of your project including client or sponsor, collaborative needs, problems or concerns to be addressed (approx. 150 words).
　　　8. Expected outcomes of project:
List the main outcomes or goals of your project.
　　　9. Project plan:
List the major steps required to complete this project with resources required (include human resources here) along with a projected timeline.
　　　10. Submitted by:
Provide the name of the member submitting this proposal on behalf of the group.

Figure 1. *Stages/phases in online community building/growth and knowledge construction. Adapted from Salmon (2004b) and Gunawardena, Lowe & Anderson (1997)*
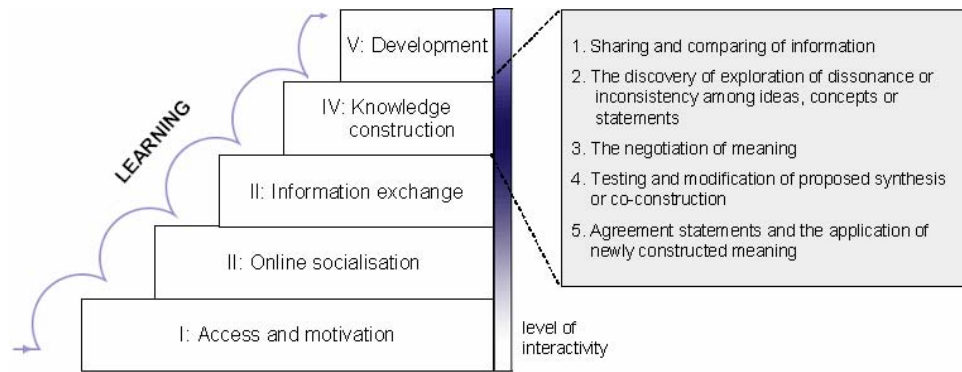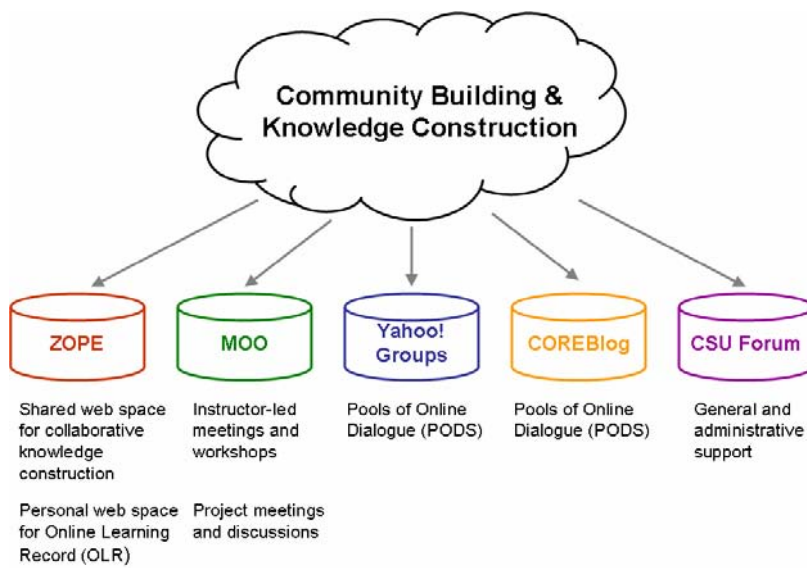

Figure 2. *CSCW groupware framework*

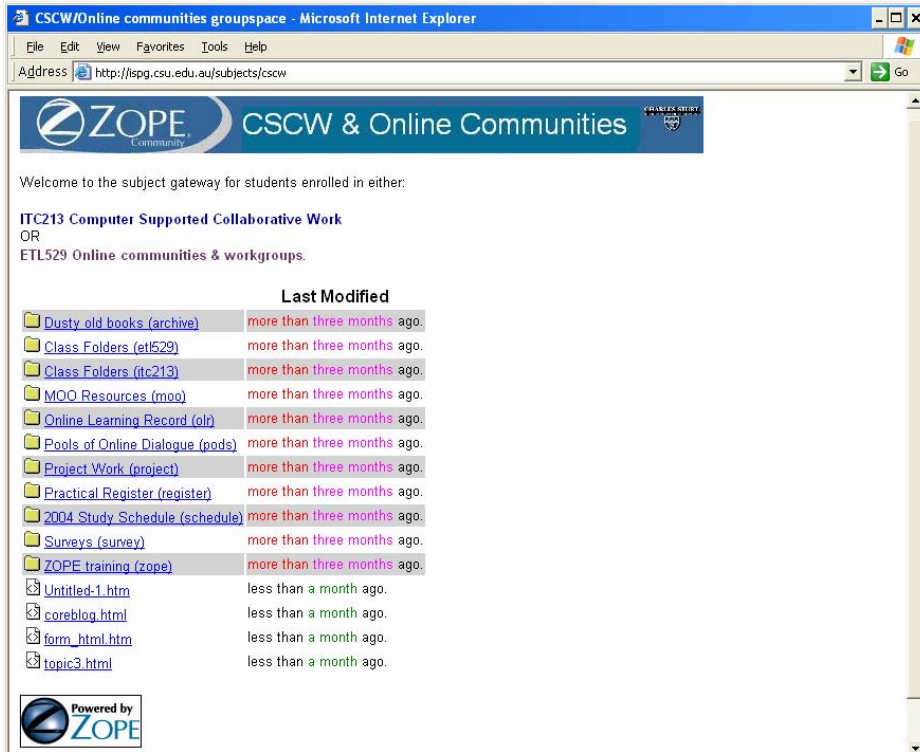Figure 3. *The top-level folder (home page) of the CSCW Zope site*

Figure 4. *The Bulga Ferngully room in LC_MOO, where the CSCW meetings and workshops were held*
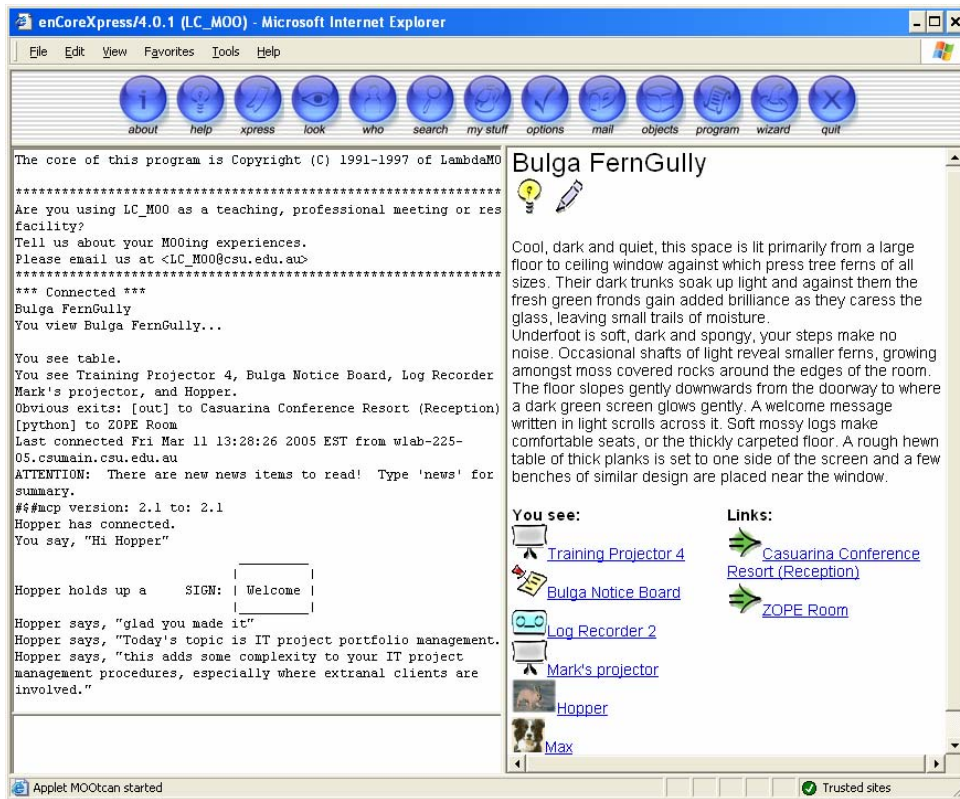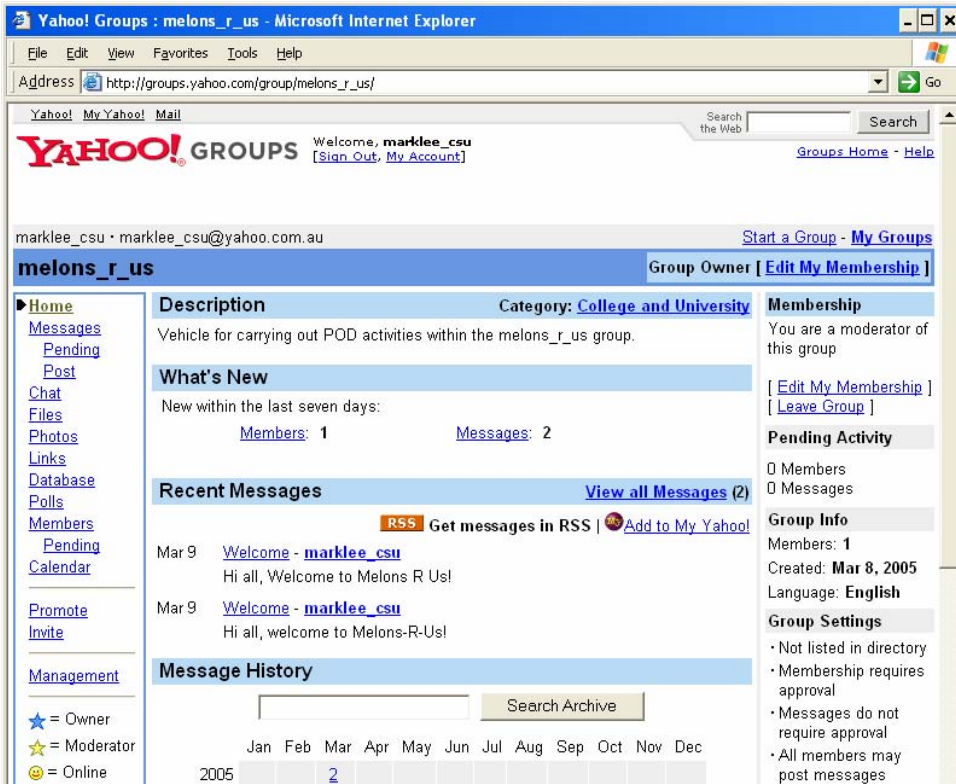
Figure 5. *Yahoo! Groups*
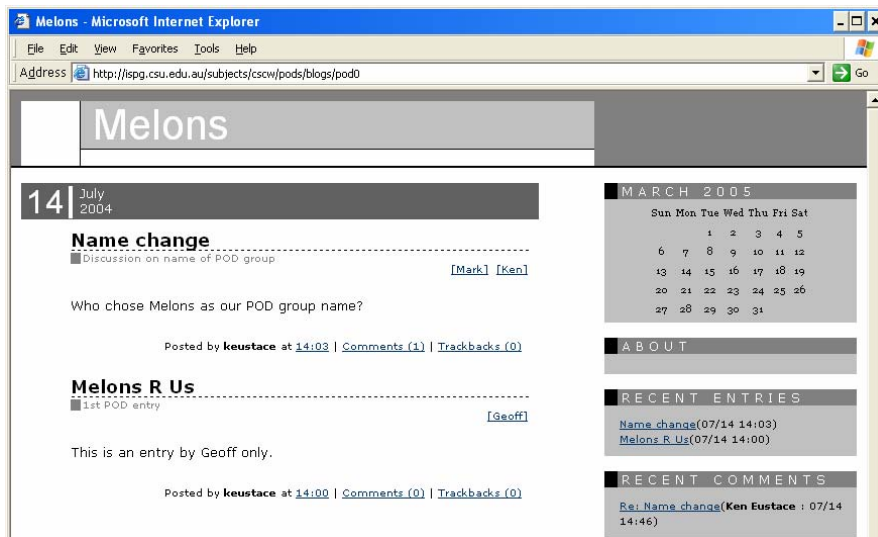

Figure 6. *Group blog established using COREBlog*

Figure 7. *A typical [OLR] entry that appeared within the CSCW topic schedule on Zope*

Figure 8. *A log recorder object (behind) player object (in front) - MOO objects can be viewed directly in a browser by specifying the relevant object number in the URL*

Impact of Technology-Mediated Peer Assessment on Student Project Quality

Lan Li
Allen L. Steckelberg
University of Nebraska at Lincoln

Abstract

This study was designed to investigate the impact of an anonymous technology-mediated peer assessment on student project quality in higher education. In this study, particular attention was paid to the quality of student feedback and opportunities for students to improve their work. Forty-seven students from two undergraduate classes from a central US university participated in this study. Students were randomly divided into two groups – a control group and an experimental group. Before instructor assessment, peer assessment was conducted and peer feedback was provided for students in the experiment group to improve their projects. The control group received no peer feedback. An independent grader's scoring of the two groups was analyzed to investigate the effect of technology-mediated peer assessment on student project quality. Results indicated that there was a significant difference of project quality between these two groups. A post assessment survey indicated that students generally held positive perceptions of this peer assessment process. These findings supported previous studies that a well-implemented peer assessment could promote student meaningful learning.

Introduction

Promoting student autonomy and shifting student roles from traditional passive observing to active learning have become an important focus in higher education. Peer assessment, viewed by some researchers as "the learning exercise in which the assessment skills are practiced." (Sluijsmans, Brand-Gruwel, & van Merrienboer, 2002), is a process in which peers assess the performance or achievement of others of the similar status (Topping, Smith, Swanson, & Elliot, 2000). Peer assessment's value in stimulating student motivation, promoting student critical assessment skills and enhancing student meaningful learning has been established (e.g. Pope 2001, Freeman 1995 & Topping 1998).

Most current peer assessment methods are conducted through paper-based systems. Two issues associated with this system -- anonymity and administrative workload may hinder the widespread acceptance of this process.

A number of studies suggested that peer pressure is one of the causes of student negative feelings towards peer assessment. Hanrahan and Isaacs (2001) reported student discomfort from peer pressure (associated with having peers rating own paper and critiquing others). Falchikov (1986) found the "possibility of marking down/failing a peer" as one of student least liked features in peer assessment. Chen and Warren (1997) noticed that students "felt compelled to award a higher score to those with whom they were more friendly". In a paper system, potential bias caused by peer pressure (such as friendship) can influence students' judgment and lead them to rate good performance down and poor performance up. Therefore some researchers suggested providing anonymity to reduce the impact of peer assessment (e.g. Davies, 2002). When peer assessment is conducted in a confidential environment and assessors and assessees are not aware of each other, peer pressure should be substantially reduced.

Excessive administrative workload is another concern of some researchers (e.g. Davies, 2002). Hanrahan and Isaac (2001), in their study, reported more than 40 person hours for documentation work to maintain an anonymous paper-based peer assessment distribution system in classes with 244 students.

To overcome these two problems, Li and Steckelberg (2005) designed and implemented a database-facilitated peer assessment support system. In this system, anonymity was provided and assessors and assessees were not aware of each other's identity. Projects were typed and submitted via the Internet; therefore the possibility of revealing student identities and characteristics (such as gender) from their styles of handwriting was eliminated. Students were instructed to remove any personal information from their projects. Projects were coded numerically for assessment purposes. The distinctive features of database-driven website made it possible for student projects and peer assessments to be submitted from students' computers to a database, and at the same time become available and accessible for students and instructors viewing. Management workload was substantially reduced.

This system was previously utilized by the authors (Li & Steckelberg, 2004) to investigate the impact of anonymous peer assessment on student meaningful learning and student perceptions. Prior results presented an interesting picture. Data analysis indicated that there was no significant difference of project quality of two groups.

However, students held general positive perceptions of this peer assessment method. They acknowledged and recognized the merits of peer assessment in promoting meaningful learning and fostering critical thinking. After scrutinizing each step of the peer assessment process and consider student perceptions, Li & Steckelberg suggested that these seemingly contradictory findings might be explained in part by limited time for project improvement after receiving peer's feedback and the poor quality of student feedback. Some students in the post-assessment survey indicated that they would like more time to improve their projects after viewing peers' rating and comments. Others expressed that they had expected more constructive peer comments. In this study, the peer assessment model was modified to address these two issues. First, students in the experimental group were given more time to revise their projects after peer reviewing. Second, students in the experimental group were informed that their assessment (of peers' performance) would be assessed by instructor and it would compose a part of their project grade, providing incentive for students to put more effort into assessing peers' work and into providing higher quality feedback/suggestions.

Based on the findings of previous studies, our hypotheses are:

1. Anonymous peer assessment promotes student deeper understanding of subject matter and marking criteria. There is a significant difference between project quality of the control and experimental groups.
2. Students acknowledge and recognize the values of this peer assessment method.

Facilitating website

In this study, the technology-mediated website (Li & Steckelberg, 2005) was utilized to provide anonymity and facilitate instructor assessment the quality of peer's assessment. This site contained two interfaces – student interface and instructor interface. In the student interface, students performed two roles: assessors and assessees. As assessors, students logged in and assessed (rated and commented upon) two randomly assigned peers' projects. As assessees, each student had immediate access to peer's rating and feedback for his/her own project for further improvement as soon as data were submitted. Shifting between two roles helped student gain better understanding of project elements and marking criteria. This process was conducted in an anonymous environment. Assessors and assesses didn't need to face each other and all the data exchanges were through the website. The instructor interface was designed to allow instructors to track the whole peer assessment process as well as managing/maintaining student accounts. Instructors had access to students' ratings and comments on peers' work. Instructors used this access to grade the quality of feedback provided by students in the experimental group.

Methodology

Subjects

Forty-seven undergraduate students from a central US university participated in this study. All the participants were from a technology application course at the college of Education and Human Science.
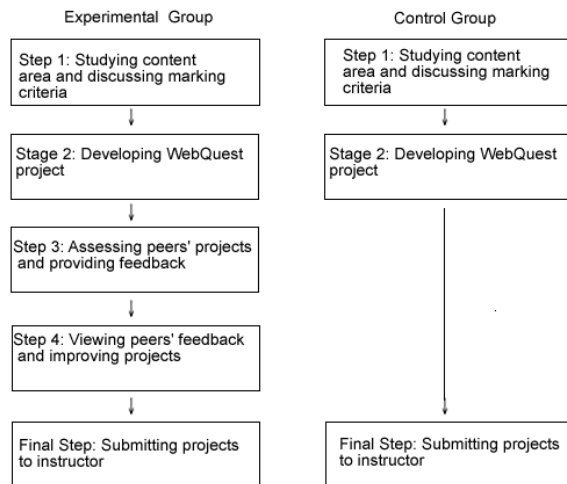
Preparation for peer assessment

Since most students had never had any peer assessment experience before, a brief discussion of advantages and current issues such as anonymity of peer assessment was conducted in class. Students were encouraged to ask questions and discuss concerns. Students were then introduced to the technology-mediated peer assessment support system. The features of this system assuring anonymity were specifically explained to students.

Procedures

As a class assignment, students were asked to build a WebQuest project and upload it to the Internet. A WebQuest is an instructional material utilizing web resources. It was designed to involve users in a learning process of analysis, synthesis and evaluation. Peer assessment was utilized in this study to help student gain deeper grasp of critical features of WebQuest and better understanding of the marking criteria.

Students were randomly divided into two groups – a control group (twenty-three students) and an experimental group (Twenty-four students). In the control group, after thoroughly studying the project elements and marking criteria, students were instructed to develop a WebQuest project by themselves without any external intervention. In the experimental group, peer assessment intervention was conducted (Figure 1).

Figure 1. Peer assessment steps in control and experimental groups.

Step 1: Studying content area and discussing marking criteria
　　　The content area was thoroughly studied, which familiarized students with what a WebQuest was and what its critical features were. Marking criteria provided by Dodge (2001) were also discussed in class. These marking criteria included 13 items, ranging from overall aesthetics to each critical feature of WebQuest. For each item, there were three performance indicators and corresponding points. A sample project was provided in class and students were asked to rate it according to the marking criteria to practice their assessment skills. Instructor assessment and student assessment were compared and discussed in class.

Step 2: Developing WebQuest project
Students were asked to construct a webquest project and upload it to Internet. A web page template was built and provided for students to convert their projects into websites to simplify the task.

Step 3: Assessing peers' projects and providing feedback
Students were asked to rate and provide comments/suggestions on peers' work through a web form. The web form replicated the 13 items in the marking criteria (Dodge, 2001) elaborated in the training.

Step 4: Viewing peers' feedback and improving project
Data were made available to the author of each project. After viewing peers' feedback, each student was asked to use the feedback summarized to improve the project.

Final Step: Submitting projects to instructor
Completed projects were submitted to instructor for assessment.

Post-assessment survey
　　　After students submitted their projects, students in the experimental group were asked to fill in a post-assessment survey concerning their general perceptions of this technology-mediated peer assessment method. This survey was adapted from previous study (Lin, Liu, & Yuan, 2002) and included 15 five-point Likert Scale items with 1 representing "Strongly disagree" and 5 representing "Strongly agree", as well as two open ended questions concerning students best and least like features.

Scoring procedure
　　　One trained independent rater graded all student projects based on the same rubric (Dodge, 2001). This rubric included 13 items with a total point of 50. The whole scoring process was conducted in an anonymous way.

Projects from the control group and experimental group were coded and mixed together for the independent rater to assess. The independent rater didn't know which project was from which group and had no way to connect projects with individual students. To make sure that the scoring process was consistent, reliable and free of bias, inter-rater reliability of course instructor's scoring and independent rater' scoring was calculated. The Pearson correlation was .829 (significant at .01 level).

Results

Two types of data were collected in this study. First, student project scores from the independent rater were collected to compare the difference of project quality between two groups. Second, post assessment survey data were gathered to depict student attitude toward this anonymous technology-mediated peer assessment method.

Difference of project quality

Independent rater's scoring was analyzed and ANOVA was utilized to see if there was any significant difference in student project quality between two groups (control and experimental). Results indicated that there was a significant difference (Table 1).
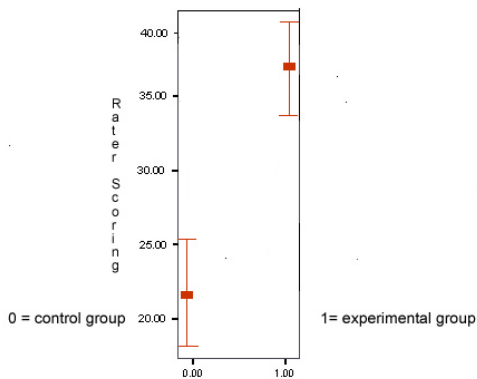
Table 1. Mean and standard deviation of the final project scores for the experimental and control groups

Group	N	Mean	SD
Experimental	24	37.67	9.70
Control	23	21.57	8.32

As Table 1 indicates, the difference between the two means (37.67 vs. 21.57) is statistically significant, $F(1, 45) = 37.083$, $p < .01$.

An error bar graph (Figure 2) shows that the scores in the experimental group were much higher than that of the control group.

Figure 2. Scoring in the control and experimental groups

Student perceptions of peer assessment

Twenty-one students in the experimental group completed the post assessment survey (table 2). This survey included two parts. The first part is 15 five-point Likert Scale items adapted from a previous study (Lin et al, 2002). These items deal with student general attitudes towards this peer assessment process and range from 1 (strong disagree) to 5 (strongly agree). The second part is two open-ended questions regarding students' likes and dislikes; "Please specify what you like mist in this peer assessment procedure" and "How would you change this peer assessment procedure? And why?"

Table 2. Minimum, Maximum, Standard Deviation and mean of student perceptions in post-assessment Survey

Items		Min	Max	SD	Mean	95% Confidence Interval of the Difference	
						Lower	Upper
1	I am content with my own work.	2	5	.75	4.07	3.73	4.41
2	I learn more from peer assessment than from traditional teacher assessment.	2	4	.77	3.10	2.75	3.45
3	The procedures on how to do peer assessment are clearly outlined.	3	5	.59	3.95	3.68	4.22
4	Peer assessment is a worthwhile activity.	2	5	1.02	3.67	3.20	4.13
5	Peers have adequate knowledge to evaluate my work.	2	5	.91	3.33	3.92	3.75
6	I benefited from peers' comments.	2	5	.86	3.95	3.56	4.37
7	The peers' comments on my work were fair.	2	5	.89	4.00	3.59	4.41
8	Peers can assess fairly.	3	5	.71	3.88	3.56	4.20
9	I have benefited from marking peers' work.	2	5	.85	3.86	3.47	4.25
10	I took a serious attitude towards marking peers' work.	2	5	.75	4.48	4.14	4.82
11	I felt that I was critical of others when marking peers' work.	3	5	.71	4.00	3.68	4.32
12	I had enough time to assess peers' work.	3	5	.72	4.29	3.96	4.61
13	I had enough time to improve my work after I got feedback form peers.	3	5	.75	4.19	3.85	4.53
14	I have the knowledge to assess peers' work accurately.	1	5	.96	3.86	3.42	4.30
15	My project improved because of the peer review.	2	5	.86	4.05	3.65	4.44

Data analysis of the first open-ended question, "Please specify what you like most in this peer assessment procedure" revealed two major themes: peers' feedback for improvement and the opportunity to view peers' projects. Another two themes emerged for the second open-ended question, "How would you change this peer assessment procedure? And why?" (Table 3)

Table 3. Themes and supporting raw data from the post assessment survey

"Please specify what you like most in this peer assessment procedure"	
Themes	Student Comments (raw data)
Peers' Feedback:	"I felt that the peer assessment helped me fix my own project." "I got feedback from others." "…gave me the opportunity to look for things I hadn't realized needed to be included." "I liked the feedback and hearing what worked and what didn't." "I liked being able to read others opinions about my webquest. It helped me make mine better." "I really did appreciate the comments made." "I really liked it because I was able to improve my work and add

	things I forgot." "I liked being able to get feedback and then be able to change it." "Gives us a chance to see what we did wrong and improve it." …
Opportunity to view peers' projects	"you got to see other projects." "that I could see other peer's projects and get ideas form them." "I think it is nice that you can see others' work, so you have an idea where your abilities lie." …
"How would you change this peer assessment procedure? And why?"	
Themes	Student Comments (raw data)
No change of the procedure:	"…change nothing." "I wouldn't. I really thought it was a good idea to have it." "I wouldn't, I think it is fine." …
Use peer assessment in more projects	"I would have liked to be peer assessed on both webquest and lesson plan." "use it more often, for other projects."

Conclusion

This study investigated the impact of an anonymous technology-mediated peer assessment support system on student project quality and explored student attitudes toward this method. Data analysis revealed a statistically significant difference in project quality between the control and experimental groups. A post assessment survey also indicated that students generally held positive perceptions of this peer assessment process.

In the implementation process, we felt that a few critical features of peer assessment had an influence on its success.

Time to improve projects. Students should be given enough time to improve their projects after viewing peers' gradings and comments. Both feedback and the opportunity to act on that feedback are important to improve student work. This issue was especially addressed in this study. In the post assessment survey, students indicated that they had enough time assessing peers' work as well as improving their own projects after viewing peer feedback.

Incentive to provide quality feedback. Student incentive is essential for the success of peer assessment. When students put effort into reviewing peers' projects, they provide more constructive feedback, which is important in allowing students to benefit from the process. In this study, the quality of peer assessment was assessed by instructor to encourage higher quality peer feedback. In the post assessment survey, most students indicated that they took a serious attitude towards marking peers' work.

Technology-mediated support. The technology-mediated peer assessment support system played an important role in this study. All the data were automated and transmitted back and forth between a database and students' computers. Information exchange was extremely prompt and easy, which saved a substantial administrative workload and stimulated student interactions. This system also facilitated instructor assessing the quality of peer feedback. Once the instructor logged in the instructor interface, she had access to detailed assessments made by each student, which made the process extremely easy and prompt.

Anonymous peer assessment. Anonymity, another advantage of this system was acknowledged in student survey responses. Most students felt that they were critical of others when marking peers' work (survey item 11; mean = 4.00; SD = .71). Students appreciated the "freedom to give comments that came from anonymity", which would certainly minimize the potential impact of peer pressure, thus maintain the reliability and validity of peer assessment.

The findings from this study support previous findings that a well-implemented peer assessment can help student gain deeper understanding of subject matter and promote student learning.

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Factors that Influence Learners' Performance
in a Goal-based Scenario e-Learning Environment

Kyu Yon Lim
Hyeon Woo Lee
Pennsylvania State University

Il-hyun Jo
Chuncheon National University of Education

Abstract

The Goal-based Scenario (GBS) model, which is renowned for its rigor in developing high-quality, highly-transferable courseware, has been attracting instructional designers' keen attention for several years. This study tries to share the process of developing e-learning courseware which employs GBS, and investigates the effectiveness of the GBS model in corporate settings in terms of learners' satisfaction and performance. The researchers pursue theoretical as well as practical implications for instructional design practitioners by conducting quantitative and post-hoc qualitative research.

Introduction

Korea's corporate training community has a need for effective, performance-oriented e-learning courseware to help companies cope with and survive in today's hype-competitive market environment. In order to provide the learning tasks and resources that reflect the context of the "real" world, the need for constructivist instructional models has recently come to the fore (Schank, 2002). The Goal-based Scenario (GBS) model is renowned for its ability to embrace both constructivism and objectivism, and has been attracting the attention of instructional designers who are interested in developing high-quality, highly-transferable courseware (Jo, 2002).

Hybrid Instructional Model: Goal-based Scenario (GBS)

GBS initially originated from scientific research on human cognition. Roger Schank (1999) defines the characteristics of natural human learning as follows. First, natural learning is goal-directed. The basic cognitive mechanism of attention, reasoning, and memory that are involved in learning depends on authentic learning goals. Second, natural learning is driven by expectation failure. The learning mechanism is invoked when the world is not as expected. Such a divergence makes it apparent that existing knowledge is incomplete and even incorrect in some ways, thus signaling an opportunity to learn. Third, natural learning is the process of problem solving based on a case. Learning is the accumulation and indexing of cases, and thinking is the finding and consideration of an old case to use for decision-making about a new case. Cases give us real experience, and GBS is designed to provide learners with those experiences as they perform a task that is relevant to them.

In the beginning of the 1980s, researchers in Northwestern University under the direction of Roger Schank developed the concept of GBS, which is a framework based on the principles for effective learning outlined above. GBS provides a learning by doing experience, whereby learners pursue a goal by practicing target skills and using relevant content knowledge to help them achieve their goal (Schank, Berman, & Macpherson, 1999; Jona, 2000). According to this definition, GBS facilitates learners to perform authentic tasks and provides various resources as suggested by constructivist pedagogy. At the same time, GBS leads instructional designers not only to decide which types of support to give the student but also how to set the instructional goals and break them down to a level at which they can be taught directly as the objectivist tradition suggests. One thing different from the objectivist instructional design model is that learning materials are embedded in the scenario as the tools for performing the tasks, not delivered as a textbook which has pre-defined logical structure.

GBS is expected to produce some critical learning outcomes when applied appropriately; First, learners can transfer the skills to similar cases, even to real business situations. Second, learners are encouraged to reflect on their problem-solving process. Third, learners work cooperatively and get the experiences of sharing their ideas and points of view. Finally, learners learn how to set up plans and revise them in terms of variable situations and limitations (Campbell & Monson, 1994).

Purpose of the Study

The primary purpose of this study is to share the process of developing e-learning courseware which

employs a GBS model, and to empirically investigate critical factors in learners' performance in GBS e-learning environments. Two separate studies were conducted. Initially, the researchers analyzed learners' characteristics and design strategies that influence learners' satisfaction and achievement,. Secondly, to further investigate the reasons that could have resulted in the findings discovered in the first study, the researchers conducted post-hoc qualitative research. Research questions were as follows: 1) What level is the learners' satisfaction and achievement with the GBS-based e-learning courseware? 2) What factors are related to the learners' satisfaction and achievement in the GBS-based e-learning environment? 3) Are there any other factors related to the learners' achievement in the GBS-based e-learning environment?

CE (Construction and Engineering) Academy Jr.

The initial stage of this study was designing six e-Learning courses based on the GBS model for the Construction Engineering Academy Jr. of Samsung Engineering & Construction Company (SECC).

Design Principles

The company adopted several critical design requirements for the six courses. First, curriculum of the CE Academy Jr. should be developed according to the needs of job-site employees by conducting a survey and focus group interviews. Second, courseware should be developed for an online environment to provide all the employees, including people who work in the overseas site, with equal opportunity for high-quality training programs. Third, an instructional strategy that could enable learners to develop problem-solving skills should be adopted to help them solve the real-world problems that happened in their construction sites everyday, not just understanding the concepts behind new technologies. GBS model was selected to meet this need. Finally, a tutoring plan for effective leaning should be pre-designed. As GBS is task-oriented by nature, continuous facilitating by experienced experts is one of the most important learning resources.

Operational Strategy

Each courseware product consisted of four to seven learning tasks that should be performed within eight weeks. Learners could complete the course study once they achieved more than 70 points (total 100 points) in three categories: the rate of progress, quizzes, and performance level of tasks. Besides, completion of "at least one course in the CE Academy Jr." was a requirement for promotion to managerial positions. That is, it was regarded as compulsory courseware.

Development Process

For this challenging project, the researchers and instructional designers modified GBS to meet the specific design requirements for a Korean business situation. The modified GBS, which we call GBS+, is an instructional design model that is embodied by the proactive communication between subject matter experts and instructional designers. GBS+ uses a specified taxonomy and terms which are familiar to Korean instructional design practitioners, presents practical guidelines for each step, and most of all, describes a conceptual framework for GBS-based e-learning courseware to diffuse this hybrid model which blends constructivist design ideas with an objectivist systemic approach. The five development steps embodied in GBS+ are as follows.

(1) Identify Learning Goals
    Learning goals are sets of skills that learners should learn. At the beginning of the analysis phase, instructional designers, subject matter experts, and star performers had a series of workshops to share the idea of GBS and define the learning goals. Novak's knowledge-mapping method was used to describe the structure of knowledge and skill sets which were essential for performing the job task in a real situation (Jo, 2001; Novak, 1999). Consensus among all parties was another issue. The output of this stage was a concept map which showed the hierarchical and procedural relationships among the knowledge nodes.

(2) Design and Develop Learning Tasks
    Tasks are the key to success of GBS+. As motivation of learners depends on the authenticity and relevance of tasks (Petraglia, 1998), researchers aimed at developing plausible and meaningful tasks that encompass the pre-described learning goals.

(3) Create Scenarios
    Scenarios are closely related to the learning goals and tasks. In addition, scenarios contain learning resources which are needed to complete the tasks (Schank, 1992). Star performers and subject matter experts cooperated to create scenarios to motivate learners with not only realistic but also dramatic

stories based on real cases. The result was the construction of a Master Scenario and Sub Scenario, both of which are brand-new terms created by GBS+.

(4) Develop Learning Resources

Three types of learning resources were developed to scaffold learners to perform the given tasks: "Tutorials" for understanding the content and process knowledge, "Glossaries" for catching the meaning of terms, and "Data" for solving the problem, especially similar to real documents and information resource that are easily found in the job-site. All parties worked together to embed these resources in scenarios to maintain the contextual and cognitive liaisons among task, scenario, and learning resources.

(5) Develop Storyboards and Media

Instructional designers developed storyboards according to micro-level design strategies such as message design principles and the ARCS model. Media development followed this stage.

Quantitative Study

Method

157 employees of SECC Participated in this study and 105 employees answered the survey instruments. The independent variables were the level of learners' self-regulated learning skills and perceived level of authenticity of tasks. A revised MSLQ (Motivated Strategies for Learning Questionnaire) was used to measure the former (Pintrich, 1986). Learners' self-regulated learning skills were categorized into sub-components of motivation (internal motivation, external motivation, perception on tasks) and learning strategy (organization, metacognition, time management, effort control). For the perceived authenticity of the tasks, instruments developed by Roelofs & Terwel were revised to fit the needs of this study, summarized into three sub categories of reality, contextuality, and learner control. The dependent variables were learners' satisfaction and learning achievements. Survey instruments on satisfaction tried to measure the satisfaction level resulting from GBS-based e-learning courseware. Two variables were adapted to measure learning achievements: understanding level and performance level. Several multiple regression tests were utilized for the analysis of data.

Results

Research Question 1: What level is the learners' satisfaction with the GBS-based e-learning courseware? Survey instruments for learners' satisfaction were organized into 4 categories: items on scenarios, learning tasks, general satisfaction, and satisfaction compared with tutorial-based e-learning courseware. The result shows that students were satisfied with the GBS-based e-learning courseware in general (m=3.83). Above all, learning tasks were the area in which respondents had the highest satisfaction (m=3.91).

Table 1. Means for Learners' Satisfaction

<n=105>

Sub Categories	mean	SD
Satisfaction with Scenarios	3.73	0.70
Satisfaction with Learning Tasks	3.91	0.70
General Satisfaction	3.84	0.79
Comparative Satisfaction (with Tutorial)	3.90	0.74
Overall	3.83	0.75

*5 point-Likert scale was used (5=I am strongly satisfied).

Research Question 2: What factors are related to the learners' satisfaction and achievement in the GBS-based e-learning environment? Multiple regressions were conducted to examine the factors that influence learners' satisfaction (Table 2). Study results show that the level of perception on authenticity of tasks (Beta=.84, p<.001) and learners' self-regulated learning skills on motivation (Beta =.12, p<.05) were the independent variables which predicted learners' satisfaction.

Table 2. Multiple Regression Analysis for Learners' Satisfaction

<n=105>

Independent Variables	Adjusted R^2	Beta	t	p
Perception of Authenticity of Tasks	.836	.84	16.12	.000***
Self-Regulated Learning Skills on Motivation		.12	2.32	.022*
Self-Regulated Learning Skills on Learning Strategies		.06	1.23	.222
F value of the model = 266.27, p>Model F = .000***				

***p<.001, ** p <.01, * p <.05

Another multiple regression analysis was performed to investigate the influence of sub-factors. The results indicate that sub-factors included in authenticity of tasks were positively related to learners' satisfaction (Table 3).

Table 3. Multiple Regression Analysis for Learners' Satisfaction in terms of sub-Constructs

<n=105>

Sub-constructs of Independent Variables	Adjusted R^2	Beta	t	p
Reality of Tasks		.37	5.81	.000***
Contextuality of Tasks		.25	4.12	.000***
Perception of Tasks	.864	.22	3.92	.000***
Learner Control		.18	3.07	.003**
Time Management		.10	2.40	.018*
Internal Motivation		-.04	-.77	.446
External Motivation		-.05	1.20	.232
Organization		-.01	.17	.862
Metacognition		-.01	.14	.890
Effort Control		.00	.04	.970
F value of the model = 133.27 p>Model F = .000***				

***p<.001, ** p <.01, * p <.05

Analysis for learners' achievements was performed for the next stage. The result of multiple regression analysis for the level of understanding indicated that there were no statistically significant factors that predict the dependent variables. There were similar results for the level of performance; no factors predicted learners' achievements.

To sum up, learners' satisfaction with GBS-based e-learning courseware was closely related to the learners' perception of the authenticity of the assigned tasks and their self-regulated learning skills. Learners' achievements, on the other hand, had nothing to do with any independent variables. Therefore, a post-hoc qualitative study was conducted to investigate the factors related to the learners' achievements.

Qualitative Study

Method

Ten learners and six tutors participated in the qualitative research. Learners were purposively sampled by their satisfaction and achievement scores. The qualitative study was conducted mainly by a semi-structured interview questionnaire designed to evoke new information and suggestions. Every comment and word was recorded and subjected to a content analysis.

Results

Research Question 3: Are there any other factors related to the learners' achievement in the GBS-based e-learning environment? Learners who reported the highest scores in both satisfaction and achievement had the opinions that the learning materials and given tasks were authentic enough to transfer to their job tasks. They participated proactively in the learning process by searching information on the Internet or asking questions to their experienced seniors. Additionally, they had abundant pre-acquired knowledge related to job performance.

"At first, I enrolled in this course because it was a requirement for promotion. But I found it useful to my job. Tasks and learning resources were interesting and looked like real situations."

"Tasks were a little bit tough but I could solve them by collecting and analyzing data around my office. I have already experienced that kind of situation before, so I know the way it goes."

On the contrary, learners whose scores were the lowest in satisfaction and achievement had not been motivated since the given tasks had nothing to do with the job they were performing at that time, although they regarded the GBS model as being effective and helpful. The only factor driving them to complete the course was the characteristic of CE Academy Jr., which was "compulsory for promotion."

"I would have given up finishing the course, if it had not been required. I logged in just to complete!"

"All I need was 70 points to complete the course. Why do I have to do my best?"

The results of the one on one tutor interviews have some implications on the factors related to learners' achievements. Six tutors had similar opinions that learners' job experience had a strong effect on performing tasks due to the nature of tasks. It was also said that most learners focused on "completion."

"The most important thing for learners was to finish the course. For example, some learners just selected easier tasks to get 70 points. There was no need to solve all the problems in that courseware."

Interview results indicate that learners' achievement is closely related to the rules and regulations within the Human Resource Management system. In this case, completing the courseware was equal to obtaining the points for promotion.

Discussion

Learners' satisfaction can be predicted by self-regulated learning skills on motivation, corresponding to the previous research results (Pintrich & DeGroot, 1990; Schunk, 2000). Interview with learners indicated that high internal motivation resulted in high satisfaction levels.

It is the authenticity of tasks that counts in this study. Authenticity explained more than 80% of learners' satisfaction with GBS-based e-learning courseware. The result of qualitative research shows consistency with statistical analysis. All the learners who were satisfied with the courseware commented that the tasks were highly useful in performing their current job tasks.

None of the independent variables, however, predicted learners' achievement. Qualitative research results indicate two reasons for that. First, courseware in CE Academy Jr. was requirements for promotion, which drove learners to focus on completing the course. The company was concerned with the list of learners who finished the course, not with the performance itself. Second, learners' job experience and pre-acquired knowledge had strong effects on their achievement. It is mainly because GBS is inevitably based on real job tasks. This authenticity allows pre-acquired knowledge to help learners perform their real tasks.

Based on these findings, the study suggests that, for instructional design, authentic tasks are critical to maximizing learning outcomes. The operational implications are that courseware should be connected to the HR systems of companies, an issue that should be considered at the stage of analysis and macro-level design.

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Fostering Communities of Practice –
A Case Study of Heads of IT Departments

Wei-Ying Lim
John G Hedberg
Jennifer Ai-Choo Yeo
David Hung
Nanyang Techchological University, Singapore

Abstract

This paper describes a project which sought to foster communities of practice in Singapore schools both as a culture and as a professional development strategy. We adapted such a concept to one of the leadership training modules in NIE using Wenger's evolving community as a guiding framework. Our findings have been mixed thus far, and relate to the complexities of fostering CoPs and why participants would seek to continue collaboration in non formal settings. At this stage, we have found that two main types of preconditions, personal imperatives and nature of tasks need considerations before enactment. The personal imperatives that individuals bring into the community determine the density of connectivity in a CoP which in turn affects the undertaking of complex tasks.

Introduction

Currently, through conversations, interactions and sharing sessions with teachers and school leaders, knowledge is typically tapped on for problem-solving, and through such approaches groups have access to the accumulation of years of experience. *Experience* is knowledge that is deeply entwined with the context in which it occurs, encountered only by the first-person(s) in the situations. Thus, knowledge is very much tacit in nature and it resides in the individuals who 'own' it. Paradoxical as it may seem, schools can look within and across their organization for solutions, rather than asking external providers to provide such tacit knowledge. Indeed professional development in the Singapore schools' context has included a rationalization of the teachers' workload such that it can give the experienced teachers "time to coach the younger teachers and help them to absorb the ethos and values of the profession. That way, overall quality goes up in teaching"(MOE para. 42, 2005).

The need for a situative approach to professional development and knowledge sharing has led teachers, through "legitimate peripheral participation" (Lave & Wenger, 1991) to participate and observe the community's activities on the periphery, and appropriate knowledge (particularly tacit knowledge) from the more experienced (or central) participants. Progressively, teachers move from peripheral participation to central participation where they change from being passive observers to active contributors in the community. Through this process, teachers gradually acquire the skills, norms and rules held by the community of practice (Hung, 1999).

Case Study of HoDs IT

This case study describes a series of cases which sought to foster CoPs amongst a particular group of Heads of Department (HoD) in Singapore schools. The case study group consists of adult practicing teachers who were at the University for HoD in-service training. The learning objectives of this eight-week course (face-to-face tutorials and online discussions) included: a) understanding the constructivist philosophy; b) developing design strategies for the constructivist learning approach; and c) adopting ICT tools that supported constructivist learning. In the process, these school leaders were required to engage in a group project in collaboration with a few other members in their cohort. Conceptualizations of the projects were carried out during the six months of formal training at the University, followed by six months of collaborative implementations whilst being back on-the-jobs in schools. All in all, the entire study lasted one-and-a half year long with which we saw two cohorts of HoDs graduating.

In this study, Wenger's et. al (2002) tenets for evolving communities were used as a guiding design framework (Table 1) from which a more detailed curriculum design (Table 2) was developed. Table 2 describes the curriculum design in terms of the events, activities of each cohort and the support and tools used for the activities.

Table 1: Wenger's tenents — a guiding design plan.

Wenger's tenets	Rationale	Design Plan for fostering HoD ICT Community
Events	To bring the community together	• Weekly face-to-face sessions to plan project • Annual conference of HoD

Wenger's tenets	Rationale	Design Plan for fostering HoD ICT Community
		• Monthly face-to-face or online session after the formal training at the University
Leadership	To help the community develop	• To facilitate the evolvement of leaders as they begin to take ownership and responsibility of core topics or tasks • To allow leaders to take ownerships in facilitating discussions
Connectivity	Enable a rich fabric of connectivity among people	• To connect different batches of HoDs with other groups/communities such as School Principals
Membership	To foster a sense of belonging	• To elicit common goals amongst all members
Learning Projects	To deepen mutual responsibility	• The Project Plan • To introduce online discussions • To introduce topics for discussion that interest sub-groups interests
Artifacts	Documents, tools, stories, symbols etc that represent the community.	• To encourage the sharing of experiences and adopt success stories and examples of personal experiences of HoDs

Table 2: Curriculum design — activities, events, supports and tools

	July2003 cohort	Jan 2004 cohort
Curriculum Events	Nine classroom sessions. Each session dealt a different topic – 1. Introduction to key ideas of learning - engaged learning, learning communities, project work, knowledge producing and authentic assessment 2. Different conceptions of learning: constructivism; IT MasterPlan II; 3. Project proposal presentation & final implementation presentations	Eight classroom sessions. Each session dealt with a different topic – 1. Introduction to key ideas of learning - engaged learning, learning communities, project work, knowledge producing and authentic assessment 2. Different conceptions of learning: CoP, CoL; Multimedia; CSCL 3. Evaluation of technology planning (including BY(i)TES) 4. Empowerment for managing IT & financial resources 5. Project proposal presentation & final implementation presentations
Operational Execution	**Online discussion threads** – • Five general topics for all participants • Two threads for each project group for negotiation and reflection of their proposal. **Project** presentation required groups to craft out a practical project proposal that could be implemented in their schools. The implementation of the project took place after the course and a conference was held for the participants to share their implementation with each other. **Presenters** – University Professors **Facilitators** –Education Ministry officers	**Online discussion threads** – • Eight threads for all participants • Three threads for each project group for negotiation and reflection of their proposal. **Project** presentation required groups to craft out a practical project proposal that could be implemented in their schools. The implementation of the project took place after the course and a conference was held for the participants to share their implementation with each other. **Presenters** – University Professors **Facilitators** –Education Ministry officers
Activities in Class	• Introduction and presentation of concepts, ideas and lesson issues • Small group discussion & sharing of ideas/perspective of issues • Whole class discussion facilitated by course lecturer(s) • Question and answer session (with guest speakers, issues raised in class) • Presentation of group projects Feedback	• Introduction and presentation of concepts, ideas and lesson issues • Hands-on (case study and CSCL) • Small group discussion of issues/topics/questions • Group presentation • Whole class discussion facilitated by course lecturer(s) • Sharing of ideas/perspective of issues raised

	July2003 cohort	Jan 2004 cohort
	• from course lecturers and ETD facilitators • Summarising whole class discussion/ group sharing/lesson • Sharing of food in class	in class • Presentation of group projects • Feedback from course lecturers and ETD facilitators • Summarising whole class discussion/ group sharing/lesson
Activities Online	• Individual online reflection • Discussion of spillover topics/issues/questions from face-to-face session • Online discussion forum set up for group discussion, negotiation and reflection of their project • In all the online discussions, there was no facilitation from the course lecturers or the ETD facilitators. One of the forums (professional development) is facilitated by one of the participants.	• Individual online reflection • 3 discussion forums for each project group • 3 forums for discussion of issues surfaced in f2f sessions • No facilitation from NIE course lecturers • Facilitation from ETD facilitators in some of the online discussions, mostly to direct ppts answers to some point.
Activities —Special Events	• Dialogue with Director Educational Technology Division	• Attachment to various IT commercial companies
Supports	• **Classroom** 1. Feedback on the online discussion 2. External speaker invited to speak on CSCILE • **Online** 1. Facilitation by appointed participant for one discussion thread • **Project** 1. Advice and feedback on groups' initial project ideas by course lecturers 2. Online discussion facilities provided for group's discussion and negotiation.	• **Classroom** 1. Group discussion facilitated by ETD facilitators 2. Feedback on the online discussion • **Online** 1. Facilitation by ETD facilitators • **Project** 1. Advice and feedback on groups' initial project ideas by course lecturers and Education Ministry facilitators 2. Online discussion facilities provided for group's discussion and negotiation.
Tools	• **In class** o PC, projector for presentation; Reading materials; Laptops • **Online** o Blackboard	• **In class** o PC, projector for presentation; Reading materials; Laptops • **Online** o Blackboard

For each cohort, ethnographic notes were made whenever the community met face-to-face and online discourse were analyzed contextually based on the events and activities organized or evolving at that particular instance. A historical time frame or developmental approach was adopted which traced each community from its beginnings to its maturity stages. In essence, the transformations and processes undertaken by the evolving nature of the community were documented, analyzed, and the processes relevant to the transformation process abstracted.

Findings

The following findings are presented according to teacher cohorts.

Cohort 1 – July 2003 to December 2003

Connectivity and Membership

Generally the participants started out in the course with a sense of connectedness. They espoused a relatively 'open mind', exhibiting a social constructivist stance in their epistemologies towards learning and knowledge construction. In addition, some even expressed a sense of comradeship and seemed to exhibit a shared understanding of one another's positions, roles and difficulties in schools as evidenced by their personal reflections:

Participant A:

After the first session... , I felt relief. I think I will be able to pick up a lot from my fellow colleagues. They are all so good and most important of all is they are willing to share. I feel at ease with the lecturers and tutors too. The job that they are doing is similar to what the IT HOD is doing in school. Hence they will be able to associate with the kind of pain that we actually are going through when trying to implement new initiatives or programs to the staff of the school. And be able to share with us their experiences.

Participant B:
I look forward to our learning together and collectively we can expound, explore and evolve good ideas that will optimize the use of current and limited resources for the "engaged learning" movement... The intent to extend the spirit of the course and the camaraderie developed beyond the duration of the DDM is something that will bind the HoDs together and instill pride for playing a special role to lead the school to sustain this educational reform.

Participant C:
… There is much to learn about fostering learning communities in schools, making authentic assessment work, working with students and teachers as knowledge producers and making project work to work in schools. I am looking forward to crafting out practical project proposals that will be implemented in our schools next year.

Upon analyzing the participation in the online and face-to-face discussions, the results revealed some interesting and somewhat conflicting insights. There were a total of five online discussion forums and another three for project group discussions. The level of participation for each forum was measured in terms of the number of postings for each forum. The number included those posted by the participants as well as the Ministry facilitators and University lecturers.

Figure 1: Number of postings in each forum (cohort 1) ; for each forum where at least one posting is made. With a total of 18 participants, the average posting made per participant in this cohort is 0.87. Contrasting this figure with the enthusiasm shown by the initial reflections from the participants, the participation rate in the online forums does not seem to correspond to the initial sentiments espoused by the participants.

The last three forums shown on the graph, Sec Group, Primary Group and Four Friends had no postings at all. These forums were the online facility set up for the individual project groups to discuss, negotiate and reflect on their projects. However, from the evidence of no postings and later interviews revealed that the participants preferred to meet and talk face-to-face, and this was supported by the class meeting pattern — the participants met everyday in this intensive program and thus they preferred to discuss face-to-face.

When examining the participation rate in the individual groups, we found that the group that kept their connectivity and made significant progressed in their project implementations comprised of members who had high levels of participation both online and in the face-to-face sessions (in Figure 2, five of the top seven active participants i.e. CPE, HH, JL, C, YKL were from the same project group). The group not only successfully implemented their project in their respective schools, they kept in constant contact with one another and helped with

one another's implementation problems beyond the official course duration. In fact, three of the six worked closely to conduct a sharing session for the July 2004 cohort of participants as well as a presentation at a local education conference. According to one participant, these events brought them closer to each other.

During a post-implementation interview, the respondents revealed that the project was being sustained in their schools with more teachers and departments on board. When queried on why this was the case, all mentioned that it was their desire to see the project through and their strong belief in what they were doing that saw them through the difficulties. They also mentioned that the "gelling" among them assisted in their collaboration a number of times, both during face-to-face and the online discussions.

Figure 2: Level of online participation by contributor (cohort 1)

Leadership

True to Wenger's tenets, another factor in the success of the successful group was the presence of a natural leader, JL who not only had the highest level of participation online, but was also observed to be actively participating during the face-to-face sessions, offering to share resources acquired from conferences and taking the initiative to compile summaries of the class. JL displayed leadership qualities, a keenness for appropriate use of technologies and to share experiences with others.

Learning projects and Artifacts

When analysing the learning project and the artefacts produced by each group, the nature of project task became the determinant for collaboration. Tasks that were complex, possessed some uncertainty, afforded alternative viewpoints led to greater collaboration among group members. Examples of such tasks include implementing a new technological system and introducing a different concept of learning (Table 3). In fact, the complexity of the task was heightened by cross schools collaborations which made it even more compelling for the participants to support each other, share experiences, and provide advice and alternative perspective to each other.

Table 3: Nature of the tasks by each project group (cohort 1)

	Secondary Group	**Four Friends Group**	**Primary Group**
Task	Setting up of e-Learning portal for teaching and learning	Collaborative online discussion among students from various schools (across schools)	Knowledge building using Knowledge Community
Nature of task	Technical	Pedagogical shift & Technical	Pedagogical shift & Technical
Activities and events involved	• Setting up of e-Learning portal • Designing/converting learning materials to be placed in the e-Learning portal by the school teachers	• Crafting the theme for the online discussion • Preparing teachers from each school to facilitate the discussion • Setting up the online accounts	• Individual schools to design the problems for knowledge building • Setting up of Knowledge Community system • Training teachers and students for the task to use the KC system

	Secondary Group	Four Friends Group	Primary Group
		for the students • Training the students for the collaborative discussion • Supporting the teacher facilitators	• Supporting the teacher facilitator
Complexity of task	**Low.** Technical aspects may be complex but can be outsourced to external vendors.	**High.** Technical aspects may be complex but within the capability of the HOD (IT). Required the collaboration of all the members as the online discussion involved students' participation from different schools	**High.** Both technically and pedagogically challenging High degree of uncertainty in terms of processes and outcomes. Thus working with others provides the support needed.
Participation structures	Individual	Group / Division of labor	Individual / Sharing of experience
Support and tools	External vendors	Division of labor	External vendors Experience of team members

Cohort 2 – January 2004 to December 2004

Connectivity and Membership

The participants in cohort 2 revealed similar interaction patterns to those of cohort 1; they first espoused an open and sharing epistemology, wanted to share and collaborate with each other. However over time, their online discussions did not seem to measure up to their initial enthusiasm (Figure 3).

Participant A:

In the spirit of Learning Organisation, I believe in sharing our ideas & resources. To start the ball rolling, I will like to share with the 011h group of participants my school's IT Dept Workplan which my team of IT savvy teachers & I are currently working on. Please click on at http://www.xinminss.moe.edu.sg/chiakh/default.aspx. Will really appreciate if you could give comments on how it could be improved further…

Participant B:

… Thanks for your advice. In fact, one of my strategies in my IT action plan this year is exactly what you have described. I'm glad to hear from you that it worked in your school. That gave me more confidence in implementing it.

Figure 3: Number of postings in each forum (cohort 2)

From Figure 3, the level of participation for each forum was very low and it decreased as the course progressed. Like cohort 1, the participants did not really see the need for online discussion as they see each other everyday during the course. This phenomenon persisted despite the fact that cohort 2 had facilitators from the Education Ministry, compared with none from the first cohort. The type of facilitation that took place online was mainly question-answer types of interaction with the facilitators raising questions for the participants to answer. As a result, the online forums served as a information exchange rather than as a discussion platform.

Unlike cohort 1, the top five active participants in cohort 2 spread across different groups and none of the groups seemed to particularly coherent (Figure 4). CKH performed a similar role to JL in cohort 1 where he was an active participant both in face-to-face discussion and the online group discussion.

Figure 4: Level of online participation by contributor (cohort 2).

Learning projects and Artifacts

In this case, the nature of the task from the Sungei Buloh Group seemed to encompass both the technical complexity and the need for a pedagogical shift. Again similar to cohort 1, such task afforded greater collaboration among the group members and as a result, the group enjoyed a greater success with their implementation.

Table 4: Nature of the tasks by each project group (cohort 2)

	e-Learning Resource Portal Group	**PDA Gadgeteers Group**	**Sungei Buloh Group**
Task	Setting up of e-Learning portal for teaching and learning	To provide easy access of learning resources using PDA for students	Knowledge building using Knowledge Forum with students from different schools
Nature of task	Technical	Technical	Pedagogical shift & Technical
Activities and events involved	• Setting up of e-Learning portal • Designing/converting learning materials to be placed in the e-Learning portal by the school teachers	• Purchasing the PDAs • Setting up infrastructure needed to allow students to download learning resources into PDA • Collaboration between teachers in both schools to design/convert/ share learning resources for students	• Crafting theme and activities • Designing and developing tools and supports for the activities • Preparing teachers and students (including student mentors) from different schools for the activities • Setting up Knowledge Forum and training teachers and students to use the system
Complexity of task	**Low.** Technical aspects may be complex but can be outsourced to external vendors	**Low.** Technical aspects may be outsourced to external vendors Design and development of materials can be done individually or shared	**High.** Technical aspects may be complex but support can come from external vendor or expertise High degree of uncertainty as the concept of knowledge building is new.
Participation	Individual	Individual/Group	Group / Division of labor

	e-Learning Resource Portal Group	PDA Gadgeteers Group	Sungei Buloh Group
structures			
Support and tools	External vendors Experience and working models of other schools	Own expertise	Technical assistance from experts (TSC) Expertise of different members in the team. Division of labor

Discussion

This paper describes two attempts to foster communities of practice (CoP) among Heads of IT Departments in Singapore schools employing Wenger's tenets for evolving community as a general design framework. Through the enactment of *practice,* by means of events/activities design by the researchers and having the participants work in authentic tasks situated in their schools' contexts, this study expected the participants to progress from peripheral participation to central participation where they changed from passive observers to active contributors. The literature is replete with studies and proposals such as: the characteristics of communities of practice (Barab & Duffy, 2000); principles for the design of effective learning communities (Bielaczyc and Collins, 1999); and tenets of communities of practice (Lave & Wenger, 1991). However, appropriating these ideas did not lead to sustainable communities much past the end of the course.

The outcomes suggests to us that beyond the initial enthusiasm and willingness of the participants to learn, problem solve and knowledge construct collectively, there may be some preconditions that need considerations before designing interventions such as activities, support, and scaffolding for communities to prosper. Two main types of preconditions are observed in this study – *personal imperatives* and *nature of tasks.*

First, personal imperatives such as a common belief, zeal and passion are observed to be important considerations that connect and "gel" participants (in the case of the Primary Group) together. Coupled by the presence of strong leadership (e.g. JL), membership in a CoP can grow to be closely knitted, reinforcing beliefs and interactions inherent in the community. Such fortification eventually leads to identity change where individual members spread and evangelize their beliefs and practice to other non members, thereby growing the community.

The nature of the tasks is o bserved to be the other type of precondition that is a determinant for collaboration. Tasks that are not too specific, allowing participants to contextualize into their schools' culture are those that afford a greater degree of success. Notably these tasks also encompass a pedagogical shift, one that is constructivist in orientation. Hence, we conclude that tasks that contain higher risks, in terms of uncertainly and complexity in the processes and outcomes propel a greater need for collaboration and sharing among the participants, rendering them to rely on one another for support and division of labor.

In conclusion, it is proposed that efforts towards the fostering of communities consider two main types of preconditions, *personal imperatives* and *nature of tasks* before enactment. The personal imperatives that individuals bring into the community determine the density of connectivity in a CoP which in turn affects the undertaking of complex tasks.

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Learning "Pragmatics" On-line Through Partnership: A Cross-Cultural Study between Taiwanese College Students and Their Texan Tutors

Chia-Ning Jenny Liu
Texas A&M University

Yi-Chuan Jane Hsieh
Ching-Yun University
Zhongli, 320, Taiwan

Zohreh Eslami-Rasekh
Texas A&M University

Abstract

This study investigated the effectiveness of the use of Computer-Mediated Communication (CMC) in learning pragmatics. The impact of teaching pragmatics by E-mail and WebCT discussion on Taiwanese EFL learners' pragmatic competence was explored. Relative effectiveness of learning pragmatics through in-class activities and telecommunication were also compared. Data collected in school settings were analyzed quantitatively and qualitatively. The results showed that the pragmatic instruction enhance EFL learners' pragmatic competence.

Background and Theoretical Perspective

Since the adoption of the communicative approach in second or foreign language teaching, more importance is given to the achievement of functional abilities in the target language. The development of second language pragmatic competence involves the ability to appropriately use a wide range of speech acts such as "greeting," "apologizing," "complimenting," and "requesting." Among them, requesting, the focus of pragmatics instruction in this study, has been one of the most studied speech acts. Various studies have also indicated that requesting is one of the most frequently used speech acts in communication (Ellis, 1992; Rintell & Mitchell, 1989; Rose, 1999).

There is a general agreement that pragmatic knowledge in the second language can be acquired by utilizing universal pragmatic knowledge, and some aspects from the learner's first language can be transferred to the second language. However, Bialystok (1993) has reported that in order to acquire processing control over the existing pragmatic foundations, adult second language or foreign language learners need to develop new representations of pragmatic knowledge not existing in their first language. In addition, research has shown that many aspects of pragmatic competence cannot be acquired without a focus on pragmatics instruction (Kasper, 2000). Therefore, it is reasonable to suggest that foreign language learning can be aided by instruction which helps learners practice their linguistic knowledge in communicative activities.

In spite of existing theory and research evidencing the need for pragmatics instruction, English-as-a-Foreign Language (EFL) classrooms mainly focus on grammar-oriented instruction and pragmatic development of language learners has been overlooked. Studies have examined the fact that when pragmatics is not a planned subject in a second or foreign language classroom, the opportunities for developing pragmatic competence is quite limited (Kasper, 2000). The consequence is that English language learners who have studied English for years still face problems using language appropriately in communicative contexts.

In addition, learning English is rather difficult in an EFL learning environment compared to an English-as-a-Second-Language (ESL) environment because EFL learners do not have the opportunity to interact with native speakers of the target language as ESL learners do. Language class activities in EFL settings often focus on decontextualized language practices, which do not expose learners to the types of sociolinguistic input that would facilitate pragmatic competence acquisition.

Recently, interventional studies have examined the effects of explicit instruction in pragmatic competence on the development of learners' pragmatic competence. The results from these studies have indicated the positive effect of pedagogical intervention, and this supports the view that pragmatic ability can be developed through

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planned classroom activities (Bouton, 1994; Eslami-Rasekh, 2005; Rose, 1999; Takahashi, 2001; Tateyama, 2001). Studies conducted by Eslami-Rasekh (2004), Kasper (1997), Rose (1999), Takahashi (2001), and Tateyama (2001) also suggest that pragmatic features can be effectively acquired through explicit instruction on pragmatics.

Over the past two decades, computers have become common instructional tools in the ESL/EFL classrooms. Currently, collaborative e-mail exchanges are one of the instructional tools used in classrooms. Studies have shown computer-mediated communication (CMC) has many merits in classroom settings. Computer-mediated communication refers to interaction via telecommunications. Electronic communication has been found to have a number of beneficial features that make it a good tool for language learning. Research has indicated electronic communication can enhance students' motivation (Warchauer, 1996), and improve writing skills (Cononelos & Oliva, 1993). Cifuentes and Shih, (2001) further stressed that CMC provided an authentic context for learning functional abilities by having EFL learners interact with English-as-a-first-language speakers. With explicit instruction in how to communicate in the virtual environment, CMC may benefit the intercultural teaching and learning (Shih and Cifuentes, 2003).

Objectives

This study investigated the impact of pragmatic instruction on Taiwanese EFL learners' development of pragmatic competence. Relative effectiveness of learning pragmatics through in-class activities and telecommunication were also compared. The present study attempted to answer the following research questions: (a) Did students who received the in-class explicit pragmatic instruction improve their pragmatic competence more than those who did not do so? (b) Did students who received the explicit pragmatic instruction through telecommunication connection from Texan tutors improve their pragmatic competence more than those who did not do so? (c) What was the relative effectiveness of learning pragmatic through CMC as compared to in-class pragmatic instruction? (d) What were students' perceptions of learning pragmatics?

Methodology

This study applied a pretest-posttest control group experimental design and combinations of quantitative and qualitative data collection and analyses. The independent variable was the treatment with three different levels—(1) the control group which received no explicit pragmatics instruction, (2) the experiential in-classroom group which received explicit pragmatic instruction face to face from their classroom instructor, and (3) the experimental CMC group which received explicit pragmatics instruction from their Texan tutors through CMC (e-mail and WebCT discussion). The dependent variables were students' pragmatic competence.

Participants

Participants were 82 undergraduate students majoring in applied foreign languages from a university of technology in Northern Taiwan. The other 13 participants were graduate students majoring in teaching English as a second language at a university from Southern Texas.
In Taiwan, 82 students belonged to three intact classes and enrolled in the class of "English for Tourism." Because of institutional constraints, it was not possible to assign students randomly to the different groups, thus making it necessary to work with three intact groups. In an effort to determine equivalence of the three groups in terms of their English language proficiency, the General English Comprehension Test was given to the participants.
The statistics results showed that the control group produced higher mean scores on the reading comprehension pretest (M=31.067, SD=8.183) than the experimental in-classroom group (M=28.957, SD=7.258) and the experimental CMC group (M=28.966, SD=8.011). Nevertheless, three groups did not differ significantly from each other in the performance of the reading comprehension pretest (F=0.68, df =2, p=0.51).

There were 30 students in the control group, 23 in the experimental in-classroom group, and 29 students in the experimental CMC group. In Texas, each of the 13 graduate students was randomly assigned to be the tutor for two or three Taiwanese experimental group participants. These students interacted with their Taiwanese learners through email correspondences and WebCT discussion. All Texan participants received the instruction as part of their curricular activities in the class.

Procedure

During the duration of this study (ten weeks), all eighty-two Taiwanese participants met once a week for one hundred minutes each time. At the beginning of each class, the professor in Taiwan spent fifteen minutes in dealing with class management and students affairs issues. Since the eighty-two Taiwanese participants were enrolled in "English for Tourism", participants in all three groups were engaged in the following warm-up tasks: watching a short film about tourism in English for about fifteen minutes, followed by instructors' explanation about

film for about twenty minutes in each meeting. The instructor used the text book entitled: "At your service: English for the travel and tourist industry". Each week, the instructor taught one unit of the textbook.

During the remaining fifty minutes of the class, participants in the control group did not engage in any explicit pragmatics activities. Instead, the instructor spent about thirty minutes of lectures on learning tourism English using the teacher's manual as a guide, followed by twenty minutes of summary and discussion in each meeting for a total of fifty minutes. During the thirty minutes of lectures, students had the opportunity to interact with the instructor through questions and answers. And students also had small group discussion with their peers during the twenty minutes of summary and discussion. Participants practiced their English in terms of writing, listening, reading and speaking during class.

In contrast to the control group, during the remaining fifty minutes of the class, ten weeks lesson plans were delivered to the participants in the experimental groups; i.e., in-classroom and CMC. Each lesson plan consisted of one activity and each activity was designed in order to raise students' pragmatic awareness. The content for both groups are identical and was based on the ten weeks lesson plans developed by the researcher. The components of the lesson plans aimed to raise students' pragmatic awareness and offer learners the opportunity for communicative practice. For the experimental-in-classroom group, the lesson plans were delivered by the instructor through face to face mode; for the experimental –CMC group, the lesson plans were delivered though email correspondences and Webct discussion between Taiwanese students and their tutors.

At the beginning of the study, all students were asked to complete the Discourse Completion Task (DCT) pretest. Students in the control group received the regular classroom instruction that did not explicitly address pragmatics in the teaching contents. The experiential in-classroom group received explicit pragmatic instruction face to face from their in-classroom instructor, and the experimental CMC group received explicit pragmatics instruction from their Texan tutors through telecommunication (e-mail and WebCT discussion).

Following ten weeks of treatments, all students were asked to take the Discourse Completion Task (DCT) posttest. At the end of the study, the experimental CMC group took students' perceptions of learning pragmatics survey to explicate their attitudes toward learning pragmatics, attitudes toward using e-mail and WebCT in learning, and perception of learning from Texan tutors.

The Discourse Completion Task (DCT) included twelve situations with a special focus on speech act function of request. These situations were designed to probe how participants respond in different situation in terms of social status, power, and impositions. The social contexts specified in the DCT contain relationships between a professor and a student, a boss and an employee, and among friends. The purpose of this design was to see how participants interacted or responded to certain situations from different points of view. Two native English speakers rated the participants' Discourse Completion Task (DCT) pretest and posttest productions. The rating system used in this study was adapted from the rating system proposed by Hudson, Detmer, and Brown (1995), containing components as the followings: (1) the ability to use correct speech acts, (2) expressions, (3) the amount of information, (4) levels of formality, (5) levels of directness, and (6) levels of politeness. In this case, the last three components were combined as one (levels of politeness) due to the overlapping elements of speech existing among these three components. The raters rated participants' performance based on 5 point rating scale ranging from 1 to 5. The value for interrater reliability was reached to an acceptable level of agreement (r .90).

Results

The descriptive statistics results of the DCT pretest scores by group are demonstrated in Table 1. There were four scores, including the score of the ability to use correct speech act, the score of expressions, the score of the amount of information, and the score of levels of politeness. The two experimental groups overall yielded higher mean scores than the control group against three rating components (expressions, information, and politeness). However, the experimental in-classroom group scored slightly lower in the speech act rating component as compared to the relative means of the control group and the experimental CMC group. In this case, there was no significant group effect for the DCT pretest; namely, three groups did not differ in their pragmatic abilities in the speech act function of request prior to the treatment (F=2.131, df=2, p=0.126).

Table 1: Descriptive Statistics Results of the DCT Pretest Scores by Group

Rating Components		Groups		
		Control (N=30)	In-Classroom (N=23)	CMC (N=29)
Speech act	Mean	46.00	45.70	48.45
	SD	5.92	5.65	4.63
Expressions	Mean	42.74	44.09	45.79
	SD	5.77	4.70	3.89
Information	Mean	45.28	46.45	47.00
	SD	5.58	4.72	4.53
Politeness	Mean	44.83	47.09	48.07
	SD	5.76	4.65	5.32

After treatments, the group comparison of the DCT posttest scores was conducted. The descriptive statistics results indicated that there existed greater discrepancy among the group means. The performances of the experimental in-classroom group and the experimental CMC group were better (surpassing from 2.7 points to 7.4 points) than those of the control group in each of the four rating elements (See Table 2).

Table 2: Descriptive Statistics Results of the DCT Posttest Scores by Group

Rating Components		Groups		
		Control (N=30)	In-Classroom (N=23)	CMC (N=29)
Speech act	Mean	45.07	48.32	52.45
	SD	4.43	4.83	4.44
Expressions	Mean	40.52	45.82	47.66
	SD	5.00	4.60	4.52
Information	Mean	45.11	47.82	50.10
	SD	3.69	5.01	4.24
Politeness	Mean	45.19	48.73	50.83
	SD	4.39	5.49	4.55

The repeated measures MANOVA results further showed that there was a significant difference among three groups on the four means of the DCT posttest (F=16.35, df=2, p<.05). The results of Tukey Honestly Significant Difference (HSD) Post Hoc test informed that the experimental in-classroom group and the experimental CMC group both scored significantly higher than the control group on the DCT posttest; whereas, the students in the experimental CMC group performed as well as those students who were in the experimental in-classroom group. Moreover, an interaction effect of the group by the four rating elements of the DCT posttest was found to be significant (F=2.93, df=6, p=0.009).

Figure 1 demonstrated the scores on expression yielded by three groups were significantly lower than the scores of other components (speech act, information, and politeness). The students in the experimental CMC group scored higher in the four rating components than the experimental in-classroom group, though difference was not significant. The control group produced significantly lower scores in all four rating components when compared to the two experimental groups. The experimental CMC group was found to have the highest mean scores on the speech act rating component, revealing their superior ability to use correct speech act than other elements necessary to make appropriate requests.

Figure 1. The interaction effect of the group by the four rating elements of the DCT posttest

After ten week conventional pragmatic instruction, the experimental in-classroom group showed significant improvement in their DCT productions. Overall, the experimental in-classroom group generated significantly higher scores on the DCT posttest than the DCT pretest (F=11.156, df=3, p<.05); the means for each rating component on the DCT posttest demonstrated an apparent increase, ranging from 1.37 to 2.62 points (See Table 3).

Table 3: Descriptive Statistics Results of DCT Pretest and Posttest Scores for the Experimental In-Classroom Group

Rating components	Tests	Mean Scores	Standard Deviation
Speech act	pretest	45.70	5.65
	posttest	48.32	4.83
Expressions	pretest	44.09	4.70
	posttest	45.82	4.61
Information	pretest	46.45	4.72
	posttest	47.82	5.01
Politeness	pretest	47.09	4.65
	posttest	48.73	5.49

Furthermore, as Figure 2 showed the scores on expression yielded by the experimental in-classroom group remained the lowest scores whether on the DCT pretest or posttest. The experimental in-classroom group was found to have the highest mean scores on the politeness rating component; that is, participants tended to show diverse levels of politeness while making requests. Meanwhile, the mean scores on the speech act rating component displayed the greatest improvement from the DCT pretest to the DCT posttest ($M_{DCT\ pretest}$=45.70, $SD_{DCT\ pretest}$=5.65; $M_{DCT\ posttest}$=48.32, $SD_{DCT\ posttest}$=4.83). Other than that, the mean scores on expressions, the amount of information, and levels of politeness also fairly improved after the treatment.

Figure 2. The DCT pretest and posttest scores by the four rating elements for the experimental in-classroom group

On the other hand, with ten week telecommunication connection to the Texan tutors, the experimental CMC group learned pragmatics through e-mail and WebCT discussion. The repeated measures MANOVA results showed a significant improvement of DCT productions for the experimental CMC group. Overall, the participants in the experimental CMC group generated significantly higher scores on the DCT posttest than the DCT pretest ($F=47.897$, $df=3$, $p<.05$); the means for each rating component on the DCT posttest increased ranging from 1.87 to 4 points.

Compared with the performances in the DCT pretest, the experimental CMC group produced significantly higher scores ($p<.05$) on the DCT posttest in terms of four rating components. The mean scores on speech act displayed the greatest improvement from the DCT pretest to the DCT posttest ($M_{DCT\ pretest}=48.45$, $SD_{DCT\ pretest}=4.63$; $M_{DCT\ posttest}=52.45$, $SD_{DCT\ posttest}=4.45$) (See Figure 3). Other than that, the mean scores of the amount of information, levels of politeness, and expressions also fairly improved after the treatment.

Figure 3. The DCT pretest and posttest scores by the four rating elements for the experimental CMC group

Students' Perception s of Learning Pragmatics On-line

Students from the experimental CMC group mostly expressed that the explicit pragmatic instruction indeed helped them gain more knowledge in English pragmatics. Compared to the content presented in the conventional English reading or writing textbooks, the content of this pragmatic instruction was more practical and useful for their daily communication. For example, one student stated that he did not know the accurate meaning of "You rock" until his Texan tutor explained it to him. "You rock" in the United States meant "You are so cool", and this student was pleased to learn more daily idiomatic expression in certain situations from his tutor. Another student also mentioned that he was strongly aware of the differences between Chinese and English pragmatics from communicating with his Texan tutor, and he regarded this learning experience as a valuable one because he hardly had the opportunity to interact with foreigners.

Another student shared that the pragmatic instruction was beneficial to her for it helped her to make appropriate requests in the airport while traveling aboard. This student looked forward to learning more content with higher level of difficulty and more in depth because she thought the learning of pragmatics was quite useful and important.

After ten weeks treatment, students in the experimental CMC group addressed that they enjoyed learning pragmatics by presenting examples for them in the first place, and then until they completely understood the content, they could use more examples to strengthen the concepts.

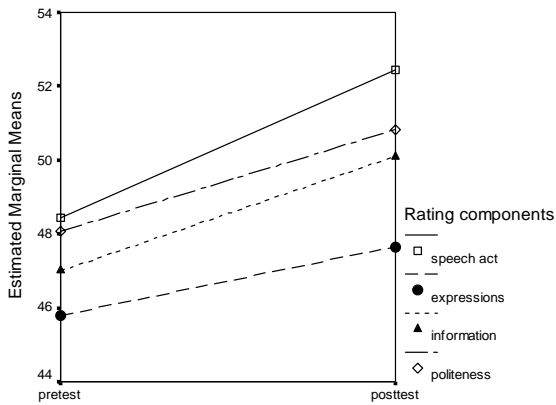Nevertheless, more than half of the students in the experimental CMC group responded that some English words and phrases used by their Texan tutors were not readily understandable; they had difficulty figuring out the meanings of certain messages. Several students in the experimental CMC group expected their Texan tutors to be more patient and affectionate.

Students also reflected that the content of pragmatic instruction could be more situational, more animated with graphs, sounds, or short movies. A majority of students thought that the design of the content in the homework needed to be improved. The classroom instructor or Texan tutors should avoid posting similar and ambiguous questions every week, which bored the Taiwanese participants.

One student pointed out that he felt frustrated, and exhausted when asked to write and type short formal essays independently per week, which was more like taking a formal serious English composition class. It was hoped that the content could be displayed from the easier level to progressively go up to the difficult level.

Even so, most participants in the experimental CMC group were aware of the importance of pragmatics, and they realized that English was not as difficult as they thought before. They felt this learning experience was challenging, but interesting. It helped them gain more knowledge regarding Western people's thinking patterns and writing styles. In addition, they also felt more comfortable when they used English to perform requests in contexts.

Educational Significance

We found the pedagogical intervention had a positive impact on Taiwanese EFL learners' development of pragmatic competence from this study. With the appropriate classroom management and the Internet access of computers, the students in the experimental in-classroom group and the experimental CMC group had the opportunity to engage themselves in the process of learning pragmatics.

Additionally, computers functioned as "cognitive tools" for the experimental CMC group students to reflect, refine, and assess their structural knowledge. The findings of this study urge educators to integrate technology in helping Taiwanese EFL learners build up expertise in how to use English language appropriately, so that they can develop the ability to comprehend and generate productive communicative acts.

It was apparent that the Taiwanese EFL learners did not naturally think and write in English. Accordingly, the Taiwanese students required more time to process the English textual information and to respond in English. If they were given more time on tasks, they might feel less concerned and threaten, and became more responsible for their own learning.

Taiwanese EFL learners indeed need additional activities that can broaden their knowledge of pragmatics, and provide a broader variety of models and opportunities for them to supplement classroom setting of learning. We concluded that more complementary activities for EFL learners should be included in classroom settings, so that they can be given the opportunity to gain pragmatic knowledge. When pragmatics is explicitly taught to second language learners, they can acquire the essential skills faster (Bouton, 1994; Eslami-Rasekh, 2004).

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Different Does Not Mean Wrong:
Using Video To Help Pre-service Teachers Understand Diverse Families

Melissa Mohammed
Eleanor Ennis
Salisbury University

Background

One of the most cited predictions about public schools is that the diversity of K-12 student populations will greatly increase (Sadker and Sadker, 2004). The school system most closely associated with Salisbury University is the Wicomico County Public School System, and according to the community's daily newspaper, the Latino Population in Wicomico County increased 200 percent in the decade ending in 2000 (Gates, 2005; Carmen, 2003). A related prediction is that the teachers of these students will continue to be much less diverse than their charges. If these predictions come true, the possibility of miscommunication between student families and teacher is higher.

To avoid miscommunication, positive communicative skills should be taught and practiced at the pre-service level. These communication skill are needed in the local region since our pre-service teachers tend to not come from the constituent base of multicultural education, but from more privileged groups (Boyle-Baise, 2002). Even when the pre-service teachers are people of color, they may have "limited direct experience with groups other than their own, or perceive poverty from afar" (Boyle-Baise, 2002, p.16). As educators at a regional university that graduates a large number of teachers, we wanted to address this area of need. We felt that the message that "different does not mean wrong" could become a mantra for our students as they entered the workforce. We also hoped this saying would emerge in practice as our more homogeneous students went out to serve the more diverse communities.

One way to promote better assistance of homogenous professionals to diverse constituencies is through a community-building project such as service learning. The case for service learning is a strong one, because it combines several factors that can lead to student success. First, students read and make preparations to do work in a non-university setting; then, they test out these ideas by actually meeting with and performing a service for persons in the non-university setting. Finally, students reflect upon various aspects of what they did and learned. One definition delineates the service learning process as "a credit-bearing educational experience in which students participate in an organized activity that meets identified community needs and reflects on the service activity in such a way as to gain further understanding of the course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility" (Cameron, Forsyth, Green, Lu, McGirr, Owens, and Stoltz, 2001).

These are appreciable goals given the need for the involvement of pre-service teachers in the various ways that fulfill the newer professional development schools model. The professional development school model requires much more collaboration between the university faculty and the school faculty than the older field service model did. As a result, the relationship between the two groups is "more complex and intertwined" than before, with the resulting culture "transform[ing] both institutions and the personnel within each" (Book, 1996). Key within this new culture is a resulting increase in student learning. The scope of this project was limited to undergraduate students.

Methods

This faculty development project was developed specifically for teachers of undergraduate pre-service teachers. It began during a Summer Institute for Preparing Tomorrow's Teachers to Use Technology (PT$_3$). Institute participants consisted of university faculty members. During the week-long institute, the two authors and an arts and sciences faculty member created a project called, "Diversity in technology: Different does not mean wrong". A group consisting of a Computers in Education instructor, an elementary mathematics teacher and Math Methods instructor, and an assistant professor of English, piloted this activity in the following fall.

Initially, each course instructor developed at least one activity for the project. Students in the English generated the literature excerpts that were used for analyses in the Computers in Education and in the Math Methods classes. The Computers in Education students interviewed parents and prepared videos of the interviews that were shared with the Math Methods class. The Math Methods class engaged in role-playing through interviews and wrote reflections of their interviews. Computers in Education and Math Methods classes also took a survey to measure their attitudes about families from diverse backgrounds before and after the intervention. The goals of each course instructor and more specific information about their activities follow.

The goal for English class was to have student groups research and collect literary excerpts from children's books and young adult novels written by women writers of color. The excerpts had to depict some aspect of a teacher/multicultural student relationship. Each group had to find a novel suitable for middle-school students and/or young adults that had been written by an ethnic writer who was not on the class syllabus. The groups were required to find biographical information on the writer, provide a list of primary works written by the writer and secondary works written about the writer, and distribute relevant excerpts from the novels that demonstrated some aspect of the teacher /ethnic student interactions. For each ethnic group studied, two different groups presented their findings in class and were responsible for sending the findings through e-mail to the Computers in Education instructor.

The goal for the Computers in Education class was to have pre-service teachers examine how to use technology to improve the impact of teacher conferences for multicultural students. Moreover, the instructor wanted students to learn how to use a technology designed to increase empathetic capacity. Students worked with a partner to interview and videotape -- if permission was granted -- a family that represents a facet of the diverse community in which the university student would be teaching. The elementary school students of the families chosen were in a program for limited English proficiency (LEP). Finally, the college students wrote a reflection about the process and the end project they created. Digital video still pictures from one project are included. In this sample the students' primary footage was damaged but they recovered very well by summarizing what they had learned in a one-minute digital video.

These videos were shown to the Math Methods students. The goal for the Math Methods class was to help pre-service teachers understand the historical perspective of diversity in mathematics class and the classroom in general while increasing the students' abilities to use online telecommunication tools. For example, students found the PT3 section on the online course site (WebCT) and read at least three of the literature selections about student/teacher interactions. The pre-service teachers then chose one of the selections and wrote a reflection about the reading that considered the following perspectives: the student's problem or situation and how the teacher reacted to the child's problem. These reflections were posted on WebCT under the appropriate selection so other pre-service teachers could read and respond to their thoughts. As an alternative final, Math Methods students conducted mock interviews; one pre-service teacher acted the role of the teacher, and another played the role of the multicultural parent in a teacher/parent conference.

With pre-service teachers being present in each of these classes, the instructors hoped the university students would learn from opportunity to communicate and learn about the needs of multicultural students and their parents. The instructors also had the chance to use the multiple technologies of electronic mail, online course management, and digital video for teaching about the diversity of families.

Results

The DDNMW project included a pre and post survey to measure student's perceptions about LEP students in their classrooms, and this data was collected through WebCT.

On both the pre and post survey 100% of the students expected to have LEP students in their classrooms. In the beginning, only 65% felt prepared to teach LEP students and while the other 35% felt if they cared enough about their students they would be able to reach them academically.

Improvement in recognizing strategies that are helpful for LEP students' academic progress was evident in the post surveys. All of these scores were improved from the pre surveys. These scores are displayed in the table below.

Table 1. Strategies That Help LEP Students Academically	
Strategy	% of University Students Answering Correctly on Post Survey
Cooperative Learning is not recommended to help non-white students learn. (F)	100%
In spite of limited fluency with English, assessing LEP student's learning with student interviews is recommended. (T)	91%
In many non-white cultures storytelling is better than discovery for approaching new math concepts. (T)	65%
Speed of performance is more important in the white culture than non-white cultures. (T)	53%
Strategies that help LEP students will also help all students. (T)	97%

The survey also showed that university students are aware that:
- math is not a universal language and LEP students need extra support
- students outside the mainstream culture of white America do not have the same opportunities to use computers
- it is important for teachers to include contributions from all cultures even if there are no diverse students in the class

not all Asian students are naturally good in mathematics.

In addition to pre and post survey information collected from Computers in Education and in the Math Methods classes through WebCT, evidence of student learning could be seen in comments written in reflections. Here are some samples:

From Computers in Education

I believe that the students and parents could grow and learn together in a way that I have never experienced.

From Mathematics Methods for Elementary and Middle School Teachers

[What I used to think about parent-teacher conferences is that they were] TO INFORM PARENTS ABOUT STUDENT PROGRESS AND POSSIBLY DISCIPLINE PROBLEMS, [but now I realize] these conferences can also be valuable tools in learning more about the students and their families, cultures, and lifestyles…

[What I used to think about parent-teacher conferences is] THE SAME, but now I realize that each conference is unique and there must be a good deal of preparation by the teacher before each conference in order for the conference to go well.

[What I used to think about parent-teacher conferences is that they were A REASON TO BE DEFENSIVE], but now I realize that the teacher and the parents make a great team and should be comfortable working together to better understand the child' successes and strengths as well as challenges.

These students also made suggestions for professional development schools with high numbers of students from families where English is not the first language:
- Have the teacher and student go to the back of room to personalize lesson
- Ask PTA to sponsor an English as a Second Language night, where communication problems are addressed

Some suggestions were also made by the videotaped families:
- Hold classes to teach English for the parents (from the parent directly)
- Have children attend these meetings with their parents (from the interviewing student host)
- Use notebook communication when speaking ability is poor (from the parent directly)

Conclusion

The reasons for teaching future teachers more about communication with diverse groups are admirable, plentiful, and sometimes difficult to explain to the university students. However, linking their work with a useful purpose helped us meet the goal of increasing this type of communication.

Problems that we encountered are the same that other collaborative projects have faced: impracticality of university students in different classes meeting face-to-face required an online solution (Greer and Hamill, 2003). However, the ability to collaborate will enhance the skill of pre-service teachers to meet the needs of diverse families.

While this study is not generalizable, it does contain many positive starting points for other teacher educators to consider.

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User Support Design to Provide a Chance to Learn

Momoko Nakatani
Masaru Miyamoto
Shunichi Yonemura
Human Interaction Procejct
NTT Cyber Solutions Laboratories
1-1Hikarinooka Yokosuka-Shi Kanagawa,
239-0847, Japan

Introduction

As a result of the increase in the popularity of Internet services, computers have been adopted by many people. Many of the novices, such as stay-at-home moms, often enjoy net-surfing and exchanging e-mail with their friends. However, they tend to use only a few simple functions and draw on other family members to perform more complicated tasks, such as changing settings or troubleshooting. The computer manufacturers and Internet service providers(ISP) have tried to make detailed manuals suitable for novices, but such manuals are seldom used. This characteristic of novices was pointed out by Nojima in 1992 for a particular network software. He gave an account of why novices failed to actively learn a new function; the presence of experts around them made it unnecessary for them to learn.

The problem of with novice users is, however, increasing because of their number and the emergence of complicated technical devices. It is extremely difficult to find experts who can fix the troubles of novices on a continual basis. ISP call-centers are forced to deal with hundreds of calls from such novices everyday.

For example, when a novice wants to change her e-mail address, or to set-up an Internet connection in a new PC, she may not be able to do it without help because the original setting was done by some other person. Also, if the novice is viewing a web page in the offline mode and clicks a hyper-link in it, she'll not understand the alert, "This page cannot be displayed offline", and will immediately ask others for help. These troubles occur because novices don't have any experience of solving problems by themselves. If they did, they would have gradually acquired knowledge about the functions and mechanisms of the computer. For example, if they acquired knowledge, such as 'accessing a hyper-link requires that the browser be in the on-line mode', they would be able to understand the 'off-line' alert.

If novices had a better understanding of computers, they would not have to waste time asking others to solve trivial troubles or bothering the experts. Moreover, they would be able to use more of the advanced functions provided by modern computers.

Therefore, the purpose of this study is to support novices in troubleshooting and changing settings by themselves.

Trouble-Based-Learning

Now, let's consider why novices keep on relying on others rather than helping themselves. Carroll insisted that learning stagnation occurs when the novice prioritizes his immediate task over the acquisition of knowledge (Carroll, 1987). The computer is seen as just a tool to achieve the immediate task and the novice fails to recognize that additional knowledge would be useful in solving any problems that may occur. Tsunoda, on the other hand, noted that novices don't learn due to not only the novices themselves, but also their environment (Tsunoda et al.,1990) which is similar to the assertion of Nojima (1992). He interviewed some word-processor users about common usage patterns and where they learned about its functions. He found that people are not always active learners; the incidents of accidental learning are significant. He suggested that if we provide novices with an environment in which to learn, their passivity might change.

This study builds on prior work and provides novices with an environment in which they can learn from a trouble when they access the call-center of the ISP; we determine if they change their attitude and adopt a more active learning stance. The users are encourage to learn from a trouble by introspection and acquiring deeper knowledge; we call this "trouble-based-learning". PC study courses are based on a prepared curriculum. Our approach is based on learning in response to troubles, so a curriculum may need to be created for each trouble. Trouble-based-learning is expected to enhance the user's experiential and introspective learning. Moreover, they may have more motivation to learn after experiencing some trouble compared to the usual curriculum-based PC lessons. In the next section, I will introduce the current call-center approach, and how we can realize trouble-based

learning in a call-center.

Utilizing The Call-Center For Trouble-Based-Learning

Our approach uses the ISP call-center to realize trouble-based-learning, because novices have many troubles early on with Internet connections. The ISP call-center receives many calls from novices who simply want to browse web pages and send e-mail. This situation limits the content which must be developed for trouble-based-learning.

Looking at the call-center of a typical ISP, we find that the customer and the operator take distinctly different roles. The operator gives the user only simple concrete procedures such as 'where to click' and 'what to input'. The user just executes the action provided by the agent. This approach is intended to finish the call quickly. We can liken the operator to the brain, whereas the user is the operator's eyes and ears in that she reports the state to the operator, and also, the operator's hand, since the user executes the operator's instructions (Fig1). In this process, the logic underlying the action is not explained to the user, so she cannot understand what she is doing or why she is doing it. While this approach minimizes the time spent by the operator, the lack of effective learning by the user means that the call center will eventually receive many more calls. It may also increase user anxiety, and it might reinforce the user in taking the procedure-based approach; they try to remember each operation as a set procedure whose applicability is limited to the immediate problem. As a result, they panic when faced with unexpected troubles, and frequently end up asking similar questions again and again.

Operator is the brain.   User is the eye, ear, and hand of the operator.

Figure1. Current call-center Approach

To establish trouble-based-learning in the call-center, we extend the call-center support to give the user additional explanation about the system and the procedure. The additional explanation can be given orally or through e-mail or fax. We visualize the procedure and the mechanism of the Internet, which we believe will trigger self-reflection with regard to the trouble.

We conducted two initial experiments as will be introduced in the following section.

Experiment 1

Method

This experiment observed the changes in how novices tackled an Internet connection problem with and without trouble-based-learning. Its purpose was to investigate practical problems in trouble-based learning. We divided 20 women (ages 20-50) into two equal groups: TS(=Test subject) and CS(=Control Subject). The situation was verbally explained to the subjects; "Assume that this is your own house. A family member has altered web browser setting so that browsing is no longer possible."

The experiment proceeded as follows:

1. Subjects were told to find and rectify the setting error. An electronic instruction manual was provided for the subject to access for self-troubleshooting. The subject was allowed to call the call-center if needed.

2. The call-center operator solved the problem across the phone. For each CS, the operator simply told them "what to do" to solve the problem. Each TS, on the other hand, was additionally told "how" to tackle similar problems at the end of the call.

Each subject performed 4 trials and the problem in each trial was slightly different; in two of the trials the trouble was with an IP-phone, and in the other two the trouble was that a webpage could not be seen. After all the trials, we carried out interviews to collect some subjective evaluations. We also compared how long each subject

tried to fix the problem before calling the call-center (trial time).

Result

TS	Satisfied (8)	Because the problem was solved smoothly(4) Because the operator told me "why"(2). Because the operator told me slowly and carefully.(2)
	Unsatisfied (2)	Because I'm tired of listening to the repetitions of the explanations.(1) Because I couldn't fully understand what the operator told me.(1)
CS	Satisfied (7)	Because the problem was solved smoothly.(5) Because the operator told me slowly and carefully.(1) NA(1)
	Unsatisfied (3)	Because I just followed the instruction by the operator and couldn't understand the reason for the operation.(2) Because the communication with the operator wasn't long enough.(1)

Table 1. Answers to the question asking whether the subject was satisfied with the support or not, and why.

Table 1 shows the answers to the question "Were you satisfied with the support provided or not". The numbers in the parentheses indicate the number of subjects. It shows that most of the subjects in CS and TS were satisfied with the support provided. We can say that most users feel a certain amount of satisfaction if the problem is solved. Some of the subjects were concerned about the "kindness offered" or the "speed" of the solution. A distinctive trend for the TS was that "understanding" was one of the reasons for the satisfaction. This satisfaction included excitement and happiness due to discovery such as "(subject A) The explanation of the mechanism made me feel an affinity with the system though I wasn't interested in it before", or "(subject B) I ignored the structure of the Internet up to now, but I learned about it for the first time. I feel that I have gained a little more knowledge!".

In response to the interview responses, we focused on the change in the attitude of the subjects who stated that their satisfaction was due to "understanding".

In the first trial, subject A immediately called the call-center when she faced a trivial trouble; she couldn't find an icon indicated in the manual in the chapter "DNS setting". However, the operational error was not in the setting operation, but the setting of the proxy. In the second trial, she couldn't log the modem in and immediately called the call-center again. She was unable to execute a particular operation indicated in the manual again; the error she had to rectify involved the wiring of the LAN cable. In the 3rd and the 4th trial, however, she tried to tackle the problem even she couldn't follow the particular page in the manual; she turned to other pages in the manual, and tried other operations she had not tried before. For the last trial, she even search for the "windows control panel", which is not described in the manual. Although she couldn't achieve the goal by herself in both trials, she tried for more than 10 minutes to tackle the problem, whereas she only tried 2.5 minutes in the first trial, and 8 minutes in the second.

Subject B in the first trial first checked the cable wiring, and then, tried to log the modem in. After a moment, she called the call-center because she wasn't able to log the modem in. In the second trial, she couldn't find an icon indicated in the manual, the same as the first trial of subject A. In the 3rd and the 4th trials, however, she changed the strategy to find the error. She searched widely in the manual first to figure out where the problem was and what to try. As a result, she successfully found the appropriate page in the manual, and could exactly solve the problem by herself. In the 4th trial, she chose the wrong page in the manual, and stuck at executing what was written in the manual. However, although she noticed that she could not follow the manual, she didn't give up, and searched for the other page in the manual, found the appropriate page, and succeeded in rectifying the error by herself. Subjects A and B advanced their skill and their attitude seems to have changed through the trials. This trend was duplicated by other subjects who stated that "understanding" yielded satisfaction.

The subjects who were unsatisfied, on the other hand, didn't show such change. For example, subject C who stated "I am tired of listening to the explanation", called the call-center even faster in the 4th trial than in the 1st trial. This result shows that even if we provide the same information, the attitude of the novices might not be the same. The key to their attitude may be the feeling of satisfaction that comes from understanding.

Figure2. Transition of the trial time

Next, to elucidate the overall trends in CS and TS, we measured the length of time spent before they called the call-center. Figure2 shows the proportion of the length of each trial to the length in the first trial. As we can see from the figure, the length of the TS members varied in the trials. The subjects who felt happiness due to an increase in understanding had long lengths, while the lengths of most of the subjects who were not satisfied with the support decreased. On the other hand, all CS members showed a uniform decrease in length. The motivation of the CS members to conduct troubleshooting seemed to decrease as the experiment progressed.

The CS members experienced the current call-center support which makes the user operate without understanding the meaning of the operation, and we can say that this support would lead to a stronger reliance on others. It's to be noted that it is not clear whether the user really understood the meaning of the operator's explanation or not (TS), but the "feeling of understanding" may lead the user to the next step.

Experiment2

Operating a computer without knowing what they are doing is said to induce cognitive anxiety (Kaiho, 1991). We assume that to correct the novice's attitude, we must provide an environment where the user can eliminate these feelings of anxiety. The subjects who stated that their satisfaction was due to an increase in "understanding" in the first experiment, may cast aside their anxieties which leads to a change in attitude.

The second experiment focused on how trouble-based learning impacted the user's anxiety and motivation in tackling problems.

Method

Another 20 women (ages 42-57) were divided into two equal groups: TS and CS. We adopted the IP-TV phone as the material and the subjects who were novice computer users and who had never used IP-TV phone before to make the experiment condition uniform. Four trials, each with a slightly different problem, were conducted by each subject. The experiment proceeded as follows:

1.Setup phase: The call-center helped the subject to setup an IP-TV phone over another phone. Each TS was told of the system mechanism together with the meaning of each step of the procedure at the end of the call. Each CS, on the other hand, received no additional explanation.

2.Troubleshooting phase: The subject was told to find and rectify an operation error (voice output was muted) made by a family member. An electronic instruction manual was provided for the subject to access for self-troubleshooting. The subject was allowed to call the call-center if needed.

3.Second troubleshooting phase: Basically the same setting as the first troubleshooting phase, except that the trouble was that both speech and video output were blocked.

To investigate motivation, we asked 44 questions that fell into 3 groups, computer anxiety, confidence in

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using IP-TV phones, and interest in IP-TV phones, at the beginning and at the end of the experiment. Also, a question was asked to determine whether the subjects felt difficulty in using IP-TVphones or not.

Results

Figure3. Answers to computer anxieties, self-efficacy, interest in using and setting

The results show that for most subjects in both groups, computer anxiety fell, confidence in using IP-TV phones increased, and as did interest in IP-TV phones (Fig3). This suggests that repeated troubleshooting increases the user's motivation regardless of any additional explanation that may be provided for most of the subjects.

This result seems to be inconsistent with the previous experiment, but a more detailed examination of the results included the interesting suggestion.

(1)Computer-Anxiety

Answers to 1 item differed significantly(p<0.01);ambiguous computer anxiety (e.g. "I stay away from computers as I am afraid of them") was reduced for CS members. For TS members, the 3 items that differed significantly indicated that more concrete anxieties (e.g. "I feel difficulty in understanding the technical aspect") involving technical hurdles were diminished.

(2) Confidence in using IP-TV phone

For CS members, 4 items differed significantly before and after the experiment: all the items suggest an unwarranted increase in confidence (e.g. "I can use an IP-TV phone without any help"). For TS, on the other hand, 6 items differed significantly (p<0.05 for 5 items, p<0.01 for 1 item), all indicating a valid increase in confidence in a limited technical situation(e.g. "I can use an IP-TV phone if I have a manual").

(3) Interest in IP-TV phone

For CS, one item: "I want to be able to setup an IP-TV phone by myself", increased significantly (p<0.05) due to the experiment. For TS, one item:" I want to develop a new way to use an IP-TV phone", increased significantly (p<0.05).

Looking at the above mentioned 3 results, we can extract a strikingly similar tendency: the TS group experienced a reduction in concrete anxiety about technical matters and an increase in confidence in specific technical situations unlike the CS group. CS members, on the other hand, experienced a reduction in vague anxiety and an increase in confidence but in an ambiguous way.

We assume that if a vague anxiety (such as I am afraid of computers) can be changed to a more concrete anxiety (I want to be able to set the browser) that can be resolved, the subject gains more confidence in her own ability. We believe that this would lead to enhanced motivation and more over, further exploration.

In addition to the above result, the TS members felt less difficulty in using IP-TVphones (p<0.01), unlike the CS members. This reduction of the feeling of difficulty, which is related to the understanding of the system, may lead to effect the above mentioned change in the feelings of TS members.

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However, we think that these suggestions should be confirmed in subsequent experiments. The feeling of anxiety is not so simple, so we assume that we will have to observe each subject in more detail for a longer span and precisely identify the actual changes in their feeling.

Conclusions And Future Work

Addressing the theme of upgrading the skill of novices includes two factors, giving knowledge and a strategy to the novice and eliminating their anxieties to enhance their motivation. Although these two goals are both too large to be solved in a single step, our idea is to use the trouble-based-learning approach as the first step to achieving them. From the experiments described in this study, the following results were extracted.

The members who experienced the current support turned more quickly to the call center as the trial progressed. The changes in time spent by the members who experienced trouble-based-learning, on the other hand, tended to vary more widely.

The differences in their actions involved the feeling of satisfaction which comes from understanding. The members who experienced trouble-based-learning seemed to have a reduction in concrete technical anxieties. Also, they felt less difficulty in using the device.

These results confirm Tsunoda's statement that providing an environment that supports learning can trigger a positive change in the user's attitude. Also, giving the novice a feeling of understanding and eliminating their anxiety about "not knowing what is what", may be the keys to avoid learning stagnation. However, much remains to be investigated. We must clearly verify the relation between "motivation(anxieties)" and "understanding" in more detailed experiments as there is a significant variation in the anxieties and how they change.

We used questionnaires, interviews, and trial times as evaluation metrics in this study, but we must identify more accurate indicators, or create experiments that enable us to evaluate emotions or attitudes more easily. There are also problems about transferring these results into the field: the subjects had no choice in the system examined or the timing of problem solving. Therefore, we will investigate the attitudes of actual users' in the field. We are planning the following two approaches:

Implement our approach in an actual call-center and investigate the overall trend in user attitudes. Observe each novice's anxieties and their skill transition carefully, and make qualitative analyses. Through these approaches, we hope to make the trouble-based-learning approach suitable for every user.

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The Interplay Between Instructor Beliefs about "Best Practices" in Teaching and Actual Practices in Online Learning: A Case Study in Higher Education

Bessie Nkonge
North Carolina A&T State University

Introduction

The focus of this paper is to describe the relationship between instructor beliefs about "best practices" in teaching and their actual practices in the online learning environment. This report is a subset of a larger study conducted in an institution of higher education to explore online instructor pedagogical perceptions, beliefs and practices.

Literature on cognition and behavior suggests that people tend to behave in ways that are consistent with or support their beliefs. From this research, it may be assumed that instructors do not engage in classroom practices that contradict their beliefs about how best to teach. However, the nature of online learning may challenge them to modify and adopt new teaching philosophies that are more aligned with that environment. Furthermore, the discrepancy between beliefs and actual practices may be attributed to the instructors' ability to use the technology effectively, or the perceived capacity of the technology-mediated environment to support some of the instructor beliefs about "best practices".

Rationale for the Study

Most studies on distance learning environments are grounded in students' perceptions and attitudes (Freitas, Myers, & Avtgis, 1998; Hara & Kling, 2002; Powers & Mitchell, 1997), technologies (Saba, 1999; Smith & Dillon, 1999), and fiscal matters (Berg, 2000; Feenberg, 1999; Olcott & Owston, 1997). Other studies examined teacher beliefs in the K-12 settings (Ertmer, Addison, Lane, Ros, & Woods, 1999; Windschitl & Sahl, 2002). As a fairly new and evolving field of research, Web-based instruction has many issues yet to be explored especially relating to instructors. Although it is well known that teachers' beliefs influence the way they teach (Cuban, 1993; Fullan, 1991; Loucks-Horseley & Steigelbauer, 1991), less attention has been given to the way teachers' beliefs apply to their actual practices in the online environment.

Research Questions

The following questions guided this study:
1. What are faculty beliefs about "best practices" in teaching?
2. What are the patterns of pedagogical practice among faculty in Web-based instruction?
3. What is the degree of congruency between faculty beliefs about teaching, and their actual teaching practices in Web-based instruction?

Review of the Literature

Gess-Newsome (1999) and Pajares (1992), confirmed that beliefs more than subject matter knowledge, are preeminent indicators of instructor classroom behavior. Similarly, Cuban (1993, p.256) noted that the knowledge, beliefs, and attitudes that teachers have . . . shape what they choose to do in their classrooms and explain the core of instructional practices that have endured over time. Teachers' educational beliefs are strong indicators of their planning, instructional decisions, and classroom practices (Clark & Peterson, 1985; Pajares, 1992). Munby (as cited in Czerniak, Lumpe, Haney, & Beck, 1999) also articulated that "teachers' beliefs and principles are contextually significant in the implementation of innovations . . ." (p. 28). However, although beliefs and ideas influence the adoption of innovations, positive beliefs do not necessarily result in changes being manifested. In addition, teacher beliefs are not always consistent with the literature about "best practices" in teaching (Czerniak et al., 1999). If beliefs that an individual holds are largely subjective, they require constant reexamination from time to time in light of new developments, in order to remain relevant in the context in which they are applied or practiced.

Pedagogical practices in higher education have tended to converge around a single dominant shape—the teacher-centered mode. Teaching is generally conducted using institutionalized social practices that essentially follow a certain tradition (Jaffee, 2003). According to Scott (1995), such institutional practices "have less to do with the proven effectiveness of the particular practice than the desire to appear legitimate or conform to normative expectations" (as cited in Jaffee, 2003, p. 6). However, teachers' pedagogical philosophies and practices are not necessarily static. Although patterns of teaching practices can persist for decades (Cuban, 1993), the climate in which teachers practice sometimes encourages or forces teachers to modify their teaching styles and what they

believe to be "best practices" in teaching (Becker & Ravitz, 1999).

In a study on technology adoption, in which exemplary practices in the field were considered, Lan (2001) stated:

Although accessing the Web is relatively easy, learning to harness its full potential is not so simple. Integrating technology into the classroom requires a clear vision and identifiable goals. For faculty to share the vision and goals, they must perceive the vision and goals to be relevant to their discipline and profession, valuable to their practice, and reasonable to pursue. In addition, incentives such as technical and pedagogical support must be present to sustain the faculty culture of innovation. (p. 393)

In higher education institutions with limited resources, the rapid expansion of Web-based teaching may have created a pedagogical challenge with more questions than answers. To teach in the evolving environment, instructors are struggling with issues of designing Web-based courses for different learners; redefining their role in the design, development, and implementation of online instruction as well as identifying the most effective teaching and learning strategies using different technologies. The nature of online instruction forces instructors to undergo personal transformations. Research indicates that instructors undergo changes in their philosophy and approach to teaching as a result of their participation in delivering Web-based courses (Brown, Cremer, & Frank, as cited in Jaffee, 2003). Teaching online requires that instructors reflect more on their practice. In their quest to become more effective online instructors, some of the instructors' beliefs and/or practices may change. Besides the rigor of redesigning their courses for the online environment, instructors have to rethink some, if not all, of the teaching strategies that they employed in the traditional classroom. Both teacher and student roles have to be carefully reexamined and refined for the virtual environment. The transition may take time, as some may struggle with the traditional 'sage-on the-stage' style of teaching, while at the same time trying to master the use of new technologies. The challenge, therefore, is how to incorporate active learning tasks including discussions, assignment exercises, and group projects that draw students into the learning process.

As a lens for evaluating learning in general, higher education institutions have adopted the "Seven Principles of Good Practice in Undergraduate Education" originally published in the AAHE Bulletin (Chickering & Gamson, 1987). New communication and information technologies have been developed since, and are reflected in the article "Implementing the Seven Principles: Technology as Lever" by Chickering and Ehrmann (1996), who revisited the "Seven Principles" and highlighted some of the most appropriate ways to use computing technologies to advance higher education.

As is the case with the traditional classroom, the online classroom imposes constraints on certain teaching practices such as frequency of communication, assignments, online chats, and grading. The instructors' pedagogical beliefs influence the learning outcomes to the degree that they are incorporated into the teaching practices.

Methodology

Following Yin's (2003) case study methodology, data relating instructor pedagogical beliefs about "best practices" and actual practices were gathered and analyzed.

The research was conducted in a medium-sized institution of higher education and involved eight instructors teaching fully online classes. The instructors' backgrounds were diverse in terms of online teaching experiences and academic disciplines. Data were gathered through semi-structured interviews, class 'observations' and analysis of course artifacts such as syllabi, lecture notes, assignments and discussion threads. The researcher compiled reflective notes, which were used to support the effort of triangulation by either corroborating or refuting the evidence from different data sources, thereby strengthening the study. The use of multiple sources of evidence promoted the development of converging lines of inquiry (Yin, 2003). The data gathered provided support for the research questions guiding this study.

Results and Discussion

Beliefs about "Best Practices" The following common characteristics emerged among instructor beliefs about "best practices":

Communication – Continuous instructor–learner interaction is important in online learning to close the "distance" in distance learning while providing the necessary support. Learning should also include cooperation among learners to further minimize isolation, and to build a community with a sense of belongingness both socially and intellectually.

Constructivism – Student-centered learning approaches are critical in online learning, coupled with active learning strategies to keep students motivated and connected to the class.

Upholding high standards – Instructors should assign work that is both challenging and requires high-level cognitive skills. They should also communicate and model high standards for the course. Learners should be

encouraged to submit quality work, and be granted multiple opportunities to practice to acquire subject matter mastery.

Assigning authentic projects – Learners become more engaged in the learning process if they are working on meaningful projects. Furthermore, when interesting projects are assigned, learners put more effort and energy to succeed in the course. Assignments should include hands-on activities, simulations, and problem solving tasks.

Flexibility and Structure – Some instructors believe that flexibility is an essential option in distance learning and should, as far as possible be incorporated in the learning process. Structure should be provided for learners who need it, and is also necessary to advance learning from one unit to the next. Learners should be given opportunities to be creative and design their projects or other assignments as long as the work was tied to course objectives.

Prompt feedback – As a subset of communication, the instructor should provide timely feedback and show interest in learners' progress. The strategy reduces anxiety about the course and allows learners to gauge their skills at each step.

Teamwork – Viewed as a critical skill for today's workplace, online learning should involve group projects in which collaboration and cooperation are encouraged and rewarded.

Relationship Between Beliefs and Actual Practices Of the eight participants, six of them demonstrated a high degree of congruency between their beliefs about "best practices," and actual practices. In considering the theoretical framework of constructivism as the underpinning theory for effective teaching and learning, it appears that all the participants incorporated constructivist practices in their classes but in different ways. The general tenet of constructivism revolves around "knowledge construction" through such things as active engagement of the learners in producing meaningful artifacts that have relevance to them, problem solving, and support for divergent thinking. The learner is also the focus of the educational process.

A closer scrutiny of the levels of congruency across all cases revealed that one participant (Brenda), was perhaps the most congruent in her beliefs and practices. Although she did not define herself as a constructivist, she believed in student-centered individualized instruction, assigning work that required reflective thinking, and granting students multiple opportunities to produce acceptable work through practice, all of which confirm a constructivist teaching style. She viewed technology as "enhancing" and supporting the ideal practices that she had always believed were best suited for teaching in her discipline. As she summed it: "I do consider myself lucky in that I was able to line up what I do with a medium that has allowed me to do it, I think, better, more effectively."

Another participant, Morgan, who labeled herself as both constructivist and behaviorist, and viewed her practices as largely dependent on the environment in which she works, was more like Brenda in terms of the congruency between her beliefs and actual practices in teaching. She was realistic about the composition of a typical class where diversity in learners is the norm rather than the exception. To that end, she adopted teaching practices that were both constructivist and behaviorist depending on the approach that best suited individual learners. Her actual classroom practices were very much in line with what she set out to accomplish, allowing students to choose projects that interested them, encouraging interactivity and cooperation, urging students to question their views in threaded discussions, and providing structure and close guidance to those who needed it. Morgan viewed teaching as very complex with no easy answers. The lens through which she assessed her beliefs and practices led her to conduct her classes in ways that were aligned with her fundamental beliefs about the importance of understanding the context where learning would take place. Although Morgan stated that she did not abandon her beliefs, she was well aware that at times, her beliefs and practices were in conflict primarily because, occasionally, she had to alter her practices in order to accommodate her students' needs. For example, she felt that there are too many unrealistic standards in the education curriculum that stifle rather than inspire excellence. Her students, who are mainly full-time teachers, were not given time off from work to attend classes. They were always pressed for time, and had little room to practice what they learned. Instructors also do not often have the time to reflect on how they are teaching. As Morgan stated, "You can have your own set of beliefs (philosophy), but the world in which you operate makes a great difference in the way you actually practice." It would therefore be unreasonable to judge this incongruity negatively.

A common thread among Allen, Lauren, and Sally is that they viewed themselves as having undergone a transition from behaviorism to constructivism. As with all other participants they incorporated constructivist practices such as hands-on activities where artifacts were produced, involved students in problem solving and knowledge exploration beyond the textbook. The participants' emphasis on structure, particularly Lauren and Sally, appeared to contradict their constructivist philosophy, but in essence, it did not. Structure was necessary to move the class along, and gives some learners a roadmap of how to proceed in the course. These individuals had no inclination to venture beyond the syllabus or take advantage of the flexible options available to them to accomplish

course objectives. Other constructivists such as Morgan, Walter, Victor and Sam enforced structure when necessary for similar reasons.

Sam and Walter both believed that delivering quality education was the guiding factor in their online courses. Although neither one of them defined themselves as constructivists, their teaching practices proved otherwise. It appears that they incorporated more extensive constructivist activities in their classes than did Allen, Lauren or Sally who fervently described themselves as constructivists. They created a truly challenging and engaging environment for their students where many student-centered activities were incorporated. These included: (a) field trips, (b) simulations, (c) on-site work experiences, (d) hands-on activities to create artifacts, (e) guest speakers in the virtual chatroom, (f) multimedia presentations, and (g) collaborative projects. The activities accentuated Sam and Walter's commitment to students' learning through exposure to a variety of experiences and resources for building knowledge. Apart from some difficulties relating to downloading information or navigating the course due to design flaws, the guiding principle of delivering quality education was upheld in Sam and Walter's classes.

The research also revealed that instructors do not always practice what they say. An analysis of course artifacts showed that incongruity existed between the stated beliefs and classroom practices. In most instances, the instructors were not aware of the discrepancies between their beliefs and actual practices. Some instructors, however, consciously modified their actual practices to adapt more readily to the learners' needs, although their basic beliefs dictated otherwise. Their classroom practices were not only influenced by their beliefs, but also by the unique qualities relating to their disciplines, the learners, as well as the overall "ecology" of the online learning environment.

Lauren, perhaps, appears more incongruent in her beliefs and practices than either Sally or Allen. She spoke passionately about the importance of group interactivity but in reality, did not assign any collaborative work. She also spoke about her belief in understanding students' prior knowledge in order "to get them from where they are to where you want them to be in the content." However, there were no instances of background knowledge probes prior to introducing new materials or discussion topics (see Tables 1 and 2 for samples of congruency and incongruity between beliefs and practices).

Allen did not participate in the online discussions as he purported to do. In addition, he failed to honor some of his own protocols such as providing feedback and direction for the discussions. The learners never engaged in mutual discourse at any time, as they only responded directly to instructor-posted topics. All formal dialogue aimed at encouraging learner-learner interaction and knowledge exchange never materialized. Moreover, there was an absence of intervention by the instructor to correct the problem.

Some of the inconsistencies between beliefs and actual practices can be explained by instructors' limited awareness of the capabilities of the technologies available. For example, Sam believed in assigning group projects and collaboration among students, yet he failed to utilize the 'Groups Management feature in the Course Management system which would have facilitated the process. Thus, a major component of his teaching was not as successful as he had wanted it to be.

Victor stands out as the only participant who neither rated the congruency between his beliefs and practices highly nor defined himself as a constructivist. However, following in the footsteps of the other participants, he did adopt constructivist practices such as problem solving, engaging students in authentic projects and personalized assignments. It was evident that there was a conflict between what Victor wanted to accomplish and ultimately what he was able to in his classes. He attributes this to the following: (a) limitations in his own technical skills, (b) the time he was willing to devote to designing ideal courses, and (c) the current capabilities of available technology. One of his disillusionments with online learning is the inability to replicate real-life experiences especially in technical disciplines. Based on these subjective observations, Victor concluded that some of his perceptions of "best practices" were currently not fully actualized in practice. By his own assessment, the level of congruency between his beliefs and practices was therefore realistically only 75%.

Table 1: Sample Elements of Congruency Between Instructor Beliefs and Practices

Element	Example
Student-centered	"I think a good teacher - in my area, … would need to be prepared to meet student where he or she is…"
	"This is good information! I need for you to polish this essay and to answer the questions that I have inserted in the text of your essay regarding ---. Do this and resubmit the assignment on (date) for a grade." (Brenda)
Problem solving	"I tell them where the breakdown has occurred and invite them to go ahead and find what is wrong . . ." (Brenda)
Active learning	"In your opinion, of the educational philosophies presented in this chapter, which one best represents your educational philosophy and why?" (threaded discussion topic – Allen
Encourage communication	"I was hoping other students would have replied to Candice's post by now. I chimed in only because I want to make sure y'all have the information you need to get your work done on time. …I encourage you to …build personal relationship with each other. However, don't forget that you need to post 20 'meaningful/quality' posts…" (Lauren
Encourage creativity	"Pick one visual situation with good potential for interpretation…It should however, appeal to you in either a positive or negative way (so it can lead you to write at least 200 words about it)." (Morgan)
Prompt feedback	"For those who sent and posted information early, your evaluations have been posted in the gradebook. For the remainder of the class, posting for Unit 3 will be as usual on the Tuesday following the close of the Unit" (Sally)
Quality work	"It should be understood that this course requires extensive work and input from each student… It is expected that the requirements for this course must be done to graduate level quality." (Walter)

Table 2: Sample Elements of Incongruity Between Instructor Beliefs and Practices

Element	Example
Interactivity in discussions	Allen described threaded discussions as opportunities for interactivity where students critiqued each other's work. In reality, the students only directed their responses to the main topic, and failed to react to each other's threads. Allen did not participate at all in the discussions nor direct the students to engage in discourse.
Assigning group work	Lauren talked at length about the importance of collaborative work, how she supports group activities in her courses, and how the virtual learning environment makes it convenient for students to work together. However, no formal group activities were incorporated in her online course, but students interacted in other ways.
Upholding high standards	Although Sam was very keen on academic soundness of his courses, the quality of the design did not match the high standards that he otherwise tried to uphold. The comments that he posted regularly indicated that students had difficulties following the course layout and navigating through the

	materials. Sam's own reference to "high standards" was not related to the course design, but the discrepancy between the design and the content that he wanted to convey was well worth noting.
Role as a teacher/communication	Unlike many of the participants, Sally did not view her role as that of a facilitator, but a dominant, controlling authority on the conduct of her online classes. Although she diligently worked on the quality of online discussions, she was only a passive participant in them, with only an occasional intervention to recognize outstanding work. Students essentially took over the control and direction of the discussions, thus nullifying the importance of instructor involvement all aspects of the class activities.
Blank slate theory	Lauren stated, "I don't believe in that blank slate theory. Students come in with experiences. You need to connect with those experiences to get them from where they are to where you want them to be in the content." However, there was no evidence of conducting background knowledge probes prior to introducing new materials or discussion topics.

The underlying justification given by the instructors for the degree of congruency between their beliefs about "best practices" and actual practices was that their beliefs essentially guided their teaching behaviors in the classroom. Some of the instructors stated that they needed to model their beliefs by aligning them closely with their practices. Others described undergoing an evolution in their beliefs and/or practices as they matured as instructors. For most, their beliefs shaped their practices but for others their practices shaped their beliefs. Some instructors viewed technology as essentially supporting changes in their teaching practices that were already aligned with their beliefs. They viewed technology as an asset, offering learners greater opportunities for communication, collaboration, cooperation, and increased time on task. Some of the instructors who preferred teaching in the traditional classroom recognized the advantages afforded by the online technologies including the innovative and meaningful alternatives that supported their teaching practices.

Conclusion

Beliefs remain the best way to predict instructor classroom practices and may lead to discovery of discrepancies between what instructors say they do and what they actually do. Instructor dissatisfaction with online learning environments could well be attributed to the lack of perceived congruency between beliefs and practices. Since instructors wish to accomplish no less in the distance learning courses than in the traditional courses, it is important for institutions to understand whether pedagogical ideals are being realized in the technology-driven learning environment. The necessary steps can then be taken to bridge the gap between teaching ideals and actual practices.

Research in this area is useful for bringing desirable changes in instructional practices or beliefs, and for promoting more cohesion between beliefs about "best practices" and actual practices where desired. The subject of pedagogical beliefs and their relationships to teaching practices in the online environment have not been thoroughly addressed in the context of higher education.

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The new global knowledge society and the ICT implementation in K-12 schools

Eunhee J. O'Neill
University of Virginia

Internationally, many people recognize the concepts of e-learning, information and communication technology (ICT) and of the global knowledge society. Scholars have discussed ICT implementation in education. However, few teachers, school administrators or policy makers fully understand the relevance of such concepts in light of the global knowledge society that we live in, and that will continue to develop, so that they fail to realize the urgent need of ICT implementation in schools. Some of them dispute whether or not the use of ICT meets two main educational functions: satisfying people's intellectual desires and preparing individuals to participate in society. A review of relevant literature and an investigation of international comparative studies of the utilization of technology in both schools and society will elucidate the need for a proactive approach to the use of technology in education. In addition, basic ideas regarding how to play a role in integrating ICT effectively will be introduced.

Introduction

We know that *education and research* play an ever-increasing role *in economic growth*. The capacity for renewal is crucial. In order to realize Sweden's potential for growth, we need to enhance our ability to generate *knowledge* and to translate it into sustainable growth and new jobs. (The Ministry of Industry, Employment and Communications & The ministry of Education, 2004)

The Swedish government released the white paper, *Innovative Sweden: a strategy of growth through renewal* in 2004. It is not difficult to see that Sweden emphasizes the relationship between education and the country's economy. Also, it is clear that economic growth, for Sweden, is based on the ability to produce knowledge. Sweden is but one example among many. The European Council (2000) set a 10 year target to become the most competitive and dynamic knowledge-based economy in the world and placed education firmly at the top of the political agenda in order to meet this challenge. At this point, we cannot help but question how knowledge can be the foundation of the economy and why the role of education is more important than it ever was before.

Traditionally, technology has been considered an important factor in a country's economic growth. With his five stages of economic growth, Rostow (1960) demonstrated that technology would play a role in helping a society to reach the stage of economic maturity. However, Rostow also emphasized that other factors such as history, culture, and the active political process have interplayed with each other to determine the specific content of the stages of growth for each society. For instance, when it comes to the economic success of South Korea, Sorensen (1994) discussed the historical, philosophical, cultural, and political elements relating the educational power and economic success of Korea. Thus, it is also difficult to internationally compare the potentials of economic development of different nations through only a single aspect.

While acknowledging the importance of these various factors, this paper will not specifically discuss all the factors that indicate the quality of a nation's educational system, all of which significantly affect its economic prosperity. Instead, this paper will specifically elucidate why we should focus on implementing technology in education for the sake of a nation's development by clarifying first, the characteristics of our society, both the society of today and that of the future, and second, the meaning of E-learning, and finally, the relationship between them. Making use of international comparative studies in terms of E-learning readiness and ICT implementation in K-12 schools, this discussion will culminate in a suggestion of the importance of the roles of core stakeholders, defined as schoolteachers, school administrators, and policy makers. Finally, this paper will address the idea that the emphasis on education is not simply for the benefit of the economic growth of the nation, but for the self-actualization of the individual, as well.

The So-Called New Global Economy

In order to begin a discussion of today's society, current technology should be described. Most countries refer to their most essential and prevalent technology as *Information and Communication Technology (ICT)*. ICT refers to all kinds of computing technologies allowing people to gain almost limitless information and knowledge and to communicate with each other through Internet access. ICT is "a key phrase which indicates the dynamism that can be achieved through the convergence of computing and telecommunications. Putting the 'C' in the middle of the IT is important in emphasizing that it is not just about 'techie' matters but is relevant to everyone whose job involves

communication. ICT makes the fast and worldwide exchange of information possible, and has the capacity to revolutionize work processes, service delivery, etc." (www.flexibility.co.uk/helpful/glossary.htm).

Since communication is the core function of human life, most segments of society need ICT, which enables people to have prompt access to information and to easily share it with a wide range of people. This is one feature of today's society and economy, which is information-oriented and requires effective communication. Whether an economy will be prosperous or not is up to the efficient utilization of technologies allowing immediate and appropriate information communication. The core technology for these needs is the Internet. In addition, rapidly spreading wireless mobile PC and cellular phones accelerate connections to the Internet. These phenomena have changed the nature of the world's economy, bringing forth what will henceforth be called the "*New Global Economy*" (ADB, 2003).

In the new global economy, the characteristics of goods are different from those of traditional goods. The London School of Economics and Political Science (LSE) indicated that it is necessary, in defining such characteristics, to be aware of the peculiarities of *information-based products* and the different ways the virtual market and the physical market operate. "Commonly, knowledge-based digital products never run out and can be used repetitively" (2000, cited in Nanclared 2001). Therefore, the sources of higher productivity increasingly rely on knowledge and information applied to production, which is shifted from material goods. Firms' competitiveness and productivity are also dependent on the quality of information and the efficiency of attaining it. The organization of production is changing from a mass, standardized model toward flexible, customized production, and from vertically integrated large organizations to horizontal networks of economic units which participate in different stages of the manufacture of a specific product under the interdependent relationship with other countries (ADB, 2003).

In the new global economy and society, which is characterized by knowledge and information-based productivity, the quality of digital access as a medium for new product delivery is the key issue in achieving social prosperity. Education functions to provide a better quality of digital access, and this is making people pay attention to education's significance in our new society; this is important because the education sector is too-often overlooked. The International Telecommunication Union (ITU) reported the New Digital Access Index, the World's First Global ICT Ranking, in 2002. The results of the index suggest that it is time to redefine ICT access potential. Michael Minges of the Market, Economics and Finance Unit at ITU says:

Until now, limited infrastructure has often been regarded as the main barrier to bridging the digital divide. Our research, however, suggests that affordability and *education* are equally important factors. (Emphasis mine)

So far, it is clear that the productivity of the new society is based on *knowledge and information,* and the prosperity of the *society* is mainly related to the potential of *ICT access*. In addition, the emphasis on *education* is becoming more significant as one of the important factors in improving ICT access in a society. At this point, educators should pay attention to how education can work in this relationship that exists between the new knowledge-based society, technology (ICT), and schools (the education sector).

The Relationship between the New Society, Technology, & School

Kozma (2000) described, "applications of ICT are making dramatic changes in economic and social development around the world. These changes go beyond a mere increase in the number of computers appearing in workplaces, homes, and schools to more fundamental changes in the foundations of economic growth and its relationship to human capital. These tectonic economic and social changes have been characterized by terms such as *'knowledge economy'* and *'learning society*,' conveying the notion that knowledge and learning are now at the core of economic productivity and social development." These terms imply a new conception of the relationship between knowledge and society—creation of knowledge and information is the most important factor underlying economic and social improvement (OEDC, 1999; Kozma, 2000).

Education deals with knowledge, and learning occurs through education. Considering ICT is a primary pillar of the knowledge-based economy and a major key to future economic performance of nations (OECD, 1999), there is no question that role of ICT in schools is vital. Traditionally, schools have used computing technology only as instructional aids in teaching particular subject curricula, such as CAI(computer assisted instruction).. An additional example of traditional technology use in the classroom would be students using computers for writing electronic papers as an alternative to hand writing them. However, ICT is used to produce knowledge by connecting students with infinite points of information and knowledge through performing investigations and problem solving, and by connecting them with other people across miles and cultures. Thus, ICT becomes the basis of enabling students to successfully participate in the knowledge economy and learning society (Kozma, 2000).

According to the new concepts, *knowledge economy* and *learning society*, a new trend in education, E-learning, is decidedly appealing to many countries as a new form of learning which utilizes ICT. E-learning is considered to be a core system of lifelong learning and economic promise. Defining lifelong learning as beyond

formal schooling and encompassing learning throughout the lifecycle, World Bank (2003) asserted that opportunities for learning throughout one's lifetime are vital in order for countries to be competitive in the global knowledge economy which relies on the use of ideas and the application of ICT. The European Commission (2003) also indicated that "e-learning is increasingly seen as a useful tool for achieving better access to lifelong learning and education for all."

E-learning is characterized by formal and informal education and by information-sharing that uses digital technology. It has substantially increased the opportunities of education (EIU, 2003). Individuals ranging from kindergarten students to older adults use E-learning for their formal or informal education. Also, the range of E-learning usages are almost limitless; that is, E-learning truly becomes integrated into people's lives. Thus, preparing students for lifelong learning is significant in terms of providing them with quality lives in the new society of the 21st century (OECD, 2000; Kozma, 2003).

Suppose an example of a Korean family who uses the E-learning system as a core way of living with ICT digital access. The father, who is 40 years old and has a master's degree from law school, consults customers through his internet homepage. Well-known for his prompt and courteous answers to all questions, the website is always busy with customers. Because his knowledge of the law is so proficient, it attracts many customers who willingly pay membership fees to use the web site.

His wife enjoys interior design and is learning how to make decorative frames at home. The on-line instructor demonstrates the methods through internet video conferencing systems. When the wife wants to ask a question or to check if she is following the lecture correctly, she simply clicks her web camera button and shows her work to the instructor in order to receive feedback. The reason that she chose the interior design web institute is that its sites provide members with various services in addition to the lectures; for example, providing friends' clubs, holding face-to-face region by region meetings, offering video-lecture review services, and offering many classes throughout the week so that she can take a class anytime she chooses.

Her oldest son came home from his regular middle school earlier and sat down in front of his computer in order to "attend" class via the Internet with other students from all over the world. Today, he plans to do a presentation in an American high school class. In the last class, one of his international colleagues brought up some cultural issues and asked that students in each country prepare an assignment which would address the cultural characteristics of the students' respective countries. After concluding his presentation, he is delighted to see his friends from other countries clapping to honor his presentation. This young man always studies hard because he wants to enroll in one of the famous American virtual universities in the future.

His younger 10-year old sister is busy outside. She is doing group activities with her classmates. The group members are scattered all over the region where ponds are present. Their homework is to investigate the quality of water in ponds around their neighborhoods and to collect pictures of various kinds of fishes and plants in the ponds. To do this, each member uses his or her own PDA—personal digital assistants—and records and beams the data to each other to communicate. After this stage is completed, they are to upload their final assignment to the class homepage on the Internet. The teacher will check their homework 3 hours later from home.

When dinnertime comes, the family sits together and starts talking about what they have done today. The daughter wants to be excused early because her pen-pal from New Zealand will connect to her PDA messenger very soon. The pen-pal was introduced to her through her private institute teacher. Her class is partnered with a class from a New Zealand school so that they can communicate by e-mail or on-line chatting for the purpose of practicing English. From the New Zealand school friends' perspective, the arrangement is beneficial because they want to know about their Korean friends' life styles, hobbies and so on. Her mother also likes the institute's service first, since the price is not very expensive and second, because the daughter is now speaking English very fluently.

After finishing dinner, the father says good-bye to his family since he has been joining them via the Internet from Japan where he is conducting a business trip. He turns off the camera on his laptop and his family turns off the big TV screen connected to Internet.

The above story shows how E-learning embraces both informal and formal forms of education as a life-long learning system, how information and communication technology (ICT) works for this system, and how knowledge and information functions in the knowledge economy and the information society. Moreover, this story describes that an E-learning environment using ICT fulfills individuals' desires for learning as well as for working successfully within a society. This is the significant difference between past technology and the current ICT in schools and its current and future effects on society.

In other words, the new knowledge-based global society requires innovative technology such as ICT, and E-learning, which makes use of ICT, occurs both in school and out of school. To participate in this new type of learning, individuals need to acquire new ICT skills, and these skills allow individuals to access knowledge. That is, individuals' ICT skills satisfy their needs for "knowing" as well as provide opportunities for "occupation." As

shown in the story, the methods of E-learning, vary from working alone, with a group, with individuals in other countries, and so on (Moeng, 2004; Kozma et al, 1999). Eventually, both knowledge and skills work towards the individual's self-actualization—a realization of one's full potential as a human being (Maslow, 1954). At the same time, knowledge and skills also allow for the individual's contribution to the prosperity of a society. One significant reason why schools should actively implement ICT is that it allows schools to perform both sides of the academic coin by equally studying academic knowledge and providing training for occupational skills – not only one or the other.

Therefore, when it comes to ICT implementation in schools, teachers, school administrators, and policy makers should keep in mind the important functions and roles of ICT in education. They also should understand the particularities of the new society, and then actively foster the appropriate environments for the students' learning and participating in their future society. To do this it is necessary to check the current situation of ICT implementation and investigate those exemplary countries successfully practicing its implementation.

The current issues and international comparative studies

Many developed countries, which need to remain competitive in the global economy, seem to realize the different roles of education in the new society. To meet the educational needs for the new economy, many countries invest more money into education. Copper (2004) says that "the role of education, and that of educators, has become a leading political and economic issue in nearly all developed countries." The rationale for continuously increasing educational spending is rooted in the evolutionary nature of economic systems. In addressing politicians' arguments against continuous educational spending, Copper also emphasizes governments' roles in fine tuning their educational systems to ensure a prosperous economy.

It is inevitable that educational investment would become an important issue, due to the rapid evolution of technology and the needs of technology implementation in education. It would be beneficial to analyze quantitative data showing the amount of money of educational investments and the outcomes produced from them. However, this paper will not deal with a numerical analysis because of the difficulties in obtaining such data and in analyzing economic records. Furthermore, it can be assumed that the outcome of educational investment is almost impossible to measure over a short period since the nature of educational funds are about human capital which is difficult to express in numbers.

Therefore, alternatively, this paper will explore the current trends of international practices regarding where different countries focus methodologically to prepare their nations for the new global society; what factors are most effective to establish the current system of education (E-learning); and how the school reformations of ICT usage are being carried out in different countries. Firstly, to observe the status of ICT utilization in different nations, E-learning readiness rankings from the Economist Intelligence Unit (EIU, 2003) will be addressed. Secondly, to get some sense of innovative countries' strategies for ICT utilization, the main characteristics of how three leading countries in E-learning readiness from Europe, America, and Asia perform ICT implementation will be provided. And lastly, some implications for teachers, school administrators, policy makers, and governments will be provided by introducing the findings from a report on the Second Information Technology in Education (SITES), "Technology, Innovation, and Educational Change", conducted by the International Association for the Evaluation of Educational Achievement (IEA) and published by the International Society for Technology in Education (ISTE). Through this process, the issue of educational investment and its outcomes will also be discussed in a different way.

E-learning Readiness

The EIU (2003) reported the E-learning Readiness Ranking by assessing four different categories: education, industry, government, society. Each category has four components: connectivity (the quality and extent of Internet infrastructure), capability (a country's ability to deliver and consume E-learning, based on literacy rates, and trends in training and education), content (the quality and pervasiveness of online learning materials) and culture (behaviors, beliefs and institutions that support e-leaning development within a country).

According to the report, E-learning readiness indicates a nation's ability to generate, use and expand Internet-based learning – both informal and formal – at work, at school in government and throughout society. Thus, the E-learning Readiness Rankings will show different countries' different statuses in how they implement ICT in entire sectors, including education. In addition, such rankings can suggest ways of encouraging government to develop E-learning for the advantage of society and the economy (EIU, 2003).

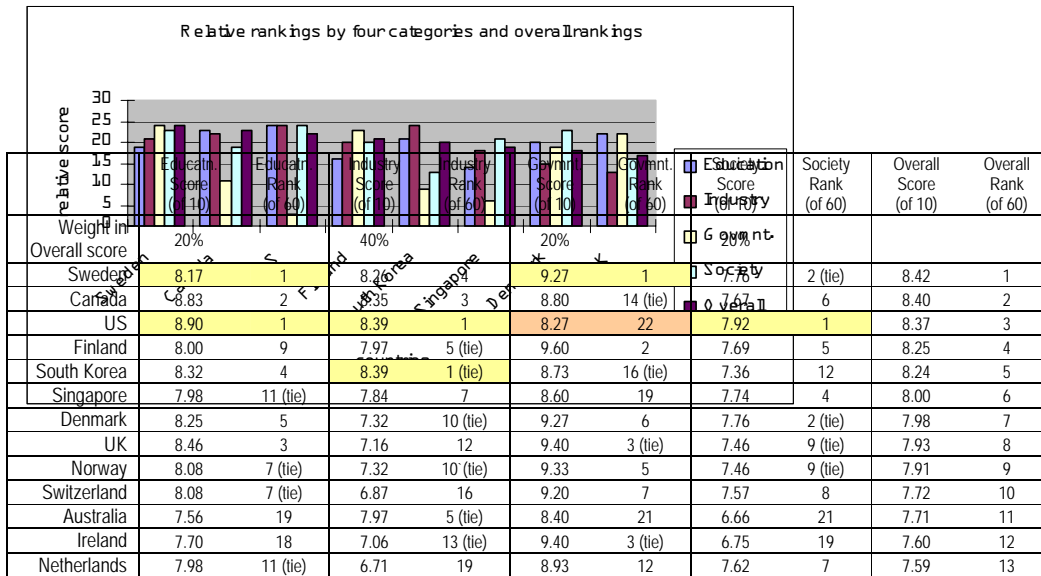| Country	Education Score (of 10)	Education Rank (of 60)	Industry Score (of 10)	Industry Rank (of 60)	Govmnt Score (of 10)	Govmnt Rank (of 60)	Society Score (of 10)	Society Rank (of 60)	Overall Score (of 10)	Overall Rank (of 60)
France	8.00	9	6.81	17 (tie)	9.13	8 (tie)	6.80	18	7.51	14
Austria	7.75	17	6.81	17 (tie)	9.13	8 (tie)	6.96	14	7.49	15
Taiwan	7.92	13	7.52	9	7.53	25 (tie)	6.89	17	7.47	16
Germany	7.80	16	6.48	24	9.07	11	7.44	11	7.45	17
New Zealand	7.83	14	7.55	8	7.53	25 (tie)	6.38	23	7.37	18
Hong Kong	7.17	20	7.06	13 (tie)	8.47	20	6.93	15 (tie)	7.34	19
Belgium	7.83	14	6.26	25 (tie)	8.67	18	6.93	15 (tie)	7.19	20
Italy	6.79	23	6.52	22 (tie)	8.87	13	6.68	20	7.07	21
Spain	6.96	21	6.26	25 (tie)	9.13	8 (tie)	6.31	25	6.98	22
Japan	6.71	24	6.52	22 (tie)	6.60	32	6.33	24	6.53	23
Greece	6.40	26	5.87	28 (tie)	8.80	14 (tie)	5.66	28	6.52	24
Malaysia	6.25	27	6.94	15	7.07	28 (tie)	5.19	32	6.48	25
Israel	6.92	22	5.52	31	6.67	31	7.07	13	6.34	26
Portugal	6.42	25	5.29	32 (tie)	8.73	16 (tie)	5.93	27	6.33	27
Chile	5.77	30	5.29	32 (tie)	7.80	24	6.51	22	6.13	28
Czech Republic	5.28	32	6.65	20	6.40	33 (tie)	5.58	29	6.11	29
Hungary	5.42	31	6.58	21	6.40	33 (tie)	5.50	30	6.09	30

<Table-1> will show overall rankings for 30 out of a pool of 60 different nations. <Graph-1> through <graph-5> will demonstrate the relationship between each of four categories used both for rating individually within these four categories and for the overall ranking. The graphs will show the comparisons between the nations ranked as the top 1st through 8th in E-learning readiness. The purpose of providing these graphs is not to come to certain conclusions, but to understand different countries' strengths and weaknesses in their E-learning environments. In addition, the Y-axis numbers simply refer to the relative scores in order to compare the rankings. The description of categories extracted from the report and summarized will be beneficial in understanding each nation's emphasis on its E-learning system and in helping us decipher what could be the most effective factor in preparing for an E-learning environment.

Comparison with E-learning Readiness Rankings

<Table-1> E-learning readiness rankings, 2003

Comparisons by each category

<Graph-1> All categories with overall rankings

Country	Education Score (of 10)	Education Rank (of 60)	Industry Score (of 10)	Industry Rank (of 60)	Govmnt Score (of 10)	Govmnt Rank (of 60)	Society Score (of 10)	Society Rank (of 60)	Overall Score (of 10)	Overall Rank (of 60)
Weight in Overall score	20%		40%		20%		20%			
Sweden	8.17	1	8.26	4	9.27	1	7.76	2 (tie)	8.42	1
Canada	8.83	2	8.35	3	8.80	14 (tie)	7.67	6	8.40	2
US	8.90	1	8.39	1	8.27	22	7.92	1	8.37	3
Finland	8.00	9	7.97	5 (tie)	9.60	2	7.69	5	8.25	4
South Korea	8.32	4	8.39	1 (tie)	8.73	16 (tie)	7.36	12	8.24	5
Singapore	7.98	11 (tie)	7.84	7	8.60	19	7.74	4	8.00	6
Denmark	8.25	5	7.32	10 (tie)	9.27	6	7.76	2 (tie)	7.98	7
UK	8.46	3	7.16	12	9.40	3 (tie)	7.46	9 (tie)	7.93	8
Norway	8.08	7 (tie)	7.32	10 (tie)	9.33	5	7.46	9 (tie)	7.91	9
Switzerland	8.08	7 (tie)	6.87	16	9.20	7	7.57	8	7.72	10
Australia	7.56	19	7.97	5 (tie)	8.40	21	6.66	21	7.71	11
Ireland	7.70	18	7.06	13 (tie)	9.40	3 (tie)	6.75	19	7.60	12
Netherlands	7.98	11 (tie)	6.71	19	8.93	12	7.62	7	7.59	13

<Graph-2> All categories-weak or strong category of each country

Relative rankings by four categories

Education

    According to EIU's report, the ranking is based upon the following criteria:

- Internet access and usage among teachers and students within a country's education system, from primary school through university level
- Whether the Internet is equally accessible in urban and rural schools, as well as in wealthy and poor communities
- Whether universities commonly offer Internet-based courses and degree programs
- The strength of the educational system as a whole: compulsory schooling years; percentage of GDP spent on education; teachers' payment; and how they are regarded by the community and government

<Graph-3> Relative rankings by education

Relative rankings by education

<Graph-4> Relative rankings by industry

Industry

According to EIU's report, the ranking is based upon the following criteria:

Relative rankings by industry

- Internet access and usage within each economy's major sectors: tertiary (services), secondary (manufacturing), primary (agriculture and mining) and governmental
- Whether the Internet is exploited across each of these sectors, among small and large organizations alike, to reach customers, enhance internal processes and train staff.
- Among the questions we asked: how do companies regard online degrees when selecting employees? Are employees enthusiastic about Internet-based training programs?
- The E-learning industry itself, assessing the ease with which an E-learning company can set up and provide services within a country's regulatory regime

<Graph-5> Relative rankings by government

Government
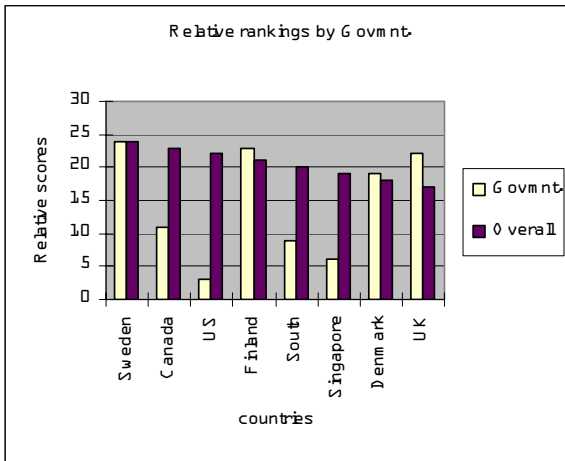
According to EIU's report, the ranking is based upon the following criteria:

- Its attitude towards the Internet and E-learning within its own agencies, within the public education system and within society at large
- Whether local and national branches of government offer user-friendly online services that the general population embraces
- Whether online training is common among civil servants at all levels
- Whether the government, and the education ministry in particular, supports the development of E-learning programs in public schools and universities

<Graph-6> Relative rankings by society

Society

According to EIU's report, the ranking is based upon the following criteria:

- The population's access to and use of the Internet
- Its attitude towards education in general and E-learning in particular
- Whether people have ready Internet access, supported by a high penetration of PCs, mobile phones, low-cost fixed-line and broadband connections
- The population's level of education: Are children encouraged to go as far as possible in their educational pursuits? How do a country's test scores compare internationally? Do people use the Internet to take courses for work, education or personal interest that they might otherwise not have taken?

Innovative countries' typical attitudes and their respective strategies

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Sweden (Europe) "Under the leadership of a working group comprising representatives of the Ministry of Industry, Employment and Communications, the Ministry of Education and Science and the Ministry of Foreign Affairs, and in cooperation with other relevant ministries, Sweden promotes the long-term growth of a knowledge-based economy" (http://www.sweden.gov.se/content/1/c6/03/25/51/29e722a9.pdf).

Canada (North America) "Canadians are people who innovate, people who create ideas, and people who implement those ideas. Invocation and learning are crucial to a high standard of living for Canadians. The National Summit on Innovation and Learning engages with the private sector, the volunteer sector, educational institutions, unions, and other levels of government and individuals…. Clearly, the Summit will be a milestone event in this long-term strategy, where Canada will be moving from verification and refinement of the challenges facing the North American nation to building the foundation for a national action plan that will guide their growth for the next decade" (http://innovation.gc.ca/gol/innovation/site.nsf/en/in02168.html).

Korea (Asia) "The Korean government possesses a substantial capacity for establishing a knowledge and information society. Such a society will enhance people's quality of life through the effectiveness of its economic and social activities which are to be organized under the umbrella of the country's future information-oriented system…. Understanding that information-oriented education is the foundation for building a knowledge and information society, government, local self-governing bodies, related organizations, public education, information associations and the private sector will systematically take and perform the necessary roles in order to accomplish educational reform and the development of human resources." (MEHRD & KERIS, 2003).

As shown above, these three nations consistently place a strong emphasis on the cooperation between different entities within the national leadership including the governmental sectors related to science, culture, economy, and education. Because of the importance of forging a new information-based society, each of these countries also places an important focus upon cooperating with the private sector in order to achieve its goals. In addition, these countries address long-term strategies for achieving long-term prosperity and strong national futures. Considering that these three countries indicate such factors as "knowledge-based economy," "knowledge and information society," "idea," "learning," "innovation," and "educational reform" in their respective blueprints for achieving national prosperity, in addition to the central role of the national leadership, it is clearly important to prepare the new knowledge-based society with innovative educational systems. At this point, it is essential to discuss how educational stakeholders should react to this change in order to make provisions for the new society. By internationally comparing different countries' ICT implementation strategies, IEA (Kozma, 2003) determined a number of implications for schoolteachers, school administrators, and policy makers.

Implications for teachers, school administrators, and policy makers

IEA conducted the Second Information Technology in Education Study (SITES Module2) on "Technology, Innovation, and Educational Change" with data from 28 participating countries in 1999. A central purpose of the study was to describe and analyze the range of innovative pedagogical practices in participating countries that use ICT (Kozma, 2003). The advantage of an international study is that the findings from other countries may help each nation to determine its status of using ICT in schools and facilitate policy-makers to compare ICT policies and practices in their own countries with those in other countries. Such comparisons might help nations discover new ideas and policies developed in other countries that will help address their own goals, problems, and needs (Kozma et al, 2000). Through the implications of this study's findings provided below (Kozma, 2003, p227~239) the stakeholders related to education—such as teachers, school administrators, and policy makers—will be able to discover relevant and effective methods and should subsequently endeavor to practice the ICT implementation in schools.

Implications for teachers

Teachers can practice and develop several alternative models for using ICT in their classes. The teacher's role in the new student-centered classroom using ICT is guidance ("guide on the side, not sage on the stage"). There are four different possible models: the student collaboration model, the product model, the student research model, and the outside collaboration model. The *student collaboration model* is one way to use ICT by allowing students to work together while using e-mail and productivity tools to search for information. The teacher could prepare the activity by structuring the task and then serve only as an advisor or guide. In the *product model*, teachers collaborate with their colleagues to design materials and their students create products and publish the results of their work by using ICT tools including multimedia. This model stems from the thought that when other components such as product creation are added to the student collaboration model, outcomes are more beneficial. In the *student research*

model, students not only collaborate with peers in their class to search for information, they also conduct research and solve problems. This model requires tasks that are more complex for both teachers and students. Also, teachers need to acquire new pedagogical skills and students should attain ICT skills, problem-solving skills, and collaborative skills. Lastly, the *outside collaboration model* is conducted by providing students with access to outside experts or to students and teachers from schools within one's own nation or outside of the country. Teachers may also use this model to foster inter or cross cultural understanding.

Implications for school administrators

Both policy makers and local administrators need to take innovative practices and level them up so as to impact the entire school or educational system. For the success of an innovation in the educational system, administrative support is essential in terms of both direct support for the innovation and support for innovative teachers. Schools and administrators also need to consider a change in curriculum, since change that utilizes ICT to bridge the boundaries of school subjects is often related with new goals considered to be important to the knowledge-based society with respect to students' acquisition of new skills; such skills include collaboration, communication, and information handling. For the school-wide curriculum change, principal and local policies and plans should play an even more active role. An important function of local policy is to articulate a vision for using ICT in schools and converting these visions into classroom-based actions. Teachers' professional development is another essential factor in achieving successful innovation. Most effectively, teachers learn from each other on the job and the efficient professional development occurs when they can participate in expressing and determining their professional needs. Thus, principals need to formulate policies and practice in the way of reflecting teachers' thoughts. Finally, when planning educators' professional development, it is important to tie new ICT skills and classroom practices to overall school visions.

Implications for state and national policy makers

This study, by examining both national education policy and national ICT policy, found that policy plays an important role in sustaining and transferring school innovations integrating ICT. These national ICT and education policies have often presented a broad vision of the way ICT can function for educational innovation or improve student achievement. Also, national policies and programs provide funds or resources for schools to implement their innovations. However, to see returns on ICT investments that change education, policy makers need to consider the use of ICT in education beyond grand visions and should implement practice-based programs that are more specific. Three channels are identified to provide policy makers with a mechanism that is more effective and concrete to make more noticeable changes in implementing ICT and reforming education.

First, a national curriculum or state standard often has the strongest influence that can encourage teachers to generate new goals regarding the integration of ICT in term of practical use in classrooms. Second, nations should concentrate on the support of policy-focused professional development programs and instructional resources that assist teachers to utilize ICT in their teaching. For the professional development for principals, the central consideration might include the ways of helping them build local visions and a community that is supportive of innovation Third, to see more returns on the ICT investment, assessment should be revised to match with new goals and content, such as information management, problem-solving, communication, and collaboration skills. Also, the effective means of measuring the return should be sought out.

In addition to these three channels – curriculum, teacher professional development and assessment, there needs to be vertical consistency between different levels of the system—from Ministries of Education to local schools—and *horizontal coherence* among national agencies and programs. The highest level should provide a broad and open vision while the goals at local levels should be specified congruently. The vertical gap occurring between those levels will be bridged through a unified message that can be created through coordination between ICT policy and education policy within the ministry or department of education. The coordination may be also required between the ministry of education and the ministries of telecommunications, science, and labor, as well as coordination among programs within these ministries. Finally, policy makers should execute ongoing funding and supportive policies to make continuous innovations and they need to provide infrastructure, resources, and supportive policies to facilitate the innovations' transfer.

<div align="center">

Conclusion

</div>

The nature of society is changing rapidly towards a knowledge-based economy, in which knowledge itself is a product and a primary means for bettering human life. In such a knowledge-based society, both individual success and a nation's prosperity are determined by the capability of utilizing ICT (Information and Communication Technology). In addition, an entire society is more controlled by people who work with ICT and for people who rely

on ICT. Such a society has more diverse and practically boundless sources utilizing the knowledge and communication skills necessary to become prosperous. Due to the proliferation of social change, educational systems are also being transformed into E-learning systems which use ICT, allowing people to achieve and produce more knowledge in both breadth and depth. When it comes to educational functions—helping people to attain knowledge and preparing them to have skills in order to adjust to the larger society, E-learning systems utilizing ICT in education are ideal since E-learning fulfills both the educational goal of knowledge achievement and that of skill acquisition. Therefore, it becomes clear that E-learning systems are essential in the new knowledge-based society both for individuals' success and for social growth. This is why the impact of education is, and needs to be, greatly emphasized today more than ever.

Being aware of the changing natures of society and education, all educational stakeholders (schoolteachers, school administrators, and policy makers) should take active roles to implement ICT in schools, which is critical in order to operate E-learning, the new trend in education. The SITES Module 2 study (Kozma, 2003) suggests how these stakeholders can play effective roles in implementing ICT in schools. Teachers should try to employ ICT in the curriculum with instructionally well-designed teaching models so that students can learn problem-solving, investigation, collaboration, and product development with ICT skills. School administrators should provide teachers with a clear vision for the utilization of ICT and should support the teachers' needs to implement ICT. Lastly, policy makers should plan educational goals using ICT, apply them to schools, support teachers' and administrators' professional development, invest funding into achieving the aforementioned goals, and then assess the process and outcomes of ICT implementation. By analyzing the investment and outcomes according to the educational goals, policy makers will see the effectiveness of their investment so that they will continue to rationally strategize their on-going investment. Over the course of the entire process, it is important to keep congruent and coherent connection of goals between vertically- and horizontally-bridged departments. Through the information from an E-learning Readiness ranking report and international comparisons about leading countries' fundamental strategies in utilizing ICT, this paper also found certain directions toward what could be the most desirable strategies for implementing ICT in schools—the governmental leadership which is highly organized and associated with other organizations

However, I chose not to investigate the differences between ranking results and each country's particularities such as cultural, political, social and historical background. Although the two reports mention that the measurements and analyses from comparative studies considered the differences in many variables between countries, I did not have access to this data and I assume that there would likely be substantial errors when taking into account a foreign country's culture, history, and society. Thus, further research on closer comparisons of ICT implementation regarding each country's historical, social, cultural, and political background will be beneficial in adapting more effective and specific methodologies. Moreover, I assume that there would be different strategies in implementing ICT in developing countries' respective societies and in participating in the global society. While I only considered leading countries' strategies and their school reform, another type of research— one dealing with both developed and developing countries—would suggest more specific strategies according to nations' different characteristics so that we might prevent all countries from trying to imitate the most effective countries' strategies, which would likely be inappropriate for different environments. At the very least, understanding the relationship between a society's background and its effect on the society's policies, would be interesting in and of itself.

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Pre-service Teachers: Development of Perceptions and Skills Pertaining to Technology Integration

Anne T. Ottenbreit-Leftwich
Cindy S. York
Jennifer C. Richardson
Timothy J. Newby
Purdue University

Abstract

Researchers continually explore more effective means for preparing pre-service teachers to integrate technology in their classrooms (Jones, Cunningham, & Stewart, 2005). This study investigates pre-service teacher perceptions of technology integration, as well as the development of their computer and technology integration skills. Through quantitative and qualitative data sources, this study provides suggestions for the design of a more effective preparation curriculum allowing for pre-service teachers to be better prepared for implementing technology in their future classrooms. The results show 96% of the students who participated in the study reported a positive change in technology beliefs due to participation in the course, as well as an increase in technology skills. In addition, the results indicated students were apprehensive, but not reluctant to integrate technology into K-12 classrooms. Their open-ended responses showed their largest concerns related to a lack of resources and time to use technology in the classroom. The implications from this study will be integrated into the course to address concerns and meet the needs of more students.

Purpose

The research team examined an introductory technology integration course for pre-service teachers in an attempt to create a more effective, efficient, and meaningful course for future teachers. The following research questions were investigated:

1. What are students' perceptions of technology integration in the classroom and how has does a pre-service technology integration course contribute to this understanding?
2. What are students' concerns related to technology integration as they consider entering the classroom?
3. What recommendations would students make to instructors of a pre-service technology integration course that can help make the course more meaningful?

Theoretical Framework

Since the advent of the computer and its increased ownership capabilities, technology integration in the schools has become a large interest within K-12 education research. Some researchers still indicate there is no evidence of increased achievement due to the use of technology and computers in K-12 education (Cuban, 2001), however, with the increased use of technology in our society it is necessary to educate our students by teaching them 21st century skills (NCES, 2001; U.S. Department of Education, 2004b). Others argue technology increases achievement in certain areas (Christmann & Badgett, 2003). Computers are becoming commonplace in schools within the United States, with an average of 5:1 student to computer ratio in 2000-2001 (NCES, 2001). Some research shows these computers are not currently being used to their full capacity (Cuban, 2001; Becker & Ravitz, 2001) emphasizing more teacher-centered tasks rather than student-centered learning experiences (Harris, 2005; U.S. Department of Education, 2004a). Technology should be used to enhance learning by using it as an integrated tool in the curriculum to assist students in obtaining, synthesizing, analyzing, and presenting information (U.S. Department of Education, 2004a). Despite a lack of research evidence, in 1998, a survey conducted by Trotter showed 74% of the public and 93% of educators agreed that computers had improved the quality of education, teaching, and learning. In addition, the Department of Education's 2004 National Education Technology Plan states "teachers are transforming what can be done in schools by using technology to access primary sources, exposing students to a variety of perspectives and enhancing students' overall learning experience through multimedia, simulations and interactive software", in addition to tracking student achievement and adjusting instruction to better meet individual needs (p. 5). One of the action plans established by the Department of Education is that all states, districts, and individual schools "improve the preparation of new teachers in the use of technology" and to "ensure that every teacher knows how to use data to personalize instruction" which can be accomplished with technology (p.15).

While the claims of the Department of Education are debatable, researchers have indicated certain conditions and teacher characteristics can provide situations where technology integration is more inclusive and seamless. These can include adequate teacher technical skills, adequate computer access, and a belief that supports meaningful learning in a more constructivist manner (Becker & Ravitz, 2001; York, Ottenbreit-Leftwich, & Ertmer, 2005). Educational technology has been defined by the Association for Educational Communications and Technology (AECT) as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" (The Meanings of Educational Technology, 2004, p.3).

With the integration of technology, the role of a typical classroom begins to change and support a more student-centered approach (Duhaney 2001; Newby, Stepich, Lehman, & Russell 2000). According to Cook and Cook (1998), when learning experiences include more student-centered instruction, they are more likely to retain the information. However, when using technology in these student-centered learning environments, it is important to build in enough scaffolding and resources to guide students, especially those with special needs (Brush & Saye, 2000; Pedersen & Liu, 2003).

The lack of technology implementation could be due in part to teacher education programs, which are not adequately preparing future teachers to use technology in the classroom (Doering, Hughes, & Huffman, 2003; Hughes, 2003; Kleiman, 2004; Stetson & Bagwell, 1999; Strudler & Wetzel, 1999). According to Doering, Hughes, and Huffman (2003), there are very few colleges of education who prepare their graduates to use technology in their teaching.

The United States Department of Education explains the importance of teacher technology training in the 2004 National Education Technology Plan and The Secretary's Fourth Annual Report on Teacher Quality. Within these documents the authors call for action from schools, districts, and most prominently, higher education programs (U.S. Department of Education, 2004a; U.S. Department of Education, 2004b). There have been many organizations which have attempted to aid Universities in the development of more comprehensive programs addressing technology integration. Perhaps the largest funding source is the Preparing Tomorrow's Teachers to Use Technology (PT3) program, which supplied large grants to individual Universities attempting to implement technology integration standards into their teacher education programs. From 1999-2003, PT3 awarded 275 million dollars to 441 teacher training institutions (Brush et al., 2003). The Society for Information Technology and Teacher Education (SITE) developed standards to help guide pre-service programs towards crucial elements necessary to include in order to build the ability to integrate technology into their future classrooms. The standards address pre-service teachers' abilities to gain technology skills, plan and design technology-enhanced learning environments, implement technology into the curriculum and activities, assess and evaluate students and learning activities, continue professional growth with the assistance of technology, and understand the social, ethical, legal, and human issues associated with technology (ISTE, 2000).

In addition, in 1998, SITE prepared a position paper, providing basic principles of technology integration and suggested actions for Universities to consider as they design pre-service technology integration components. The basic principles state technology should be (1) integrated throughout the entirety of the teacher education program, (2) taught in authentic situations and, (3) shown through technology-enhanced learning environments within the actual program. The authors proposed programs accomplish these goals by sharing results from quality technology integration teacher programs, collaborating with K-12 schools with exemplary technology use, working with a national center for technology and teacher education, train faculty to use technology, providing quality models of technology-using K-12 teachers, and contributing funds to the development of quality teacher education technology preparation materials (Thompson, Bull, & Willis, 1998).

Across programs and schools, pre-service teacher technology integration courses have been approached and formatted in different ways (Marra, 2004); whether through large lectures, small computer lab classrooms, or internships, many teacher education programs incorporate some method of technology integration instruction (Snider, 2003). According to a study conducted to discover the current trend of educational technology courses in pre-service teacher education (Tan, del Valle, & Perira, 2004), the approximate average of educational technology course experience was one two-credit hour course in educational technology for pre-service teachers. In addition, a large number (38.4%) of the 240 surveyed institutions did not require an educational technology course for pre-service teachers, while 53.8% of the NCATE accredited teacher education programs required only one educational technology course (Tan, de Valle, & Perira, 2004). However, one potential explanation could be technology is integrated throughout the teacher education program seamlessly and therefore does not require a separate educational technology course.

Bucci (2003) indicated many programs are using independent courses to facilitate technology integration instruction. Through this method, many instructors have used lecturing techniques, discussions, and other strategies

to disseminate technology integration information. The single course approach is common in many universities and colleges in teacher preparation focusing on technology integration. For example, teacher education programs at Western Michigan University, Purdue University, Arizona State University, and Iowa State University focus primarily on the single course approach to technology integration training, although course infusion may also play a role. Other aspects of teacher education programs add to the success of pre-service teachers' abilities to integrate technology into the classroom such as open lab sessions, access to quality resources, student-centered learning, and modeling techniques using technology within university courses (Stetson & Bagwell 1999).

Regardless of approach, technology integration courses are not always as effective in training teachers to use technology as they could be (Moursund & Bielefeldt, 1999). Typical problems associated with using technology in teacher education programs usually include "limited use of technology in teacher education courses, an emphasis on teaching about technology rather than teaching with technology, lack of faculty modeling, insufficient funding and faculty professional development opportunities, and lack of emphasis on technology in students' field experiences" (Schaffer & Richardson, 2004, p. 423-424). One of the most problematic results from many teacher education programs is that pre-service teachers receive a focus mainly on technology skills, as opposed to knowledge of how, why, and when to integrate technology. "Although beginning teachers report wanting to use computers, and have gained adequate technical skills, they typically lack knowledge about how to integrate computers within the more routine tasks of teaching and managing their classrooms" (Ertmer, Conklin, Lewandowski, Osika, Selo, Wignall, 2003, p. 95-96.)

Researchers are continually exploring more effective means in preparing pre-service teachers to integrate technology into their classrooms (Evans & Gunter, 2004; Snider, 2003). Though all courses are established differently, they all have the same end goal – effectively prepare teachers to integrate technology in the classroom. Therefore, this study hopes to determine a more effective preparation curriculum where pre-service teachers will be better prepared to implement technology in their future classrooms. The implications from this study will be integrated in the course to address more concerns and meet the needs of more students.

Study Background

The study was conducted at a large Midwestern university where education students are required to take a two-credit introductory educational technology course. The course consists of a large lecture component for 50 minutes each week, and a small accompanying laboratory (15-29 students per lab, 18 labs total) component for 110 minutes each week. The students within the course (n=429) are primarily education majors (91%), including elementary (39%), secondary (52%), and special education (3%) majors (See Table 1). Within the College of Education, students are separated into Blocks (I-VI) and each education major must complete these Blocks in order. The Blocks include coupled courses in the teacher education program, and incorporate dual-purpose field experiences throughout those block courses. Within each Block, students participate in a new field experience, titled Theory-into-Practice, where pre-service teachers work in classrooms, starting with observations and assisting the teacher (Block I, II, & V), to teaching small lessons (Block III & IV), and eventually lead into their student-teaching experience (Block VI). The introductory educational technology course is labeled as an independent course, which allows students to take the course wherever they have space in their schedule. However, most counselors recommend taking the course freshman year. A majority of the sample consisted of freshman (56%) and sophomores (29%), with a small number of juniors (11%) and seniors (4%). Because very few had entered Block I, a majority of our sample lacked field experience in a K-12 classroom. The research team was comprised of two doctoral students and one assistant professor in the educational technology program at a large Midwestern university. All three had background in K-12 education, and were instructors in the introductory educational technology course. The team worked together to establish the database and collect the data via a secure server maintained by the College of Education. One of the doctoral students and the assistant professor worked together to analyze the data and write up the report.

Table 1 *Majors.*

Major	Frequency	Percent
Art	4	2.5
Agriculture	5	3.1
Consumer Family Sciences	6	3.7
Technology Education	3	1.8
English	14	8.6
Early Childhood	3	1.8

Elementary	61	37.4
Math	12	7.4
Other	10	6.1
Physical Education	15	9.2
Science	5	3.1
Special Education	5	3.1
Spanish	1	.6
Social Studies	15	9.2
Undecided	4	2.5

Method

A mixed-methods design for this exploratory study was conducted to examine what students think about technology integration after completing an introductory course on technology integration for pre-service teachers. The study also investigated how to improve the course to better meet the needs and interests of future students, while adequately preparing them for their role as future teachers. Participants were solicited from a large lecture course as volunteers for evaluating the course. One hundred and sixty-three out of 429 students (38%) volunteered to participate in the study as a form of extra credit, which was only given if they completed all three measures. The students were assured the data would not be analyzed until after the semester was over and would be in aggregate form. Evaluation tools were provided via a secure web-based survey.

Data Sources

The research team used three evaluation tools for data collection. The first evaluation tool was based on the Stages of Concern survey (SoC), one of three diagnostic tools of the Concerns-Based Adoption Model (Hall, 1978). For each question, students rated themselves ranging from one (not at all true of me) to seven (very true of me now). If students found the question to be irrelevant, they answered with a zero. The SoC is a 35-item survey measuring individual views and opinions of an innovation (Hall, 1978), in this case integrating technology into the classroom. Specifically, the SoC measures participants' concerns about an innovation based on stages ranging from stage 0 (awareness stage, meaning the student has little to no concern about the actual topic) to stage 6 (refocusing stage, meaning the student is focused on how to improve the innovation and participates more in the revision of the program). The research team also included seven demographic items (name, age, gender, race, current year, projected grade for teaching, and projected teaching subject area) with an additional area for comments. The SoC data was analyzed by combining all the interviewees' data together and measuring the highest level of concern. The highest level was distinguished for each individual student, and each stage was tallied to view the number of students ranking it as their highest stage of concern.

The second evaluation tool used was a computer skills survey intended to measure whether students perceived a change in their computer skills. Students were asked to report their perceived skills prior to the course and at the end of the course, which is a limitation of the instrument since they were asked to rate both of these perceptions at the end of the course. Questions included self-rated perceptions of certain tasks they are able to accomplish in software programs such as word processing, spreadsheet, and html-editor programs, all programs that are covered within the pre-service course.

The third evaluation tool contained five essay questions, which are included in the appendix, regarding suggestions for changes and improvements to the course, as well as students' beliefs of technology integration. Unfortunately, only 95% of the student volunteers answered these questions (n=155/163). Specific questions included probes about current beliefs on technology integration and how the course has contributed to those views. The responses were also coded into categories based on a loose pattern analysis, with more than one possible code per student due to multiple points in each response.

Results/Discussion

Overall, this study attempted to investigate how a pre-service technology integration course affects student perceptions of technology integration through three main research questions. From the first question, the team explored students' perceptions of technology integration in the classroom and how a pre-service course contributes to these beliefs, which was answered through two of the essays. When students were asked to state their current opinions on integrating technology into K-12 classroom, overall, student responses spoke positively (96%) of integrating technology into K-12 Classrooms, while only 6 students referenced technology would not be used in their classrooms and/or they saw no value in using technology. Table 2 shows the categorized comments of students based on their current technology integration beliefs and percent agreement. The second essay asked students how

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the pre-service course had affected their current view on technology integration. A majority of the students (n=125) responded that their views had been positively affected by the course, while other made references to the instructional design concepts within the course (n=15), and that they already knew technology was important prior to the course (n=11). Therefore, the course seems to have positively changed students' perceptions of technology integration.

Table 2 *Current Technology Integration Beliefs.*

Themes	Percentage
Obligation to prepare students for our technological society	37%
Enhance instruction through motivational elements	36%
Vague about actual beliefs, but positive and will use technology in future classrooms	23%
Technology integration would be difficult due to their grade/subject area	14%
Make organization and management easier for teachers	13%
Students need to learn how to complete tasks with and without technology	8%
Technology should not replace the teacher	6%
Technology does not contribute to education	4%

The second research question examined the concerns students have related to technology integration in the K-12 classroom. The research team used the Stages of Concern test, along with one essay question to answer this question. Within the SoC test, student responses were calculated and the highest score was classified as their highest concern stage. A large number of students (n=87) indicated they were at stage zero (awareness stage). Since the students are still within their pre-service education, they are classified as non-users and stage zero signifies they are just becoming aware of technology integration. When the scores were averaged for all stages, it showed high scores in stages zero, one, and two, with zero being the highest average score. According to Hall (1978), this implies they are non-users who want more information about technology integration, and have intense personal concerns about technology integration and its consequences for them. These concerns show apprehension, but not reluctance to integrating technology into K-12 classrooms (Hall, 1978). The essay which supports the SoC findings asked what were their concerns related to technology integration once they enter the classroom. Interestingly enough, students ranked resources (36%) as their highest concern, with time (23%) being the next highest concern. Most concerns were realistic, which is a good sign for this group composed primarily of freshmen and sophomores who have yet to enter into field placements. They already have realistic concerns for the teaching profession. Other concerns included: ability to choose the correct technology for their curriculum (19%), student issues, including access problems and prior skills (18%), the school and district's perceptions of technology integration (10%), and the inability to keep up with the new technologies available (6%).

The final research question investigated how the instructors of the pre-service technology integration course could make the course more meaningful and applicable. Two open-ended questions specifically asked for suggestions on how to improve the lecture and lab, providing direct complaints, concerns, ideas, and solutions from the students. Suggestions for lecture improvement included more modeling of different types of technology integration (29%), more varied topic areas (17%), more examples in varying subjects/grades (14%), and involving individual students more (12%). Suggestions for lab improvement included more explanations on difficult programs and/or projects (17%), the pace for laboratory needed to be faster/slower (10%), more relevant examples and homework (8%), and more concise directions (6%). Another common concern throughout both questions was the lack of cohesion between lecture and lab. Many students (25%) stated "I feel that the labs were not connected AT ALL to the lecture." Other recommendations were extracted from the SoC test, the Skills survey and the other essays. In order to meet the needs of the students, the course needs to address the concerns of integrating technology expressed by students in the SoC and essay questions. The skills survey showed every student improved on every sub-skill within the four skill programs focal to the course labs (Microsoft Word, Excel, PowerPoint, and FrontPage). When a t-test was preformed with each prior to the course and current sub-skill, all results were significant at the .001 level. For instance, some of these items measured whether students felt they were able to "create a table with 3 rows and 4 columns" and "add and edit images to a web page."

Implications
Based on the three different evaluation tools, the researchers' intent was to gather information in order to explore more effective means in preparing pre-service teachers to integrate technology into their classrooms.

Through the design of a more effective preparation course, the pre-service teachers will be more prepared to implement technology into their future curriculum and classrooms. Because the teacher education program schedules a large lecture with smaller accompanying labs, instructors need to ensure students are active participants within the large lecture. One method being implemented in the current semester as a result of this study is to organize the students in the lecture in seated sections based on their labs. Therefore, lab instructors will attend the large lectures and manage small discussions within the lecture. We also plan to address the common criticism of lack of continuity between the lecture and lab. Another strategy being implemented in the current semester involves online lectures being provided for students that focus on the course readings and basics, allowing more time for discussion in lecture related to integration and real-world experiences. In addition, lab instructors are integrating the lecture into the labs by spending the first part of each lab discussing course activities, projects, and homework and how they relate to topics discussed in the lecture.

Most importantly, all technology integration courses should address the concerns of future teachers. We recommend addressing as many concerns as possible through lecture discussions, presentations, or lab activities. Since the lack of technology resources and lack of time to dedicate to technology integration were both major concerns for students, the course should focus on strategies to overcome these potential problems Other concerns, such as the ability to choose the correct technology for their curriculum, student issues, including access problems, prior skills, and inability to keep up with the new technologies available are easily addressed through case studies, vignettes, and discussions in the lecture and labs along with discussions of potential strategies to overcome these particular "concerns".

Broader implications include informing instructors of other pre-service technology courses in terms of student concerns and the need to address them. Implications for instructors of large lecture courses in any content area are also included in terms of instructional strategies that can make such courses more cohesive while allowing students to see relevance of the content to the real world. .

Additional research is needed in the area of preparing pre-service, as well as in-service, teachers to integrate technology in effective, efficient, and meaningful ways. Future plans include examining student concerns and beliefs, as well as better instructional strategies to improve learning not only for the content taught in this course, but for large lecture courses in general.

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Evaluation of a Pre-Service Educational Technology Program
Within a U.S. University on the Border

Cheng-Chang Pan
Michael Sullivan
Juan Hinojosa
The University of Texas at Brownsville/Texas Southmost College

Abstract

The presentation is intended to delineate and disseminate measurement and evaluation information with a focus on computer self-efficacy of Hispanic pre-service teachers enrolled in an undergraduate educational technology course during the school year of 2004 and 2005 at a southern state university on the border of the United States and Mexico. The influence of these student teachers' prior experience with and access to the Internet on their elf-Efficacy for Technology Integration is also studied.

Background and Introduction

Successful student learning outcomes are the ultimate goal of any instructional technology initiative. But success requires at least two, necessary factors: budget and manpower. Assuming that the latter *always* comes along with the former is a wishful thought.

As school administrators succeed in disseminating large quantities of a variety of instructional technologies in K-12 settings, effective use of manpower is often not prioritized. Lack of effective use of human resources is especially relevant when it comes to individual classroom teachers who stand at the front-line of the fight for a better student achievement. Unfortunately, it is still not uncommon for technology to sit in some corner of the campus while administrators (ponder effective means to change teachers' skills, knowledge, and attitudes toward technology. Sibley and Kimball (2003) distinguished "change" from "movement" in schools, and asserted that placing a computer on a teacher's desk is nothing but *movement*, whereas empowering the teacher to use the tool in his/her decision making of curriculum and instruction is truly a *change*.

As university faculty, we strongly believe that a comprehensive program can act as a powerful agent for change, not just for movement. A pre-service technology competencies program can potentially exert far more impact than an "after the fact" in-service that is all too often hastily planned and executed.

There is a sound rationale for arguing that well conceived pre-service opportunities can enable future teachers to become powerful change agents. Willis and Raines (2001) contend that technology incorporated in pre-service computer literacy curricula can, and should, play a vital role for fundamentally changing the way faculty teach, as well as how students learn. Accordingly, our School of Education has actively infused technology into each undergraduate course offered to pre-service teachers. Additionally, we have created a new course that focuses upon giving pre-service teachers the requisite skills to enable them to integrate technology into instruction. This course also demonstrates examples of various models of teaching that rely heavily upon technology for instructional delivery.

The student body in the University, and in the School of Education, is overwhelmingly Hispanic, specifically students of Mexican-American heritage. We found it appropriate, therefore, to review what literature exists that has examines learning preferences of Hispanic learners, as well as look at the demographic trends of the Hispanic population in the United States.

Hispanics' Growth

According to a CNN news report on October 18, 2004, Hispanic groups represented almost 14% of the U.S. population in 2003, which is a four percent increase from 1990. The U.S. Census Bureau also reported a 13% growth in Hispanic population from 2000 to 2003. CNN also reported that projected population of Hispanics in 2050 is 24%. This study reflects Hispanics' growth in a timely manner.

The setting for this study consists of 92% Hispanic population. We felt obliged to further investigate these possible implications for pre-service teachers' Self-Efficacy for Technology Integration. For an effective learning environment, Griggs and Dunn (1996) found the majority of Hispanic-American learners have a tendency for the following eight preferences:

1. An aesthetically well-designed and cool environment;
2. Conformity;

3. Peer-oriented learning;
4. Kinesthetic instructional resources;
5. A high degree of structure;
6. Late morning and afternoon peak energy levels;
7. Variety as opposed to routines;
8. A field-dependent cognitive style.

Self-Efficacy for Technology Integration

Self-Efficacy for Technology Integration is operationalized as learners' confidence in using computer technology in a learning context or a classroom setting. Inspired by Wang, Ertmer, and Newby's work (2004), we adapted their questionnaire to measure Self-Efficacy for Technology Integration of our mostly Hispanic pre-service teachers. Any significant increase in pre-service students' Self-Efficacy for Technology Integration throughout the semester is considered evidence of the effectiveness of the course. The original survey instrument represented a one-factor-solution model, measured on a five point Likert scale, ranging from Strongly Disagree, Disagree, Neither Degree nor Disagree, Agree, to Strong Agree. Due to a differing learning context, the questionnaire was revised to reflect our needs and philosophy in the study.

The Long-Dziuban Learning Style Inventory

Another aspect of this study is to investigate the interaction between the student teachers' learning styles (i.e., behavioral patterns) and their Self-Efficacy for Technology Integration. The Long-Dziuban Learning Style Inventory was adopted. According to Bayston (2002), four quadrants, which represent four general behavior patterns, are defined in the Long-Dziuban Learning Style Inventory: Aggressive Independent, Aggressive Dependent, Passive Independent, and Passive Dependent. Associated behaviors with each domain have been chronicled, as well as suggested modifications for instruction. Research (as cited in Kysilka & Geary, 2003) shows that of the four patterns, Aggressive Independent and Passive Independent learners appear to be incompatible to the traditional school type of learning. Similar results were found in a study by Dziuban, Moskal, and Dziuban (2000), targeting at an online population. Comparing three learning style models (e.g., The Index of Learning style and The Gregorc Style Delineator, and The Long/Dziuban Inventory, Ouellette (2000) determined that Hispanic learners are found to be more intuitive than other ethnic groups, which suggests that Hispanics prefer possibilities and relationships. How learning styles pertain to self-efficacy will be further examined.

The Purpose of the Study

How can faculty provide leadership and support for teacher candidates in technology integration in curriculum and instruction? We determined that the logical starting point was knowing their own students (Pan, Tsai, Tsai, Tao, & Cornell, 2003). We envisioned a strategy that began with ascertaining the pre-service teachers' learning styles, then implementing a carefully scaffolded series of activities aimed at increasing their self-efficacy for technology use, followed by activities that allowed pre-service teachers to transfer their skills and conceptual knowledge to field-based classroom experiences. This report describes the first step of that process – determining the pre-service teachers' feelings toward their ability to effectively use technology in their future endeavors. The scope of the analysis is concentrated on questionnaire validation and report of descriptive statistics for further use as well as a review of literature.

Significance

By conducting this study, we have made a big stride in understanding their students regarding their behavior patterns and traits. By collecting and analyzing the students' learning styles, the instructors were better able to respond to needs of students. Instructors were also able to more effectively resolve complex technology integration issues such as cooperative learning with technology. Students' Self-Efficacy for Technology Integration at large is deemed a determinant of teaching effectiveness and excellence. By having an established baseline for both students' confidence level and comfort zone with respect to incorporating technology into curriculum, the instructors could use the results can to develop a gear-up, or remedial course, prior to or after the mandatory technology course.

Research Questions

1. To what degree does Self-Efficacy for Technology Integration change from Time One to Time Two during the year? ← - - - [**Formatted:** Bullets and Numbering]
2. To what degree does Behavior Pattern interact with Semester on Self-Efficacy for Technology

Integration?

3. What demographics variables can moderate Self-Efficacy for Technology Integration?

Methods and Results

This quasi experimental study is intended to explore the effectiveness of a state mandated pre-service computer literacy program in a border university. The Self-Efficacy for Technology Integration variable and the Learning Styles variable were measured and analyzed, using SPSS v.13.

A convenient sample, composed of 172 student teachers across three semesters during 2004 and 2005 in a mandated computer competencies course, participated in the study on a voluntary basis. Response rate is 90% (equal to 73 on Time Two divided by 81 on Time One) in the Fall Semester of 2004, 100% in Spring 2005, and 100% in Summer I, 2005. Over 90% were Hispanic. Close to 80% were female. Less than 50% worked more than 20 hours a week. Over 50% had used the computer for more than six years. Over 80% had an Internet access in the place where they studied.

A paper-and-pencil questionnaire, made up of three instruments, was administered on two time occasions: the beginning and the end of each semester. The three instruments were: Self-Efficacy for Technology Integration Instrument (Wang, Ertmer, & Newby, 2004), Long-Dziuban Learning Style Inventory (as cited in Bayston, 2002), and Student Demographic Instrument (Pan, 2003). The Self-Efficacy for Technology Integration instrument was adapted to measure participants' confidence in instructional use of technologies in curriculum. Twenty items (Item 1 to Item 20) were scrutinized for face and content validity initially by three university faculty members with significant public school and pre-service computer literary courses teaching experience. Each variable was measured on a five point Likert scale, with Strongly Disagree coded as 1, Strongly Agree as 5, and Neither Agree nor Disagree as 3. A typical sample question entailed, "I feel confident in my ability to evaluate software for teaching." An exploratory factor analysis was conducted for construct validity, using principal component analysis as an extraction method (KMO = .92 and Bartlett's Test of Sphericity: $p < .001$). Three subscales were clustered: Self-Efficacy for Clinical Teaching with 32.3% of variance explained, Self-Efficacy for Content Materials with 18.3% of variance explained, and Self-Efficacy for Communications with 17% of variance explained, which explained 68% of the total variance. The results were more plausible than the previous study by Wang, Ertmer, and Newby (2004), which accounted for approximately 60% of the systematic covariance. An internal consistency test throughout the three semesters showed that our revised instrument is deemed a reliable survey tool (see Table 1).

Table 1 *Reliability Testing of the Self Efficacy for Technology Integration Instrument in Alpha Value by Semester*

Subscale	Fall Semester of 2004		Spring Semester of 2005		Summer Semester of 2005	
	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
SE1	.94	.90	.94	.94	.81	.95
SE2	.85	.81	.82	.90	.76	.91
SE3	.85	.81	.80	.90	.76	.94

Note. SE1=Self-Efficacy for Clinical Teaching subscale, SE2=Self-Efficacy for Content Materials subscale, SE3=Self-Efficacy for Communications subscale, Time 1=the beginning of the semester, Time 2=the end of the semester of the semester.

The Long/Dziuban Learning Style Inventory was adopted to determine learners' behavioral patterns in terms of four quadrants, each specified by several descriptors. For instance, an aggressive-dependent leaner is described as follows:

- Highly energized, and productive
- Strongly motivated by approval
- Sensitive to the wishes of others
- Translates energies into constructive tasks
- Deeply values close bonds with others
- Some difficulty dealing with direct confrontation
- Highly idealistic, setting lofty goals for themselves
- Fosters harmonious relationships

Student Demographics Instrument was made up of five items of Pan's (2003) demographics scale. The items included sex, race, occupation status, prior experience with the computer, and accessibility of the Internet.

Question One

To what degree does Self-Efficacy for Technology Integration change from Time One to Time Two during the year?

A *t*-test for independent samples was conducted for the Fall 2004 dataset (n = 73). A *t*-test for dependent samples was used to analyze datasets from Spring 2005 (n = 61) and Summer 2005 (n = 30). There is a statistically significant difference in the mean Self-Efficacy for Technology Integration scores between Time One and Time Two in each semester (see Table 2).

Table 2 *T-Test for Self-Efficacy for Technology Integration by Semester*

Semester	df	t
Fall 2004	144	-5.66*
Spring 2005	60	-5.54*
Summer 2005	29	-6.24*

Note. *p < .001.

Question Two

To what degree does Behavior Pattern interact with Semester on Self-Efficacy for Technology Integration?

Due to the sparse distribution of participants' behavior patterns, we collapsed the behavior patterns variable into a dichotomy: Aggressive Dependent (AD) and Non-Aggressive Dependent (NAD).

On Time One, the AD group represented 57% of the total respondents while the NAD was 43%. Given that the assumption of equal variances was met ($p = .53$), a *t*-test for independent variables was conducted. The mean Self-Efficacy for Technology Integration score in the AD group does not exceed the mean Self-Efficacy for Technology Integration score in the NAD group during the year to a statistically significant degree, $\underline{t}(170) = .44$, $p > .05$. Given that the assumption of equal variances was met ($p = .29$), a two way analysis of variance was used. No statistically significant interaction effect between Behavior Pattern and Semester was found, $\underline{F}(2, 166) = .71$, p = .50. No statistically significant difference between the group means for AD and NAD was found, $\underline{F}(1, 166) = .02$, $p = .90$.

On Time Two, AD and NAD represented 59% and 41% respectively. Given that the assumption of equal variances was met (p=.13), a *t*-test for independent variables was conducted. The mean Self-Efficacy for Technology Integration score in the NAD group does not exceed the mean Self-Efficacy for Technology Integration score in the AD group during the year to a statistically significant degree, $\underline{t}(162) = -1.16$, $p > .05$. Given that the assumption of equal variances was met ($p = .20$), a two way analysis of variance was used. No statistically significant interaction effect between Behavior Pattern and Semester was found, $\underline{F}(2, 158) = .52$, $p = .60$. No statistically significant difference between the group means for AD and NAD was found, F(1, 158) = .48, $p = .49$.

Question Three

What demographics variables can moderate Self-Efficacy for Technology Integration?

After recoded, Sex (Male vs. Female), Work (Full-timers vs. Non-Full-timers), Prior Experience with the Computer (Up to Six Years Experience vs. Over Six Years Experience), and Access to the Internet (Yes vs. No) were taken into account in a dichotomy.

On Time One, given that the assumption of equal variances was met ($p = .19$), a two way ANOVA was used. No statistically significant interaction effect between Sex and Semester was found, $\underline{F}(2, 163) = 2.91$, $p = .06$. No statistically significant difference between the group means for Male and Female was found, $\underline{F}(1, 163) = 1.03$, $p = .31$.

Given that the assumption of equal variances was met ($p = .15$), a two way ANOVA was used. No statistically significant interaction effect between Work and Semester was found, $\underline{F}(2, 166) = .06$, $p = .94$. No statistically significant difference between the group means for Full-timers and Non-Full-timers was found, $\underline{F}(1, 166) = .002$, $p = .96$.

Given that the assumption of equal variances was met ($p = .20$), a two way ANOVA was used. No statistically significant interaction effect between PC Experience and Semester was found, $\underline{F}(2, 163) = .96$, $p = .39$. No statistically significant difference among the group means for Semester was found, $\underline{F}(2, 163) = 1.83$, $p = .16$. However, a statistically significant difference between the group means for PC Experience was found suggesting that our data are unlikely, assuming that the null hypothesis is true, F(1, 163) = 8.52, $p < .01$. We therefore reject the null hypothesis in favor of the alternative which states that a difference exists between the PC Experience means in the population ($R^2 = .05$).

Given that the both assumptions of equal variances ($p = .20$) and n's were not met, results of a two way ANOVA with Internet Access and Semester as the two levels was not reported. However, a t-test for independent variables was used to examine the mean difference in Self-Efficacy for Technology Integration between students with Internet Access and those without Internet Access. No statistically significant difference between the group means for Semester was found, $\underline{t}(167) = 3.38$, $p < .01$.

On Time Two, given that the assumption of equal variances was met ($p = .19$), a two way ANOVA was used. No statistically significant interaction effect between Sex and Semester was found, $F(2, 157) = .62$, $p = .54$. No statistically significant difference between the group means for Male and Female was found, $F(1, 157) = .08$, $p = .78$. Given that the assumption of equal variances was met ($p = .24$), a two way ANOVA was used. No statistically significant interaction effect between Work and Semester was found, $\underline{F}(2, 157) = .43$, $p = .65$. No statistically significant difference between the group means for Full-Timers and Non-Full-Timers was found, $\underline{F}(1, 157) = 3.11$, $p = .80$.

Given that the both assumptions of equal variances ($p < .001$) and n's were not met, results of a two way ANOVA with PC Experience and Semester as the two levels was not reported. However, a t-test for independent variables was used to examine the mean difference in Self-Efficacy for Technology Integration between students with more than six years of PC experience and those with no more than six years of PC experience. A statistically significant difference between the group means for PC Experience was found, $\underline{t}(161) = 4.52$, $p < .001$.

Given that the assumption of equal variances was met ($p = .24$), a two way ANOVA was used. No statistically significant interaction effect between Internet Access and Semester was found, $\underline{F}(2, 157) = .11$, $p = .90$. No statistically significant difference between the group means for students with Internet access and those without Internet access was found, $\underline{F}(1, 157) = 3.11$, $p = .80$.

Conclusions

This year-long quantitative inquiry was intended to investigate the effectiveness of a Hispanic-dominated pre-service computer literacy program in a border university. The effectiveness was operationalized and determined primarily by increased self-efficacy for incorporating computer technology into curriculum upon the completion of the computer literacy course. A questionnaire comprised of three measures: Self-Efficacy for Technology Integration Instrument, Long and Dziuban Learning Style Inventory, and Student Demographics was administered at two time occasions in each of the three semesters during 2004 and 2005. Data were complied in an Excel file and then imported to SPSS v.13 for further analysis.

These student teachers' confidence in incorporating appropriate technologies into curriculum changed from Time One to Time Two in the Fall Semester of 2004, the Spring Semester of 2005, and the Summer I Semester of 2005 to a significant degree. This suggested that effectiveness of the mandated computer literacy course is determined. Another indicator of the effectiveness of the course is student end-of-class grade. The relationship between the end-of-class grade and the overall self-efficacy scores was not found. Because there is no significant difference in total self-efficacy scores among semesters either in the beginning or at the end of each semester, student teachers we had each semester seemed to start out the course with a similar confidence level in terms of Self-Efficacy for Technology Integration. Upon completion of the course, they appeared to have acquired a similar confidence level in instructional use of technologies at the class level. A longitudinal study is needed to make a confident statement in this area.

Based on the test results in the Question Two section, student learning styles did not seem to affect their overall self-efficacy either in the beginning or at the end of each semester. An aggressive-dependent learner confidence of integrating technology into curriculum did not differ from that of a non-aggressive-dependent learner. Further analysis should focus on the subscale level of Self-Efficacy for Technology Integration and any potential impact of the four auxiliary traits of Behavior Pattern.

Students' demographics: Sex, Work, Prior Experience with the Computer, and Access to the Internet were considered in an investigation of their moderating effects on overall self-efficacy of this mostly Hispanic student group. For the purpose of this study, the demographics were turned into dichotomous variables. Results suggested that students with more than six years experience of using a computer seemed to feel more confident than those with no more than six years experiences of using a computer when they started the course and when they completed the course. As computers receives acceptance in the lower Rio Grande Valley, this observation may not hold true in the long run. Perhaps attention should be placed on these students' social economic background.

Due to the fact that data were collected from one single university, cautions apply when generalizing these results to similar settings.

Acknowledgement

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Examining Barriers Middle School Teachers Encountered in Technology-Enhanced Problem-Based Learning

Sung Hee Park
Monica (Eun-Hwa) Lee
Jay Blackman
Peg Ertmer
Scott Schaffer
Krista Simons
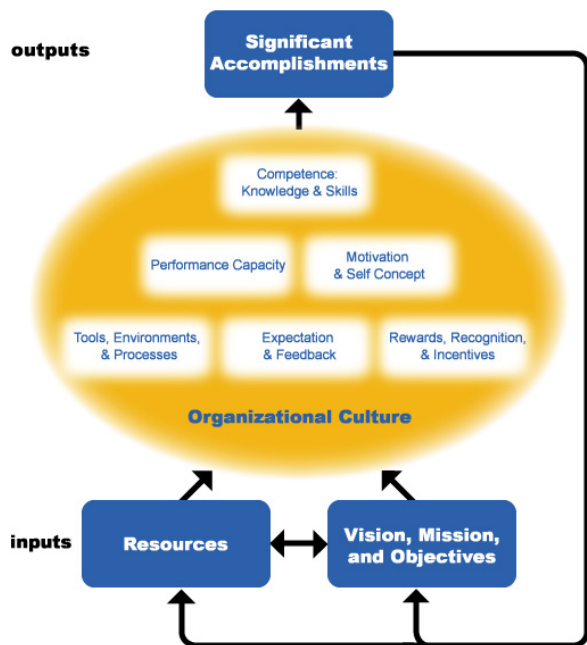Brian Belland
Purdue University

Abstract

This study focused on the barriers that middle school teachers face when attempting to implement technology-enhanced problem-based learning. We examined the perceptions of teachers, administrators, university faculty, and technical support staff to determine the relative importance of barriers to the implementation of technology-enhanced PBL. We determined the relative importance of the barriers to be in the order of lack of vision sharing, knowledge and skills, motivation, capacity, tools, expectations and rewards.

Theoretical Framework and Purpose of the Study

Problem-based learning is a constructivist approach to education in which students learn content knowledge and problem solving skills through investigating and solving an ill-structured problem (Hmelo-Silver, 2004). Technology plays an important role during the PBL process, serving as a critical tool for information searching, organizing and analyzing data, and presenting solutions effectively. As a result, technology-enhanced PBL can provide for a meaningful learning experience (Ertmer, Lehman, Park, Cramer, & Grove, 2003; Jonassen, Howland, Moore, & Marra, 2003) and a meaningful and effective way to integrate technology into the classroom (Sage, 2000). Some researchers have identified barriers related to planning for and implementing technology-enhanced PBL such as lack of preparation time, limited resources, lack of administrative support, and limited class time to implement PBL in the curriculum (Ertmer et al., 1999; Ertmer et al., 2003; Park, Cramer, & Ertmer, 2004), as well as teachers' difficulty adjusting to the role of a guide and transitioning students to become more self-directed (Brinkerhoff & Glazewski, 2004; Brush & Saye, 2000; Land, 2000). However, using a performance support systems approach can provide a more holistic view of the supports needed for teachers to be successful (Schaffer, Richardson, & Park, 2004; Wedman & Diggs, 2001). Wedman and Graham's (2004) Performance Pyramid (see Figure 1) model lists 6 factors that are foundational building blocks for supporting successful performance. When present, these factors can greatly impact the ability for individual performers and groups to successfully complete the task.

Figure 3: The performance pyramid (Wedman & Graham, 2004)

Factors impacting performance support can include:
- Knowledge and Skills – the training or know-how needed to complete the task
- Performance Capacity – the physical or mental ability to do the task
- Motivation & Self Concept – the appropriate desire to complete the task in the manner required
- Tools & Environment – resources and processes designed to help improve performance
- Expectations & Feedback – understanding of what is to be done as well as responses from project stakeholders upon completion of the task
- Rewards, Recognition, & Incentives – appropriate acknowledgment of successful completion of the task

These factors are all influenced by the overall culture of the impacted organization. In addition to culture, the vision (mission, goals) of the organization must be taken into account as well as any resources (workers, capital, time) that are available to those affected within the organization.

This study was designed to examine the barriers teachers encounter when planning for and implementing PBL in the middle school classroom using a performance support systems approach. Specifically the research questions were:

- What are the gaps in performance between expert and typical PBL teachers
- What barriers do teachers encounter when planning and implementing PBL in the middle school classroom and what is their relative importance?

Method

Overview

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We collected four types of data during fall 2004 to determine the gaps between expert and typical PBL teachers, and to identify and determine the relative importance of the barriers teachers encounter while implementing PBL processes. The data sources included a survey of teachers' perceptions of the barriers encountered while planning for and implementing PBL (See Appendix A), face-to-face interviews of eight teachers implementing PBL, observations in four classrooms during PBL lessons, and researchers' reflective journals.

Setting and Participants

The setting of this study was a medium-sized middle school in a small, rural community in the Midwest. In the 2004-2005 school year all teachers at the school were required to implement at least one PBL unit. University faculty members and graduate research assistants were available to help the teachers implement PBL.

The participants from the university included two university faculty members who are specialists in PBL. The participants from the school included 21 teachers with a range of previous experiences with PBL, two technology support personnel, and two administrators. All teachers in our sample completed a survey, and we interviewed a maximum variation sample (Patton, 2002) of six teachers, as well as all non-teacher participants. We observed PBL sessions led by five of the six teachers we interviewed.

Procedure

To answer our first research question - What are the gaps in performance between expert and typical PBL teachers – we observed 13 class hours led by 5 teachers we labeled "expert" or "typical." Expert teachers were identified by three criteria: 1) conducted 3-4 previous PBL units, 2) attended at least one professional conference, and 3) acknowledgment by both school administrators (a superintendent, a principal, a project manager) and PBL support faculty. Teachers who were not labeled "expert teachers" were labeled typical teachers for the purposes of observation. We used an observation checklist during each observation. The classroom observation checklist was developed based on a list of PBL best practices synthesized from a review of the literature and interviews with PBL experts. Two PBL experts reviewed the checklist. This checklist was used to help identify some of the differences, and hence the gap, between expert PBL teachers and typical PBL teachers. The checklist included six categories related to implementing PBL: 1) Pedagogical beliefs (student-centered learning), 2) technology use for higher-order thinking, 3) planning and organizing techniques, 4) classroom management skills, 5) collaboration, and 6) professional development. We asked each teacher we observed about what type of and amount of professional development in which they engaged (e.g., PBL workshop, presentation at a professional conference). Each observation was completed by two researchers, who then came to a consensus on the traits and practices on the checklist that were observed.

To answer our second research question - What barriers do teachers encounter when planning and implementing PBL in the middle school classroom and what is their relative importance? – we used a survey, interviews with stakeholders (eight teachers, two school administrators, one project manager, two technical support staff, two university PBL faculty members), and our reflective journals. We based the survey on Wedman and Graham's (2004) performance pyramid and used it to identify barriers teachers encounter during the PBL process. The pyramid includes factors such as knowledge and skills, capacity, motivation, environment and tools, expectations and feedback, and rewards and incentives. The survey included nine forced-choice questions and one open-ended question. For the forced-choice questions, teachers were asked to indicate whether they agreed, disagreed, or were unsure if certain supportive factors were present during their PBL efforts (e.g., "Expert PBL support is available in a timely and helpful manner in our school"." I have received explicit expectations regarding the implementation of problem-based learning (PBL) in my school."). For the open-ended questions, teachers were asked to list any specific barriers that they perceived as being personal barriers to PBL implementation.

Interviews were conducted with a variety of stakeholders to examine the perceived barriers to implementing PBL from different viewpoints. Interviewees were asked about the current and ideal status of both the organizational support and the PBL practices of teachers.

After completing each observation, the researchers also recorded practices in a reflective journal that may not have been captured by the observation checklist. These data were used to triangulate the other data sources. We determined a relative importance of the barriers according to each data source, and then we combined those relative importances to determine the final relative importance.

Results
What are the gaps in performance between expert and typical PBL teachers?

Analysis of the observational data indicated that there were large gaps between the performance of typical

and expert PBL teachers on many of the best practices included on our checklist, especially on those practices that are important to the successful implementation of PBL, and not necessarily to the implementation of other pedagogical strategies. Some of the biggest gaps between expert and typical PBL teachers were in the areas of having students self-evaluate and reflect on the problem-solving process, providing students with self-monitoring guidelines, and collaborating with other teachers. These practices are desirable to maximize the potential of a PBL unit to promote learning because students engaged in PBL learn not only by engaging in the problem-solving process, but also by actively reflecting on it (Hmelo-Silver, 2004). Students also gain from being involved in interdisciplinary PBL units (Stepien, Gallagher, & Workman, 1993), and need to be provided with tools to help them self-monitor (Brush & Saye, 2000).

What barriers do teachers encounter when planning and implementing PBL in the middle school classroom and what is their relative importance?

Upon analysis of data, we determined the relative importance of the barriers to be in this order: vision-sharing, feedback and expectations, knowledge and skills, motivation, rewards and incentives, and tools and environment. In the paragraphs that follow we will report the data that supports the relative importance.

Vision sharing. Interview data suggested that a lack of vision sharing was a major barrier to the effective implementation of PBL. During the interviews we learned that administrators believed that the overall purpose of technology-enhanced PBL was to increase student-centered learning through the use of technology, whereas PBL support faculty involved with the project believed that the goal was to promote pedagogical change through the implementation of a more student-centered approach to instruction. When we interviewed teachers, they indicated confusion about the goals of the PBL initiative. When asked why the school expects all teachers to implement PBL, one teacher said, "That's where I have a little bit of a problem because I'm not sure what they are trying to accomplish." Another teacher stated, "I think they are trying to be innovative and do things other schools aren't."

Feedback and expectations. On the survey, only 5 of the 21 teachers agreed that they received regular and helpful feedback on their implementation of PBL. Many of the teachers that we interviewed mentioned that they never received feedback based on their implementation of PBL. One teacher asked, "Is there any formal evaluation or feedback?" Another noted, "They haven't really checked on us; I don't really know how they would know if I did it."

Knowledge and skills. On the survey, 15 teachers indicated that they have the knowledge and skills to effectively implement PBL in the classroom, while 6 indicated that they do not. Many teachers also indicated that they lacked knowledge related to how to plan and implement PBL in their classrooms. One teacher said, "I still don't know what I'm doing or if I'm doing it right." Another teacher explained, "A half day of workshop wasn't enough time to develop or even understand."

Motivation. Fifteen out of 21 teachers indicated in the survey that they were motivated to implement PBL in their classes, while 3 disagreed and 3 were unsure. When asked in the interview what motivates them to implement PBL, 4 teachers indicated that it was the students' engagement in PBL units. One of these teachers mentioned, "I like to watch them get excited about what they are doing." However, one teacher noted that the only motivation that he had was that it was a requirement, explaining, "If my boss says to do it, I do it."

Rewards and incentives. Nine teachers who completed the survey agreed that the school offered rewards and incentives for the implementation of PBL, while 9 disagreed and 3 were unsure. Many teachers mentioned in the interviews that there were rewards in that students gained ownership in and enjoyed learning more. One teacher explained, "What is neat is that at the end of these PBL units they usually have more questions than answers…all of a sudden the world is a much bigger place and PBL allows that to happen." However, some teachers did not perceive that there were any rewards and incentives. When asked what rewards there were with regards to PBL, one said, "Nothing for me, except that it's my job."

Tools and environment. Teachers completing the survey were also asked to indicate their agreement with the statement: "The physical environment and tools (hardware, software, network, local and school library, field trip support etc.) of my school makes it easy for me to implement PBL." Nineteen teachers agreed, while 1 disagreed and 1 was unsure. We asked the teachers in the interview sample what other resources and help they needed in implementing PBL. Some teachers wanted opportunities to team teach. Others stated that they could use more preparation time.

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Conclusion and Recommendations

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A major finding of this study was the lack of vision sharing across the organizational system that resulted in incompatible goals for administrators and teachers. This also contributed to a weak support for the

implementation of technology-enhanced PBL. Others have identified vision sharing as essential to technology integration and the implementation of new pedagogical techniques (Anderson & Dexter, 2000; Hunter, 2001; Jukes, 1996). "When the vision is not shared, teachers often view the plan as just another example of rhetoric rather than a substantive commitment to a plan" (Jukes, 1996, p. 14).

Our study also indicated that feedback and expectations were a major barrier to the design and implementation of PBL units. Many of the teachers that we interviewed mentioned that they never received feedback based on their use of PBL. Schaffer and Richardson (2004) also found that insufficient feedback relative to expectations was one of major barriers to technology integration in the K-12 classroom. That is, teachers need regular, corrective, feedback especially when they implement new teaching methods (Scheeler, Ruhl, & McAfee, 2004; Spencer & Logan, 2003).

The results of this study illustrated the importance of sharing vision, detailing expectations, and providing feedback to support teachers as they implement technology-enhanced PBL. Many schools focus on acquisition of technology (hardware and software) instead of sharing a vision of technology-enhanced PBL or providing any feedback and expectation about teachers' performance in implementing technology-enhanced PBL. Therefore, it is unreasonable to expect teachers' performance to improve because some teachers are confused about their roles and want to know both what the school expects from them in classrooms and whether they were performing in line with expectations. Therefore, a systemic support structure is needed to help teachers make meaningful uses of technology.

We recommend sharing the vision of technology-enhanced PBL with teachers (i.e., school strategic plans) and providing increased opportunities for collaboration among teachers such as the development of joint units, peer coaching, and mentoring. Teachers should be encouraged to develop joint units with other teachers and get consistent feedback from each other. Collaboration with a peer is essential to teachers' implementing PBL.

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Appendix A. Survey

1. How many different PBL units have you implemented during your class time or reading time since fall 2000?
    ___ None   ___1-2 units   ___3-4 units   __ more than 5

2. Have you taken PBL workshop or Purdue classes offered at Crawfordsville since fall 2000? If so, when and how many?

Directions*: Decide if a statement is totally true, if you are unsure, or if a statement is completely untrue; then circle the appropriate letter.*

No.	Statement	True	False	Unsure
1.	I have received explicit **expectations** regarding the implementation of problem-based learning (PBL) in my school.	T	F	U
2.	I receive regular and helpful **feedback** about how well I am meeting expectations regarding PBL implementation.	T	F	U
3.	Expert PBL **support** is available in a timely and helpful manner in our school.	T	F	U
4.	I have been given enough **time** to plan and implement PBL.	T	F	U
5.	The physical **environment and tools** (hardware, software, network, local and school library, field trip support etc.) of my school makes it easy for me to implement PBL.	T	F	U
6.	There are **rewards and incentives** for PBL implementation in my school.	T	F	U
7.	I am **motivated** to implement PBL in my classes.	T	F	U
8.	I have the physical and mental **capacity** to plan, design, and manage PBL in my classroom.	T	F	U
9	I have the **knowledge and skills** needed to implement PBL.	T	F	U

3. Please describe any barriers you face in planning and implementing PBL (use the reverse side if necessary)

Foundations for Transforming Education

Charles M. Reigeluth
Indiana University

Public education in the United States is an array of highly complex systems whose results have proven difficult to predict or control. Similarly, the process of transforming a school system is highly complex and difficult to predict or control. Chaos theory and the sciences of complexity (Kellert, 1993; Wheatley, 1999) were developed to help understand highly complex systems. They recognize that beneath the apparently chaotic behavior of a complex system lie certain patterns that can help one to both understand and influence the behavior of the system. This paper begins with a summary of some of the key features of chaos theory and the sciences of complexity and then explores the ways that these theories can inform the systemic transformation of K-12 education in the United States.

What Are Chaos Theory and the Sciences of Complexity?

Some of the key features of chaos theory and the sciences of complexity include co-evolution, disequilibrium, positive feedback, perturbance, transformation, fractals, strange attractors, self-organization, and dynamic complexity. Each of these is briefly discussed next.

Co-evolution

For a system to be healthy, it must co-evolve with its environment: it changes in response to changes in its environment, and its environment changes in response to its changes. Wheatley says, "We inhabit a world that co-evolves as we interact with it. This world is impossible to pin down, constantly changing …." (Wheatley, 1999, p. 9). A K-12 educational system exists in a community and larger society that are constantly evolving. But how are they evolving? Toffler (1980) has identified three major waves of societal evolution. Each has been accompanied by a major changes in our educational systems, and collectively they provide us with examples of co-evolution between educational systems and their environments. During the agrarian age, the one-room schoolhouse was the predominant paradigm of education, with its focus on tutoring and apprenticeship. During the industrial age, the factory model of schools became the predominant paradigm of education, with its focus on standardization and teacher-centered learning. Now, as we evolve ever deeper into the information age, society is undergoing just as dramatic a change as during the industrial revolution, and this is putting great pressure on our educational systems to co-evolve in major ways.

As the pace of changes in our communities and society has been increasing, the need for co-evolution in education has become ever more urgent. Banathy (1991) has pointed to a large co-evolutionary imbalance between education and society, which places our society in ill-health and peril. Schlechty (1990), Caine and Caine (1997) and others have pointed out that our educational systems are doing a better job than ever at what they were designed to do, but that our society is increasingly calling on them to do things they were not designed to do.

To identify how an educational system should co-evolve, one issue we must look at is how its environment has changed. This includes changes in the community's educational needs, in the tools it offers to educators, and in other community (and societal) conditions that impact education, such as drugs, violence, teen pregnancy, and latch-key children. However, an educational system is not just shaped by its community; it also helps shape its community. Thus, another issue for identifying how an educational system should co-evolve is the ways the community would like its educational system to change to better shape the community. Those ways are heavily based on the values, beliefs, and visions of the community.

Disequilibrium and Positive Feedback

Co-evolution is fostered by disequilibrium and positive feedback. Equilibrium is defined as "a condition in which all acting influences are canceled by others, resulting in a stable, balanced, or unchanging system" (American Heritage Dictionary, as quoted by Wheatley, 1999, p. 76). Systems can be in a state of equilibrium, in which case minor changes or adjustments to the system are all that is necessary; or systems can be in a state of disequilibrium, in which case they approach the edge of chaos. This might lead one to believe that disequilibrium is a bad thing. However, Wheatley (1999) makes the following

points:

"I observed the search for organizational equilibrium as a sure path to institutional death." (p. 76).

"In venerating equilibrium, we have blinded ourselves to the processes that foster life." (p. 77).

"To stay viable, open systems maintain a state of non-equilibrium…. They participate in an open exchange with their world, using what is there for their own growth." (p. 78).

"Prigogine's work demonstrated that disequilibrium is the necessary condition for a system's growth." (p. 79).

Hence, disequilibrium is one important condition for co-evolution. The other is positive feedback. Systems may receive both negative and positive feedback. Negative feedback provides information about deficiencies in attaining a system's goals so that the system can adjust its processes to overcome those deficiencies. In contrast, positive feedback provides information about opportunities for a system to change the goals that it pursues. Thus, positive feedback is information from the environment that helps a system to co-evolve with its environment. Often it takes the form of perturbances (or disturbances) that cause disequilibrium in a system.

Perturbance

A perturbance is any change in a system's environment that causes disequilibrium in a system. For example, as our society in the United States has evolved into the information age, a new educational need that has arisen is the need for life-long learning. Rapid change in the workplace and the new reality of multiple careers during one's life require people to be life-long learners. To help people become life-long learners, schools must cultivate both the desire to learn (a love of learning) and the skills to learn (self-directed learning). However, our typical industrial-age school systems do the opposite on both counts, placing stress on the environment (co-evolutionary imbalance) and causing the environment to put pressure (perturbance) on the educational system to undergo fundamental change, or transformation.

Transformation

Disequilibrium creates a state in which the system is ripe for transformation, which is reorganization on a higher level of complexity. Transformation occurs through a process called "emergence," by which new processes and structures emerge to replace old ones in a system. Transformation is in contrast to piecemeal change, which entails changing one part of a system without changing other parts or the way the parts are organized (the structure of the system). According to Duffy, Rogerson and Blick (2000), transformation of an educational system requires simultaneous changes in the core work processes (teaching and learning), the social architecture of the system (culture and communications), and the system's relationships with its environment.

Fractals and "Strange Attractors"

Transformation is strongly influenced by "strange attractors," which are a kind of fractal (Wheatley, 1999). Fractals are patterns that recur at all levels of a system, called self-similarity. In educational systems, they can be considered "core ideas" and values or beliefs (Banathy, 1991, 1996) that guide or characterize the design of the new (transformed) system. These recurring patterns can be structural and/or behavioral – that is, they can be patterns of form and/or function, and they strongly influence, and are influenced by, complex system dynamics (Senge, 1990). One example of a fractal in education is autocratic control. On the district level of an educational system, the school board typically controls the superintendent, who controls the principals. On the building level the principals control their teachers. And on the classroom level the teachers control their students.

Another example of a fractal in education is uniformity. On the district level all elementary schools are typically supposed to be the same (equal) in such key features as policies, curriculum, methods, and assessments. On the building level all teachers at the same grade level are supposed to teach the same content at the same time with the same textbooks, again to provide "equality". On the classroom level all students in a classroom are typically supposed to learn the same thing at the same time in the same way. And even for professional development, all teachers typically engage in the same professional development activities at the same time. Top-down control and uniformity are but two of many fractals that characterize our factory model of schools. While we are beginning to see changes in some of these patterns, few would argue that they were not typical of our industrial-age educational systems, and they are likely still the predominant paradigm in educational systems today.

A strange attractor is a kind of fractal that has a powerful influence over the processes and

structures that emerge in a system undergoing transformation. Fractals are similar to what Dawkins called "memes," which are ideas or cultural beliefs that are "the social counterpoints to genes in the physical organism" and have the power to organize a system in a specific way (Caine & Caine, 1997, p. 33). One example of a strange attractor, or meme, in education is empowerment/ownership, which entails providing both the freedom to make decisions and support for making and acting on those decisions. On the district level this takes the form of the school board and superintendent empowering each building principal to experiment with and adopt new approaches to better meet students' needs and to make other important decisions (hiring, budgeting, etc.). On the building level the principal empowers each teacher to experiment with and adopt new approaches to better meet students' needs and to participate in school policymaking and decision making. On the classroom level the teacher empowers each student to make decisions about how to best meet her or his needs. This form of leadership at all levels entails providing guidance and support to cultivate the ability to make good decisions and act effectively on them.

A second example of a strange attractor is customization/differentiation (or diversity). On the district level, each school has the freedom to be different from other schools. On the school level each teacher has the freedom to be different from other teachers. And on the classroom level each student has the freedom to be different from other students (with respect to both what to learn and how to learn it). A third example is shared decision making/collaboration. On the district level the school board and superintendent involve community members, teachers, and staff in policymaking and decision making. On the school level the principal involves parents, teachers, and staff in policymaking and decision making. And on the classroom level the teacher involves the child and parents in decisions and activities to promote the child's learning and development.

To become an effective strange attractor for the transformation of a school system, the core ideas and values (or beliefs) must become fairly widespread cultural norms among the stakeholders most involved with making the changes. Once that status is reached, very little planning needs to be done for the transformation to take place. Appropriate behaviors and structures will emerge spontaneously through a process called self-organization.

Self-Organization

Self-organizing systems are adaptive; they evolve themselves; they are agile (McCarthy, 2003). They require two major characteristics: openness and self-reference (Wheatley, 1999). To be open with its environment, a system must actively seek information from its environment and make it widely available within the system.

The intent of this new information is to keep the system off-balance, alert to how it might need to change. An open organization doesn't look for information that makes it feel good, that verifies its past and validates its present. It is deliberately looking for information that might threaten its stability, knock it off balance, and open it to growth. (Wheatley, 1999, p. 83)

But the system must go beyond seeking and circulating information from its environment; it must also partner with its environment. As Wheatley (1999) notes: "Because it partners with its environment, the system develops increasing autonomy from the environment and also develops new capacities that make it increasingly resourceful." (p. 84).

A second characteristic of self-organizing systems is the ability to self-reference on the core ideas, values, or beliefs that give the organization an identity. In this way, "When the environment shifts and the system notices that it needs to change, it always changes in such a way that it remains consistent with itself. … Change is never random; the system will not take off in bizarre new directions." (Wheatley, 1999, p. 85).

A third characteristic is freedom for people to make their own decisions about changes. Jantsch (1980) has noted the paradoxical but profound systems dynamic: "The more freedom in self-organization, the more order" (p. 40, as cited by Wheatley, 1999, p. 87). As long as the freedom is guided by sufficient self-reference, it will allow changes to occur before a crisis point is reached in the system, thereby creating greater stability and order. Paradoxically, the system is "less controlling, but more orderly" by being self-organizing (Wheatley, 1999, p. 87). Typically, co-evolution occurs through self-organization, but complex system dynamics have a powerful influence on self-organization and any resulting systemic transformation.

Dynamic Complexity

According to Peter Senge, social systems have detail complexity and dynamic complexity. The nature of dynamic complexity is revealed by Senge (1990):

When the same action has dramatically different effects in the short run and the long, there is dynamic complexity. When an action has one set of consequences locally and a very different set of consequences in another part of the system, there is dynamic complexity. When obvious interventions produce nonobvious consequences, there is dynamic complexity. (p. 71)

System dynamics are the web of causal relationships that influence the behavior of a system at all its various levels. They help us to understand how a change in one part of an educational system is likely to impact the other parts and the outputs of the system, and to understand how a change in one part of an educational system is likely to be impacted by the other parts of the system. Dynamic complexity is captured to some extent by Senge's "11 laws of the fifth discipline" and his "system archetypes." The laws include such general dynamics as:

- The harder you push, the harder the system pushes back.
- The easy way out usually leads back in.
- The cure can be worse than the disease.
- Faster is slower.
- Cause and effect are not closely related in time and space.
- Small changes can produce big results—but the areas of highest leverage are often the least obvious.

Senge's (1990) system archetypes include:

"Limits to growth" in which an amplifying process that is put in motion to create a certain result has a secondary effect (a balancing process) that counters the desired result.

"Shifting the burden" in which the underlying problem is difficult to address, so people address the symptoms with easier "fixes," leaving the underlying problem to grow worse unnoticed until it is much more difficult, if not impossible, to fix.

"Tragedy of the commons" in which a commonly available but limited resource is used to the extent that it becomes more difficult to obtain, which causes intensification of efforts until the resource is significantly or entirely depleted.

"Growth and underinvestment" in which growth approaches a limit that can be raised with additional investment, but if the investment is not rapid nor aggressive enough, growth will be stalled and the investment will become unnecessary.

"Fixes that fail" in which a fix that is effective in the short run has unforeseen long-term effects that reduce their effectiveness and require more of the same fix.

Senge's laws and archetypes identify high-level or general system dynamics, but it is important to also identify the complex system dynamics at play in a particular educational system. Those dynamics are complex causal relationships that govern patterns of behavior, explain why piecemeal solutions are failing, and predict what kinds of solutions may offer higher leverage in transforming a system to better meet students' needs.

How Can Chaos Theory and the Sciences of Complexity
Inform the Transformation of Education?

The remainder of this paper explores the ways that chaos theory and the sciences of complexity can inform the systemic transformation of education. They can do so in two fundamental ways. First, they can help us to understand the present system of education and how it is likely to respond to changes that we try to make. Second, they can help us to understand and improve the transformation process as a complex system that educational systems use to transform themselves.

Understanding the Present System

Chaos theory and the sciences of complexity can help us to understand our present systems of education, including (a) when each is ready for transformation, and (b) the system dynamics that are likely to influence individual changes we try to make and the effects of those changes.

Readiness for transformation. Chaos theory and the sciences of complexity tell us that readiness for transformation is influenced by several factors. First, there must be sufficient impetus for transformation, which is created by perturbations from outside the system that produce a state of disequilibrium in the system. That disequilibrium may be caused by either of two kinds of changes in the environment (a school system's community): a) ones that create problems for the system (such as dysfunctional home environments and lack of discipline in the home), or (b) ones that present opportunities to the system (such

as the Internet or other powerful technologies to support learning). Second, there must also be sufficient enablers of transformation, which are created by factors inside the system, such as "participatory" (Schlechty, 1990) or "transformational" leadership (Duffy et al., 2000) (as opposed to the industrial-age command-and-control form of leadership – or more appropriately, management), and sufficient levels of trust within and among stakeholder groups, such as the teachers association, administration, school board, and parents.

System dynamics.

 System dynamics are complex sets of causes and effects that are largely probabilistic (a "cause" increases the chances that an "effect" will take place) and highly interactive (the extent of influence of a "cause" on an "effect" is strongly influenced by other factors, including other causes). Regarding causes, system dynamics provide us with an understanding of aspects of the current system that will likely influence the viability and durability of any given change. For example, we come to learn that high-stakes tests that focus on lower levels of learning in Bloom's taxonomy (Bloom, Krathwohl, & Masia, 1956) are likely to reduce the viability and durability of attempts by teachers to develop higher-order thinking skills, because such efforts will necessarily reduce the amount of time the teachers spend on the lower-level content, causing a decline in the high-stakes test scores. Regarding the effects of any given change, system dynamics provide us with the ability to predict what effects the change is likely to have on the outcomes of the transformed educational system, such as levels of student learning. For example, as the Saturn School of Tomorrow found (Bennett & King, 1991), allowing students to do what they want when they want can cause a reduction in "time on task" to learn the important skills and understandings, resulting in a reduction in learning.

Understanding the Transformation Process

Chaos theory and the sciences of complexity can also help us to understand and improve the transformation process in which educational systems engage to transform themselves. The transformation process is itself a complex system comprised of many subsystems, processes, and dynamics. With research and experience we can expect to learn much about the dynamics that influence the subsystems and processes that are most likely to foster systemic transformation, but chaos theory and the sciences of complexity tell us that we cannot hope to control the transformation process (Caine & Caine, 1997; Wheatley, 1999). Caine and Caine (1997) state that "the underlying belief is that we are in charge and can control the nature of change. All the reports on how difficult it has been to change education confirm the failure of this logic." (p. 12). Chaos theory and the sciences of complexity also tell us that we can hope to influence the process through the use of such tools as strange attractors and leverage points, and that we must constantly adjust and adapt the process to the emerging, ever-changing reality of a particular educational system and its environment (Caine & Caine, 1997; Wheatley, 1999).

Strange attractors.

The most powerful strange attractors are core ideas and beliefs like those described earlier: ownership and empowerment, customization and differentiation, and shared decision making and collaboration. These core ideas stand in stark contrast to those that characterize the industrial-age mindset about "the real school" (Tyack & Cuban, 1995): centralization and bureaucracy, standardization (or uniformity), and autocratic (or command-and-control) management. However, to have a powerful influence on the features that emerge in the system undergoing transformation, the core ideas and beliefs must become integral parts of the mindsets or mental models held by a critical mass of participants in the transformation process, and, therefore, they must collectively comprise the culture of the transformation process as a system. This means that the major focus of a systemic transformation process in a school district must be on helping all stakeholders to evolve their mindsets about education and to develop a set of shared core ideas and beliefs about the ideal kind of educational system they would like to have (Banathy, 1991; Caine & Caine, 1997; Reigeluth, 1993). This entails helping people to uncover the mental models that often unwittingly control their views of education and then deciding whether or not that is the way they really want their educational system to be.

Leverage points.

Leverage points can greatly facilitate the systemic transformation of educational systems. An example of a leverage point is student assessment. Our industrial-age schools reflect the belief that the purpose of student assessment is to compare students with each other. Hence we use norm-based tests, and students become labeled as winners and losers, successes and failures. In contrast, if we want all children to succeed (no children left behind), then the purpose of assessment should be to compare students with a

standard of attainment, so that they may continue to work on a standard until it has been met. The current report card, with its list of courses and comparative grades, could be replaced by an "inventory of attainments" that are checked off as they are reached by each student. This one change could exert leverage on other parts of the system, most notably the way teaching and learning occur in the classroom, that might be more powerful than the forces that the rest of the system would place on student assessment to change back. Furthermore, if appropriate strange attractors have been developed (e.g., enough stakeholders have evolved their mental models to encompass the belief that student assessment should be designed to inform learning rather than to compare students with each other), those strange attractors will create a powerful force in support of such a compatible leverage point and against those aspects of the current system that would otherwise be working to change the assessment system back to what it was.

Conclusion

An understanding of chaos theory and the sciences of complexity is crucial to systemic transformation of our educational systems to better meet the rapidly changing needs of our children and communities. Helpful concepts include co-evolution, disequilibrium, positive feedback, perturbance, transformation, fractals, strange attractors, self-organization, and dynamic complexity. These concepts can help us to understand (a) when a system is ready for transformation, and (b) the system dynamics that are likely to influence individual changes we try to make and the effects of those changes. Furthermore, chaos theory and the sciences of complexity can help us to understand and improve the transformation process as a complex system that educational systems use to transform themselves. Strange attractors and leverage points are particularly important to help our educational systems to correct the dangerous evolutionary imbalance that currently exists.

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Using ASP for Web Survey Data Collection and an Empirical Assessment of the Web Data

Xuejun Shen
Stanford University

Hope Ruifang Adams
Idaho State University

Abstract

An experience of survey data collection predominately through the Internet in conjunction with the traditional paper-and-pencil medium reached a response rate of 75% out of 100 randomly selected school principals. Based on these data, this study compared the demographics, qualities and values of the survey responses collected through the Web and the traditional media. The results indicated that the Web data were comparable to the paper-and-pencil data in the respondent demographics, nonresponse rates, response variability and mean values. In addition, this paper specifically shared implementation of the Web-based survey using Microsoft Active Server Pages; and discussed merits and lessons that could be drawn from this mixed-mode survey experience, and integration of electronic and traditional media in survey studies.

An experience of data collection predominately through the World Wide Web (WWW) in conjunction with the traditional paper-and-pencil medium reached a high response rate of 75% out of 100 randomly selected school principals. Based on these data, this study compared the demographics, qualities and values of the survey responses collected through the Internet and the traditional medium. The following hypotheses were proposed for investigation.

Hypothesis 1: The survey data collected through the WWW and the data collected via the paper-and-pencil medium did not differ in the respondent demographics.

Hypothesis 2: The missing data rate did not differ across survey data collection medium.

Hypothesis 3: Response variability did not differ across survey data collection medium.

Hypothesis 4: The mean response values did not differ across survey data collection medium.

Furthermore, as technical difficulties have been reported as an obstacle for applying Web technology in survey data collection, this paper was also intended to share the specific experience of implementation of the Web-based survey using Microsoft Active Server Pages (ASP). The process covered online data collecting, validating, processing and recording. It is hoped that presentation of this paper will stimulate discussion on the merits and lessons that could be drawn from this mixed-mode survey experience, and on the integration of electronic and traditional media in survey studies.

Theoretical Background

With the development of technology, the WWW has increasingly been used as a medium to collect survey data for research in the social sciences, including the field of education. As a type of electronic surveys, the Web-based survey shares the advantages of saving cost and transition time over traditional paper-and-pencil surveys (Mavis & Brocato, 1998). In addition, the Web-based survey allows a wide variety of graphics, sound and response options; as well as automatic data entry into the database (Shannon et al., 2002).

On the other hand, electronic surveys may result in limited population and sample due to the computer proficiency and access to the Web facilities required on the participant part to complete the survey (Scantron Corporation, n.d.). There have been concerns particularly about the overrepresentation of males and young people using the Web (Yun & Trumbo, 2000). Furthermore, the advanced Web knowledge and skills involved in developing the Web-based survey has been referred to as an obstacle for applying the technology into survey studies (Shannon et al., 2002).

There have been reports of higher as well as lower response rates for electronic surveys than paper-and-pencil surveys. Multiple contacts, personalization, mixed mode, and incentives have been reported effective in raising response rates (Shaefer & Dillman, 1998; Mehta & Sivadas, 1995).

Nonresponse rate has often been used as an indicator in comparing the quality of Web data and paper-and-pencil data (King & Miles, 1995; Sproull, 1986). In addition, Stanton (1998) used variability as a

measure of data quality. Although Stanton acknowledged the measure of variability is equivocal, he justified his approach based on the grounds that (a) "restriction of range in item responses can suppress item intercorrelations" (p. 713) and (b) unmotivated respondents tend to scramble the same choices across survey items.

Methods

Sampling

The survey data were collected to explore Idaho secondary school principals' perceptions on high-stakes accountability. The sample of 100 was randomly selected from the Idaho State Public Secondary School Principals Contact List available at the Web site of the Idaho State Department of Education (ISDOE). The sample's email and mailing addresses at work were available on the list.

Instrumentation

The survey instrument specifically addressed three dimensions of high-stakes acrateability regarding the uses of standardized test scores to make decisions about students and schools and the effects of high-stakes testing on instruction, resulting in three scales: HSA vs. Students, HSA vs. Instruction and HSA vs. Schools. The instrument consisted of nine demographic questions asking about participants' demographics including gender, age, educational level, years of experience of teaching, educational administration and principalship, school size, school type, and school location; and 15 items asking participants to rate statements on a 1-4 Likert scale. The coefficients for inter-item consistency -- Cronbach's *alpha*s--were estimated above .60 for each scale.

The predominate Web-based survey medium was adopted mainly out of considerations of participants' educational levels at master's degree or above, and access to the computer and the Internet at their workplaces. All three pilot respondents indicated favor of the Web-based survey over the traditional paper-and-pencil method, and completed the survey online.

Implementation of Web-based Survey

All the files involved in the Web-based survey were composed in ASP. These files functioned on a commercial Web server that hosted ASP files.

The first step was for pin-number verification. The URL address provided in the invitation email led participants to the pin-number soliciting page. When the "submit" button on the pin-number soliciting page was activated, the inputted data would be checked against all the pregenerated pin-numbers saved in a file. If the inputted data did not match any prescribed pin-number, a box would pop up indicating there was an error. Otherwise, participants would be directed to the survey Web page for data entry.

Validation of the data fields before submission was not applied in the survey Web page in consideration of the voluntary nature of participants' responses. Once the "submit" button on the survey Web page was clicked, a working file would be activated to process and transfer the entered data to an online database. The database file was created with Microsoft Access software for recording the inputted pin-numbers and survey data. The content of the database file could be viewed online through a Web page, and access to this page was limited to the researchers. For data analysis, the database Access file was downloaded from the server, and the stored data were imported into the SPSS analysis software.

Procedures and Response Rate

The survey data were collected during the spring of 2002. An invitation email was first sent to the sample. This email included a personal style informed consent letter, requesting participants to log onto the survey Web page with their pin-numbers and complete and submit the survey online within two weeks of receipt.

During the next few days, two participants reported the URL link in the invitation email was inaccessible as the commercial server hosting the survey was blocked by the school filtering systems. In response, the researchers immediately posted a HTML Web page of the survey onto the Idaho State University (ISU) Web site with an educational domain. A follow-up email was then sent to all the participants providing the alternative survey page address. As the ISU server did not host ASP, the data entered from the alternative survey page were still processed and stored on the commercial server site.

In order to raise the response rate, we sent an email reminder to the participants whose pin-numbers and responses did not appear in the database after one week. Another week later, we sent a follow-up letter with a stamped return envelope to the sampled principals who had not responded. It was indicated

in the letter that principals might complete the surveys in whatever way they preferred: by the Web, mail or fax. We collected 36 survey responses through the Web during the first two weeks after the initial request was sent via email; and 16 responses by mail, 13 by fax, and 10 by the Web after the follow-up letter was sent (these 39 responses are referred to "follow-up data" hereafter). For testing Hypothesis 1, statistics were run on both the full set of data collected from 75 principals, and the subset of follow-up data collected when the subjects were offered multiple response methods. Only the full set of data were used for testing Hypotheses 2-4 given its larger sample size. We combined the faxed and mailed responses as "paper-and-pencil data" versus those received through the Web as the "Web data." A total of 75 survey responses were collected out of the 100 sampled Idaho principals, making the response rate 75%. Figure 1 illustrates the frequencies of survey responses by response mode and date after the follow-up letters were sent to the nonresponding subjects.

Results

Hypothesis 1 states that survey data collected through the WWW and the data collected via the paper-and-pencil medium did not differ in the respondent demographics. For either the full dataset or follow-up data, the Pearson Chi-Square tests revealed no significant differences between the Web data and the paper-and-pencil data in terms of all nine demographic variables, $p<.05$. Tables 1-4 cross-tabulate the frequencies of Web and paper-and-pencil surveys against the key demographic variables of gender, age group, and school location for the full dataset as well as the subset of follow-up data.

Figure 1. Frequencies of Survey Responses by Response Mode and Date
After the Follow-up Letters Were Sent to the Nonresponding Subjects

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Table 1 Frequencies, Percentages, and Pearson Chi-Square Tests Comparing Survey Collecting Methods Relative to Respondent Gender for Full (N=75) dataset and Follow-up (N=39) subset

Responding Method	Data	Male	Female	Total	Pearson Chi-Square
Web	Follow-up	9 / 90.0%	1 / 10.0%	10 / 100%	X^2(df=1) = .02, p= .695
	Full	36 / 78.3%	10 / 21.7%	46 / 100%	X^2(df=1) = 1.31, p= .252
Paper-Pencil	Follow-up / Full	23 / 88.5%	3 / 11.5%	26 / 100%	

Table 2 Frequencies, Percentages, and Pearson Chi-Square Tests Comparing Survey Collecting Methods Relative to Respondent Age for Full (N=75) dataset and Follow-up (N=39) subset

Responding Method	Data	30-40	40-50	Above 50	Total	Pearson Chi-Square
Web	Follow-up	2 / 5.3%	5 / 13.2%	3 / 7.8%	10 / 100%	X^2(df=3) = 1.26 p= .739
	Full	4 / 08.7%	22 / 47.8%	20 / 43.5%	46 / 100%	X^2(df=3) = 1.40 p= .704
Paper-Pencil	Follow-up / Full	5 / 17.2%	12 / 41.4%	12 / 41.4%	29 / 100%	

Table 3 Frequencies, Percentages, and Pearson Chi-Square Tests Comparing Survey Collecting Methods Relative to School Location and for Full (N=75) dataset and Follow-up (N=39) subset

Responding Method	Data	Urban /Urban Adjacent	Suburban	Rural	Total	Pearson Chi-Square
Web	Follow-up	0 / 0.0%	1 / 10.0%	9 / 90.0%	10 / 100%	X^2(df=2) = 1.57 p= .457
	Full	3 / 6.5%	10 / 21.7%	33 / 71.7%	46 / 100%	X^2(df=2) = 2.38 p= .304
Paper-Pencil	Follow-up / Full	4 / 13.8%	3 / 10.3%	22 / 75.9%	29 / 100%	

Hypothesis 2 states: "The missing data rate did not differ across survey data collection medium." All 24 demographic and perception items of the survey were included for rateing the nonresponse rate. Although the WWW data had smaller missing response rate per person (M = 6.1%, SD = .01) than the paper-and-pencil data (M = 7.0%, SD = .03), the difference is not statistically significant, t = 1.68, df = 35.90, p = .101, equal variance not assumed.

Hypothesis 3 proposes: "Overall variability did not differ across survey data collection medium." The Levene's test for equality of variance shows that responses to the 25 perception items in general have equal variances between the Internet and paper-and-pencil data except those for two items on determining college admission and scholarship based on standardized test results. For these two items, the Levene's test values were respectively F = 5.76 and F = 2.16, p < .05. These two items had higher standard deviations for Internet responses than for paper-and-pencil responses.

Hypothesis 4 states: "The mean response values did not differ across survey data collection medium." Most of the survey items were aggregated into three scales, as stated, for examination of

response values. As shown in Table 4, the *alpha* levels of all three scales were acceptable—at or above .60—for the survey responses collected either through the Web or the paper-and-pencil methods.

Table 4 Scale Titles, Item Numbers and Alpha Reliabilities for Full Survey Responses Collected Through Web Versus Paper-and-Pencil Methods (N=75)

Scale Titles	Number of Items	*Alpha* Reliabilities	
		Web Data	Paper-and-Pencil Data
HSA vs. Students	4	.62	.78
HSA vs. Instruction	6	.60	.63
HSA vs. Schools	5	.89	.84

Table 5 displays means and standard deviations of the full set of Web data and the paper-and-pencil data; and the results of the *t* tests comparing their means. As revealed by the *t* tests, there were no significant differences between the Internet data and the paper-and-pencil data in all three scales, $p < .05$.

Table 5 Comparison of the Means of the Scales for Full Survey Data Collected through Web Versus Paper-and-Pencil Methods (N=75)

Scale Titles	Web Data	Paper-and-Pencil Data	*t* test Results
HSA vs. Students	M = 2.66, SD = .56	M = 2.92, SD = .50	t(df=71) = -2.08
HSA vs. Instruction	M = 2.73, SD = .40	M = 2.73, SD = .37	t(df=70) = .05
HSA vs. Schools	M = 3.11, SD = .60	M = 3.10, SD = .51	t(df=73) = .11

Note: All the *t* tests were for independent samples with unequal variances.

Discussion

The study results indicated that, as compared with the survey responses collected through the paper-and-pencil method, the Web survey data shared similar respondent demographics of gender and age, missing data rate, overall variability and mean response values. This study supported that the Web survey responses were comparable to the paper-and-pencil data in the data quality, values and demographic representativeness among school principals. This allowed aggregation of the two sets of survey data for further response analysis ignoring the medium via which the data were collected.

The number of respondents who responded via the Web was 1.6 times as large as that of the surveys collected through the traditional paper-and-pencil methods. This rate might not be the same if the respondents were offered choices of Web or traditional methods to complete the survey from the initial request. However, we received from the respondents more positive comments on the Web survey method than on the mail/fax method as we implemented the pilot and final survey.

In reflection of the survey experience, in addition to the possible factor of participants' interest in the survey content, the researchers would attribute the high response rate to the close follow-ups, and the offer of multiple methods—the WWW, mail or fax—for completing and submitting the survey. The access control of the Web survey was vital to the validity and credibility of data collection, and assigning exclusive passwords to participants enabled the researchers to send follow-ups specifically to those who had not responded. The last follow-up through the phone allowed individualized contacts with participants, and inquiry about their preference of the medium in completing the survey. The flow of the media employed to reach participants, from the Web, phone to mail, exemplified the notion suggested by Shaefer and Dillman (1998) that "researchers can begin with an e-mail approach and use progressively more expensive methods for nonrespondents until an acceptable response level is reached" (p. 3).

A lesson that could apparently be drawn from this survey data collection experience was to take into acrate possible filtering systems installed on participants' computers when designing the Web survey, especially when participants are likely to complete the survey through computer network facilities at their workplaces.

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Taking Statistics Doesn't have to be Scary: Keeping the Heartrate Down

HeeGyoung Song
John R. Slate
University of Missouri-Kansas City

Abstract.

In this paper, the authors will examine how a well-developed graduate-level statistics course that uses online technologies scaffolds students who are in M.A. degree and Ph.D. programs to become less anxious and to become more motivated towards developing statistical and technological skills and knowledge. The significant emphases upon which these authors will focus upon are the following instructor characteristics: 1) Ability to communicate statistics at a level that students can understand; 2) Desire to provide the students with quality online learning materials; 3) Multiple teaching strategies; 4) Interpersonal skills for interaction with students; 5) Ability to use technology; and, 6) Dedication to provide online and offline feedback to students. These six factors result in empowering students to learn and reducing their statistics anxiety while preparing for three exams and six assignments with the instructor's guidance.

Introduction

In this paper, these authors demonstrated how a teacher's well-developed online curriculum using technology and interpersonal skills with students in a Statistics Methods I class, and quality learning materials can influence students' motivation (Stipek, 2002), reduce their statistics anxiety (Onwuegbuzie & Wilson, 2003; Widmer & Chavez, 1986), and empower them to participate and interact (Dewey, 1997, p. 340). A thoughtfully designed class structures the process of learning new technology while fostering "social interaction" (Vygotsky, 1981, p. 145; Wetsch, 1981, p. 190) and knowledge of statistical content. As a student, the first author was deeply impressed by the teacher's skills in helping students construct "knowledge" (Barab & Kirshner, 2001, p. 5) through their "activity" (Leontiev, 1974-75, p. 10) as a unit of life mediated by mental reflection in Vygotskyian formulations (Robbins, 2003, pp. 55-58) and "reflexivity" (p.76) rather than "taking objects in from outside" (Bereiter, 2002, p. 20) in using technologies as mediation tools.

The teacher's curriculum included online course documents with information updated on a weekly basis, assignments, and guidelines to help students complete their assignments successfully and to provide the conditions to decrease anxiety associated with performing tasks and to increase motivation associated with both mastery learning skills and performance based on given tasks. Also, the online curriculum provided three sets of exam preparation exercises to help the students better know which concepts they needed to review. These materials served to reduce exam anxiety and assisted students in reaching their goals in this class and further in applying the concepts and ideas to realities (Beins, 1985; Lutsky, 1986). The three exams given measured the objectives outlined in this course's online curriculum and contents. Learning in this Statistical Methods I class was designed to take place with advanced skilled learners (Vygotsky, 1978), and to help less skilled learners expand their actual developmental level to the zone of promixal development (Vygotsky, 1978, 1987) both in the classroom and in the computer lab with the teacher playing the role of coach and facilitator (Bruning, Schraw, & Ronning, 1999, p. 195), who is always present to guide and scaffold the students and their learning to do their assignments and to understand what they need to do in their tasks.

Theoretical Framework

This research is based on Vygotsky's dialectical constructivism in sociocultural theory (Bruning et al., 1999, pp.196-198) and further is grounded in "Vygotsky's cultural-historical theory, which differs from sociocultural theory in the United States" (Robbins, 2003, p. XIII) in an effort to understand how the students learn in a technology-mediated statistics class. Onwuegbuzie and Wilson's (2003) comprehensive literature review related to statistics anxiety was implemented to analyze how the teacher designed this online curriculum to reduce statistics anxiety and empower the students to engage in doing tasks with advanced learners and teacher's help. Based on Vygotsky's (1978) views of "language and its importance

as a social and cognitive tool," statistics students face the same level of anxiety as a foreign language student. They feel frightened by the unfamiliar content and by the new language that must be used to learn and demonstrate mastery of this content.

In this Statistical Methods I class the teacher used technology as mediation tools to aid in communication and interaction with the students to reduce the four general components of statistics anxiety: 1) instrument anxiety; 2) content anxiety; 3) interpersonal anxiety; and, 4) failure anxiety (Onwuegbuzie, 2003, p. 201). This use of technology also helped to scaffold student learning and enhance student motivation in a graduate level statistics course. As Engestrom (2003) wrote, "human activity is endlessly multifaceted, mobile, and rich in variations of content and form" (p. 20), the activities that the teacher designed considered these "multiple intelligences" (Gardner, 1983) that impact the student learning and statistics anxiety (Onwuegbuzie & Wilson, 2003, p. 198). These activities also provide interaction at the level at which the students can understand in meaningful learning environments.

These activities, learning processes, and online curriculum using technology show how the internal aspects are first influenced by the external, logically following the model of "Vygotsky's dual-dialectical vision" (Robbins, 2003, p. 5) . Also, from a biological and/or cognitive perspective to understand interaction between learning and cognitive development, these authors examined the class activities, online curriculum, and use of technology that include "social interaction" (Lightbown & Spada, 2000, p. 23.) that distinguishes Piaget's view of language and cognitive development from Vygotsky's view. Furthermore, the understanding of human cognitive development in social interaction with skilled advanced learners' guidance is explained by "the zone of proximal development that defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state" (Vygotsky, 1978, p. 86; Robbins, 2003, pp. 28-48).

Technology used to aid the learners' learning and access to information and the online curriculum which was designed to address different "learning styles" (Onwuegbuzie, 1998) and cultural factors (Gay, 2000) in multicultural education (Banks & Banks, 2004) may influence student motivation for learning, reduce statistics anxiety, and finally, scaffold the students to further construct "knowledge" (Berger & Luckmann, 1967, p. 87).

Methodology

In this study, the first author used qualitative methodology with a case study method (Stake, 1995, p.xi; Eisenhardt, 2002, p.9; Patton, 2002, p. 297; Yin, 2003, pp. 9-13; Mile and Huberman, 1994, p. 25) to structure data and to analyze data collected through survey questionnaires, interviews, and classroom observation. From an emic perspective in this study, the first author, who is a student and researcher, interpreted and analyzed the data, and through these methods the author will demonstrate validity and reliability (Maxwell, 2002, p. 48; Merriam, 1998, p. 199). These interpretations were then shared with the second author, the instructor of the course. From Vygotsky's cultural-historical theory to activity theory (Engestrom) and situativity (Barab) in a cognitive perspective, these authors attempted to understand better how statistics anxiety can be reduced by the teacher's attitudes and innovative instructional design using technology. Also, these authors investigated how online curriculum and the appropriate timely online and offline feedback may impact student motivation.

Participants in this study came from a pool of 50 students in either M.A. or Ph.D. degree programs. Most of the students who are in the Statistical Methods I class were required to take this graduate level statistics course in their major emphasis or as background to develop their thesis or dissertation. The first author, as a researcher and doctoral student in both Education and Urban Leadership and Policy Study at the University of Missouri-Kansas City in the U.S., enrolled in this course to understand what statistics is, how data are collected, analyzed, and interpreted, and how research, conducted using quantitative methodological tools, would be able to be implemented in the real world.

Students and the faculty member met in a classroom that was well-equipped with technological tools, such as 20 laptop computers, access to the internet and Blackboard at the University, in the front two large projection screens on which the teacher projected well-designed PowerPoint slides, course documents, and up-coming dates. Also, the class was a roomy place with spiral-type stairs and individual chairs and with a good lighting system and ideal temperature adjusted to reduce the students' anxiety and stress.

The class met once a week for 2 hours and 45 minutes, for a total of 16 meetings during the academic 2004 Fall semester. Each meeting time the teacher used a whiteboard to let students know what to do, turned on the computer to access the university's Blackboard system, opened the online syllabus to

address what to do, and visited course documents to explain what to learn about. The syllabus was designed to allow students to obtain free quality materials that would support them at their current level of understanding and beyond (Miltiadou & Savenye, 2003). Because this class did not have required textbooks, which is different from most traditional classes, students needed to use technological tools to get resources linked to the internet web sites and to print out PowerPoint slides and handouts that include what the students should know about. In announcements through the university's Blackboard site for this course, the teacher supplied the students with the information that some web sites had disappeared and others had been updated. Also, before the teacher noticed these changes, some students mentioned the changes on the web sites of the class in the class and the teacher and later the whole class was informed through Blackboard.

Data were collected through survey questionnaires and interviews with the students and with the faculty member (Maxwell, 1996). The goal of data collection was to analyze and interpret the instructor's six characteristics from both the students' perspective and the teacher's perspective in class and online experiences and to find how the teacher's six characteristics resulted in empowering students' motivation to learn about, reduce their anxieties in preparing for three exams and six assignments with the instructor's guidance.

Data Analysis

Students were asked six open-ended questions on a survey questionnaire (see Appendix A). Summary statements for each of the questions will be followed with several representative samples of student comments.

Question 1: In what ways did your anxieties for this course increase or decrease during the semester?

In responding to this question, among 37 participants in this study, 17 students demonstrated that their anxiety has been decreased with the instructor's willingness to assist students' questions or concerns, quality materials designed to help students understand, instructor's high but reasonable expectation to the students, caring learning environments, and positive results of the exams. Ten students answered that anxiety increased. When the difficulty of topics increased, during the test and when preparing the exams, dealing with new terminologies and delayed homework assignments, the students said that they felt increased anxiety. Eight students answered that test and/or homework anxiety existed but these factors were reduced with the instructor's attitudes. The others (n=2) pointed out time demands outside class and lots of terminology that impacted their level of anxiety.

Anxiety decreased (n=17)

The instructor was open to questions and willing to assist

The teacher made the material easy to understand

Anxiety decreased as the content was presented in a detailed and repeatable format

My anxiety decreased because I became more and more comfortable using SPSS and taking Dr. Slate's exams

As grades increase, anxieties have decreased

Anxiety increased (n=10)

Anxiety increased as the difficulty of topics increased

During the tests, anxiety increased

Whenever I met new & very unfamiliar terminologies, the level of anxieties increased

I feel more anxiety when I prepared for exam

Test and/or homework anxiety but reduced these with instructor's attitudes (n=8)

My anxiety increased on the nights of the exams because I was worried I would not remember all the symbols...but my anxiety were lower during regular class night because Dr. Slate helped me feel that I could understand statistics.

Anxiety increased due to my minimal computer skills. Anxiety decreased by instructor's clear explanation of material and his testing using what he taught and review the material to prepare for the test. Anxieties increased when an exam was present and when assignments were due. Other than these times my anxiety was normally low.

Others (n=2)

Time demands outside class

Lots of terminology that was cumulative in nature

In summary, students felt uncomfortable and experienced anxiety. Gradually the instructor's willingness and well-structured quality online materials to assist the students' concern related to statistics

per se low-self esteem, exams, and assignments resulted in reducing the students' anxiety.

Question 2: In what ways did this Stat 1 class impact your motivation for academic achievement?

Concerning this question, 26 students mentioned that statistics class impacted their motivation for academic success. Specific factors they mentioned were grade points, preparation for future research skills, the instructor's prompt assessments and thorough feedback, and the students' increased self-confidence to take risks. Three students mentioned that statistics class did not much impact the students' motivation for academic success. One student answered that statistics class lowered the students' motivation for academic success.

Statistics class impacted the students' motivation for academic success (n=26)

The grade in the statistics class is what motivated me

Getting a good grade on the first test and on the first SPSS really motivated me to try harder and not give up

Even though this class was difficult and required a lot of study time I would like to learn more because it will affect my research skills in the future

Dr. Slate's prompt assessment and thorough feedback motivated me to study and achieve

I feel that I am comfortable with a subject now that I wasn't before. I am more willing to take risks

Statistics class did not much impact the students' motivation for academic success (n=3)

Not much. I like to do well in all classes

Not much. I have a lot of material already

Not much. I only wanted to pass

Statistics class lowered the students' motivation for academic success (n=1)

My motivation for academic achievement was lowered because of the need to balance course work, family and full-time employment.

In summary, most students reported they had been influenced by this Statistics 1 class in terms of academic achievement and motivation in their individual intellectual inquiry.

Question 3: In what ways did the use of technology impact your class performance, including three exams and six assignments?

Regarding this question, 29 students answered that the use of technology helped and improved their performance in preparing three exams and six assignments in the ways that the students can easily follow guidelines the instructor provided on Blackboard, focus on the content rather than keeping up with notes, and feel confident using the computer and running the SPSS. Five students answered that the use of technology negatively impacted their performance. One student said that the use of technology did not impact their performance.

The use of technology helped and improved my performance in preparing three exams and six assignments (n=29)

I appreciated the way Dr. Slate explained all steps in doing SPSS carefully and thoroughly. Also I appreciated having the PowerPoint presentations on the Web so I could print them out and take notes on them. It helped me have all study materials another web as well as the assignments. Helped to keep me organized

Very easy to use. I could concentrate on the content and not on keeping up with notes I printed them off Blackboard.

I have more confidence using it and the computer.

It helped me improve my class performance and ability for statistical analysis.

The use of technology negatively impacted my performance (n=5)

I wasn't very good with the SPSS program and feel it negatively impacted my performance.

It was a real "push" to come to the lab to use SPSS.

Many times I couldn't remember what things were nominal, ordinal, etc (basic concepts are confusing to run SPSS).

I am extremely frustrated at the SPSS program and it was hard.

Honestly, I hate technology, but I hate math more.

The use of technology did not impact my performance (n=1)

I was very proficient technology and computers. I have or had a strong aversion to learning the SPSS program—only because I know I will never use it in anyway in the future. I just wanted to be able to interpret research.

In summary, negative impacts to use technology in this class indicate that math concepts are relevant to some students' attitudes to use SPSS and technology even though majority of students said that

the use of technology helped and impacted positively their performance in preparing three exams and six assignments.

Question 4: Were there any instructional strategies used in this statistics 1 class that you would encourage other instructors to implement? Please describe.

Under the fourth question, 31 students pointed out significantly greater impacts in online syllabus design the instructor developed to share with other teachers, such as all materials on the web and well-constructed PowerPoint slides, additional online resources and use of links on website group discussion, and posting all information needed for all assignments in a very detailed and logical manner with real life examples. Three students mentioned the teacher's expectations and attitudes, such as simple, but clear expectations, availability of professor for student questions and attitude was amazing, and diligence of instructor to assist student to understand in their tasks. One student viewed test reviews and another attributed the instructional strategies used in this class to be the natural giftedness of the professor to deal with such complicated material. One student irrelevantly answered that she/he did not like Power Point presentations.

Online syllabus design and benefits for students (n=31)

The use of online material for instruction and posting lecture materials online was very useful

Liked the Power Point presentation of notes so I could "listen" to the lecture and understand to do so

No fixed textbook. Reading links on the blackboard gave me a lot of new ideas

Power Point decks with the important concepts and lectures were provided to all of us as references. This lessened the need for note taking. We could focus on additive notes and ever you've received a strong base

I benefited from the guided practice implemented in the on-campus computer lab

Power point, Blackboard, posting all information needed for all assignments in a step-by-step logical manner and very detailed with examples from real life.

Teacher's expectations and attitudes (n=3)

Yes, clear, crystal clear expectations

Simple explanations. Availability of professor for student questions and attitude of professor was amazing

Diligence of instructor make me to actually UNDERSTAND homework instead of just doing it

The instructional strategies (n=2)

Test reviews

The instructional strategies used in this class seemed to be more of a gift that the professor has for dealing with such complicated material. I do not know if the effectiveness can be mimicked. The instructor definitely has it

Others (n=1)

In general, I do not like Power Point presentations. They do not do an effective job of conveying knowledge, when compared to group assignments or other active learning techniques.

In summary, apparently, the instructor's high but reasonable expectations, caring attitudes, and well-designed online syllabus and relevant online learning materials were demonstrated as the very important implemental factors that other teachers are encouraged to apply.

Question 5: Do you think technology scaffolds what you learn in a positive way? Why or why not?"

Under this fifth question, 9 students said that technology scaffolded what they learn in a positive way, three students said that technology did not scaffold what they learn in a positive way, twenty three students did not respond to this question because under the fifth question there are several questions I assume.

No responses (n=23)

Technology scaffolded what I learn in a positive way (n=9)

Makes learners easier with better access to resources

Provides real world application

Easier to communicate and obtain instruction. I love having everything used in this easily accessible

Technology did not scaffold what I learn in a positive way (n=3)

I do not grow up with computers so I found assignments difficult

No

Others (n=2)

I learned a totally foreign software to me.

Yes and no. No in that when you are not sure how to use it. Things get more difficult and time consuming.

In summary, even though 23 students did not answer this question, partly the first author assumes this is due to the structure of the question including a main question and three sub-question categories. Nine

students explicitly stated that technology supported what they learn in a positive way.

Question 5.a. What problems, if any, did you experience accessing Blackboard to obtain online reading and learning materials and prepare for class activities and exams? Be as specific as possible.

For this question, 31 students said that there were no problems with Blackboard. Four students expressed that when the school server systems had some problems, they faced problems. The other two students pointed out effectively using digital internet connection and a personal computer at home.

No problems with accessibility to Blackboard (n=31)

No problems with Blackboard

It is easier to use and faster than my dial up connection at home

No problem experienced

I love having everything used in class easily accessible

Problems with accessibility to Blackboard (n=4)

Only a couple of times when the school server was down

Not being able to get on when server was down

I have a slow modem at home--- long wait time

Others (n=2)

Some of the listing are labeled more clearly than others.

The most important pieces need to use blackboard successfully is a digital internet connection and a personal computer at home.

In summary, except for technological problems in school server systems and personal computer at home, the students were able to easily access to the Blackboard system and reach the resources.

Question 5.b. Do you prefer to have required textbooks in this class or online, free materials?

Here, 31 students preferred to have free online materials. One student preferred to have a required textbook. Two students liked both a required textbook and free online materials. The other students indicated some elements that may be irrelevant.

I prefer to have online free materials in this class (n=31)

Online free materials

Save trees

I prefer to have a required textbook (n=1)

I prefer to have textbooks because selecting materials among several online resources makes me confused.

I like both (n=2)

I like both. If the book is good I like to retain it as a reference. I like a hard copy and printing out 500-1,000 pages of online material isn't really free since it takes time and toner.

I think online materials are good, however a book that will explain in better and more details will help a lot in understanding at the material.

Others (n=3)

It does not matter

I think the required material should be the student SPSS software. Just need to make the purchase process easier.

In summary, most of the students indicated that they want to have free online materials even though several students liked both.

Question 5.c. Please describe the "pros" and "cons" of using technologies, such as opening Power Point slides, printouts, and hands-on calculation.

Responding to this question, 21 students described the pros of using technologies to be easily obtainable and easy to follow, eight students described both the "pros" and "cons" of using technologies, pointing out the fact easier and faster and the worry about losing interaction with other students. Five students described the "cons" of using technologies, such as discomfort in using the technologies and loss of focus why they do what they do. Other factors are described with necessity of a prior knowledge to use Power Point.

The "pros" of using technologies (n=21)

Very helpful to have Power Point

Allow more time to listen to instruction

I appreciate and benefit from the visuals to help me organize the information in my head

It was very easy to use the technology

The "cons" of using technologies (n=5)

I think the goal of the "paperless classroom" hampered students' ability to learn

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It is difficult when you are relying on technology and some part of it fails

Forces people to use them if not comfortable and good

Both (n=8)

Pros—easy to organize and take notes on. I am so glad we had SPSS and did not have to use EXCELL or do it by hand. Cons—If I did not sit close I couldn't see

Pros—easy to access and less papers. Cons must have Power Point at home

Pros: time saver, cheaper, easily accessed. I do not have to carry books on my bike. Cons: I get lazy

Others (n=3)

A prior knowledge to how to work with Power Point is needed before coming to class

In summary, the important factors the pros of using technologies insisted indicated ease in using technologies, more time spent listening to the instructor, and mapping out with visual tools provided with technologies. Several factors concerning the cons of using technologies were related to students' laziness and accessibility to the technology at home and technical problems in case the server is down.

Question 6: Do you think Blackboard is good as a tool to disseminate information in online or offline courses? Why or why not?

Here, 32 students answered that the use of Blackboard as a tool to disseminate information in online or offline courses worked very well. Two students were neutral in this question. Three students were categorized in others, such as no response and comparing the instructor with others.

The use of Blackboard as a tool to disseminate information in online or office courses worked very well (n=32)

It was great

I appreciate having easy access to grades and assignments online

Excellent way to communicate with class

Liked that grades and announcements were quickly available

It is a very effective way. I would encourage all the instructions to do so

Neutral (n=2)

It is a tool but no means on all-encompassing one

Continue use as long as sources are not flooded again

Others (n=3)

Too many instructors are unskilled in its use and offer times expect timely posts from students, but not this instructor. Others fail to stay up to date themselves on grades, etc.

In summary, the use of Blackboard as a tool to disseminate information in online or offline course worked very well and provided the students with excellent resources in a very effective way

Four subcategories were present under the sixth question.

Question 6.a. how would you describe the instructor's relationship with the students?

For this question, 35 students stated that the relationship between the instructor and the students was a very positive one. Only one student answered negatively about the relationship between the instructor and the students.

The instructor's relationship with the student is described in a very positive way (n=35)

Professional. Showing personal interest by learning names and asking conversational questions. Focus on the lesson and start class with small talk concerning family, hobbies, and university issues

Wonderful and great. Very attentive, helpful, patient, enthusiastic, and energetic. Great instructor

Excellent. Receptive and open to changes, always willing to help, a knowledgeable.

The instructor is an asset to UMKC

Make sure all students are understanding the objectives of the course

Very thoughtful and caring

Professional with an approachable way

Excellent-friendly-respond in a positive and timely manner to questions or concerns

The instructor's relationship with the students is described in a negative way (n=1)

The instructor was a bit over heads as times. Very often the students were confused, but were unable to think of how to ask their question. Otherwise, he was very friendly, helpful, and gave timely feedback assignments.

Others (n=1)

In summary, except for one student and the other who did not answer this question, 35 students viewed the instructor as very thoughtful, open, helpful, knowledgeable, and available in a timely manner. Even one student who described negatively the relationship between the instructor and the students stated

that the instructor was very helpful and friendly.

Question 6.b.1. What correspondence, if any, did you use in this course with the instructor? (e.g., email, phone, face-to-face?)

For this item, 22 students corresponded with the instructor through email and face-to-face, ten students through email, two students through email, face-to-face, and, one student through email and phone, two students through face-to-face.

I corresponded with the instructor through email and face-to-face (n=22)

I corresponded with the instructor through email (n=10)

I corresponded with the instructor through email and face-to-face, and phone (n=2)

I corresponded with the instructor through email and phone (n=1)

I corresponded with the instructor through face-to-face (n=2)

I corresponded with the instructor through phone (n=0)

In summary, most of students corresponded with the instructor through more than one communication ways.

Question 6.b. 2. If yes, when and how often did you send emails to the instructor? Did this exchange impact your learning?

Sixteen students answered that they sent emails to the instructor 5-10 times, ten students sent emails to the instructor 2-3 times, five students marked that they sent emails to the instructor more than 10 times, two students sent emails to the instructor once, and four students indicated others.

I sent emails to the instructor 5-10 times (n=16)

When having trouble assignments, it impacted positively

It was very efficient way of communicating

Email exchange helped me communicate wit the instructor before or after class

I can get responses about my questions as soon as possible

No impact to learning in sending emails

I sent emails to the instructor 2-3 times (n=10)

The instructor was helpful in explaining things and in telling me what I missed on assignments

It impacted my learning by getting my questions answered quickly

Encouraged me to keep trying and that the instructor wanted me to learn

It was very helpful

I sent emails to the instructor more than 10 times (n=5)

Weekly or at least weekly. It had a significant impact in my learning

24 times during semester. Helped with my learning immediately

Great way to facilitate communication

I sent email to the instructor once (n=2)

Only for enrollment issue

Only once it gave me a small amount of information

Others (n=4)

No email exchange

Nothing mentioned to email frequency

In summary, the more frequently students exchanged emails with the instructor, the more positive were the comments that they made.

Question 6. c. Do you think the instructor communicated effectively with students? Please be specific.

Thirty four students answered that the instructor communicated effectively with students, such as very clear and concise instruction and nonjudgmental way in class, return of email in a timely manner, very fluent and very knowledgeable to ideas and concepts, and reasonable expectations, help the students whenever they are needy. One student answered that the instructor did not communicate effectively with student. The other two students' ideas belong to others.

The instructor communicated effectively with students (n=34)

Yes, return of email was prompt

Yes, the instructor was very approachable during and after class

Yes, he is very precise in his communication which helped make things very clear

His help on homework in the lab was terrific

Direct, effective, compassionate and real

The instructor tried to see what my problem was and how he could help

The instructor did not communicate effectively with students (n=1)

Very often the students were confused, otherwise the instructor was friendly, helpful, and gave timely feedback on assignments.

Others (n=2)

I have extremely high math anxiety and I even fainted in class once. However, I think I did o.k. because this class is more of a logic class to me than a math class.

In summary, the instructor communicated very effectively with the students and assisted the students to meet their real needs in classroom and a lab in a timely manner and friendly ways.

Findings

Based on the instructor's six characteristics: 1) Ability to communicate statistics at a level that students can understand; 2) Desire to provide the students with quality online learning materials; 3) Multiple teaching strategies; 4) Interpersonal skills for interaction with students; 5) Ability to use technology; and , 6) Dedication to provide online and offline feedback to students, the data collected by survey questionnaires and interviews were analyzed. Based on the results of the instructor's survey (see Appendix B), most of all, the teacher beliefs about learning were demonstrated to be a very important factor. This faculty member believed that study skills that include good learners' characteristics were: 1) willingness to take risks, 2) a strong drive to communicate with peers and the teacher, 3) asking for help when the learner needs help, 4) practicing to learn more about things associated with statistics contents and realties, 5) monitoring progress, and 6) making connections within experiences and interests. These characteristics can influence students' motivation and reduce anxiety in the statistics class and increase students' self-confidence to complete their six assignments and to pass three exams and finally develop their performance and master necessary skills. Based on his beliefs about learning, the online curriculum was designed and quality learning materials were provided to allow the students to engage the content at a level that they can understand and to communicate with the teacher through technologies and face-to-face interaction. Also, the teacher focused on helping students understand rather than memorizing formula. The instructor also placed emphasis on content related to statistics findings and realities in a graduate level statistics course.

The teacher's interpersonal skills, including warmth, caring, the ability to listen well, and availability to students through emails and online dialogues, made the students feel comfortable to communicate with the teacher and ask for help to clarify what they need to know about in given classroom tasks and move beyond to apply what they learn to read-world situations.

Even though the class size was large with an enrollment of 50 students, students worked in collaborative environments with a well-equipped computer lab and a roomy classroom that had 50 laptop computers available. Ease in accessing quality on-line resources and teacher's immediate feedback allowed the students to share what they found to be problematic in completing their assignments and to prepare for exams. Except for two students, they strongly demonstrated their academic success in this graduate level statistics course.

Finally, these six factors resulted in empowering students to learn and reducing their statistics anxiety while preparing for three exams and six assignments with the instructor's guidance.

Implications

Findings in this study were interpreted to mean that using an online syllabus, online instructional technologies, and the instructor's six characteristics can maximize the students' motivation and reduce anxieties in a graduate level statistics class. Further research needs to be conducted by using technologies as a means to better provide the students with instructional online curriculum at levels that students understand and that synchronically and asynchronically allows the learners to access quality online learning materials that consider multiple intelligences (Gardner, 1983) and empowers them to "know about" (Barab & Duffy, 2000, p. 28). Also, technology as a means to mediate the learners' inner thought into doing activities should be used in practical collaborative environments and in conditions that consider the levels at which the teacher and the learners understand one another. As Robbins (2003) wrote that "learning results through meaningful activity" (p.76) and "the basic components of Russian activity theory are activity=act=operation" (p. 76) and " the corresponding conditions are need=motive=goal" (p. 76), the practical implication the author insists upon is to empower the individual learners toward "self-regulation" (Robbins, 2003, p. 67) and "self-actualization" (Maslow, 1987 pp. 158-167). These six factors result in empowering students to learn and reducing their statistics anxiety while preparing for three exams and six assignments with the instructor's guidance which stresses the expressive quality of self-actualizing

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creativeness rather than problem-solving or product-making quality, and this helps learners grow. Finally, as this research demonstrates, a good teacher communicates in ways that allow the students to see, hear, and touch and conceive "the world [that] is a symbolic world in the sense that it consists of conceptually organized, rule-bound belief systems about what exists [different from statistically significant findings], about how to attain goals, about what is to be valued" (Bruner as cited in Leontiev, 2003, p. 20) The learners should know what they need know about and what they do not know in socially culturally constructed learning environments and through meaningful activities. Again, technology is a tool and as Gunter (2001) stated, to close the teaching and learning technology gap between where we are and where we need to be in the 21ˢᵗ century, instructional design and curriculum should be focused on preparing the students to participate in using technologies to learn. In this sense, the study the authors investigated is a case that demonstrates how technology use and teacher attitudes reduced statistics anxieties and impacted the student motivation, reflecting a literature review that indicates "only a few researchers have investigated ways to reducing statistics anxiety" (Onwuegbuzie & Wilson, 2003, p. 202).

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Configuring graphic organizers to support higher-order thinking skills

Cameron Spears
Gregory Motes
William A. Kealy
University of South Florida

Abstract

Graphic organizers (GO) spatially arrange conceptually related words as a text alternative that aids comparative and inferential judgments. Past GO research has only studied displays consisting of words. This experiment, by contrast, studied GOs that employ "retinal variables," such as size and color, to nonverbally depict concepts. This strategy, we argue, reduces the cognitive load imposed by a GO by reducing its number of elements and "offloading" a portion of verbal encoding to visual processing.

Configuring graphic organizers to support higher-order thinking skills

Researchers have long sought way to help readers both recall the information contained in texts but also to better understand the relationships between the ideas and concepts presented therein. Besides the various instructional strategies devised for this purpose, such as summarizing, outlining, and highlighting (Snowman, 1986), many types of adjunct graphic displays have also been used to improve learning from text. Some displays, such as pictures, photographs, and maps, elaborate text by presenting information, such as spatial relationships, that would be difficult to comprehend through words alone. By contrast, another class of adjunct displays, exemplified by concept maps, "tree" diagrams, and graphic organizers, are not representational in nature, but rather what Rieber (1994) classified as "arbitrary" graphics.

A common trait of these arbitrary graphics is that they possess an organizational structure that is the basis for the support they provide during reading. This is exemplified especially well by a graphic organizer (GO), the focus of this report, which is an array-like arrangement of key terms in an accompanying text. These words are spatially organized on the GO in such a way that their relative placement to one another reflects the conceptual relationships present in the corresponding prose. Hence, like a table, a GO uses space to organize words—specifically, ones that are conceptually related. Nevertheless, they differ substantively in their potential for precisely representing data—tables afford greater exactitude while GOs are able to provide viewers with a "qualitative gist of relationships" (Shah and Hoeffner, 2002).

The facility of a GO for showing conceptual relationships at a glace allows it to serve as an effective alternative for gleaning the same information from a text. For example, consider the text and corresponding GO shown in Figure 1. It is clear that the task of locating a fact, which Wainer (1992) states is the most elementary

Table 1 *Mean percentage correct scores and response latencies on comparative and inferential judgments during two trials following study of a graphic organizer (GO) differing in methods for depicting information*

Type of GO	Performance		Mental Task			
			Comparisons		Inferences	
Depiction	Measure		Trial 1	Trial 2	Trial 1	Trial 2
Label (15)	Accuracy	X	0.70	0.76	0.74	0.88
		SD	*0.19*	*0.17*	*0.24*	*0.17*
	Latency[1]	X	7.19	5.89	6.57	5.30
		SD	4.12	2.38	2.81	1.48

Size (16)	Accuracy	*X*	0.75	0.83		0.81	0.93
		SD	*0.14*	*0.11*		*0.20*	*0.11*
	Latency	*X*	6.92	5.78		7.52	5.43
		SD	4.48	2.29		5.12	2.23
Color (17)	Accuracy	*X*	0.74	0.79		0.73	0.87
		SD	*0.19*	*0.13*		*0.20*	*0.17*
	Latency	*X*	6.98	6.35		7.32	5.66
		SD	3.63	3.11		2.16	1.79

Note: Number of participants in each treatment group shown in parenthese.

[1] Mean latency figures are in seconds

function of an information array, is much easier to perform using the latter. Additionally, research has demonstrated that GOs are effective alternatives to text when learning tasks involve making comparative judgments about the information presented (Robinson & Schraw, 1995; Kealy, 2000).

One explanation for this effectiveness of GOs is that they arrange information in a way that facilitates side-by-side comparison, presenting a "visual argument" in which the interrelationships among their data elements are clearly evident (Robinson, Robinson, & Katayama, 1999). Additionally, because GOs presents verbal information in a spatial format, researchers have proposed that, unlike lists and outlines, this material is concurrently encoded through separate but mutually referable processing channels (Paivio, 1986, Robinson & Schraw, 1995). Hypothetically, by conjointly retaining information in linguistic and imaginal mental storage, the GO's visual components can be brought into working memory during recall to act as a secondary retrieval cue for the semantically-related verbal material (Kulhavy, Lee, & Caterino, 1985; Robinson, Katayama, & Fan, 1996). Because graphic organizers present information in a combined verbal—visual format, they are considered by some (Robinson, Corliss, Bush, Bera, & Tomberlin, 2003) to be a type of multimedia and subject to many of the principles of multimedia design that have been formulated by Mayer (2001).

Theoretical Premise

An important consideration in the design of multimedia, and a major concern for the research reported herein, is how to reduce the "cognitive load" of information displays. Sweller (1988) defines cognitive load as the demand on mental resources imposed by both the number of elements and the interrelatedness of these elements for a given task. Since the hallmark of GOs is their ability to simultaneously present many interrelated concepts, it is conceivable that their cognitive load could be potentially high. In these instances, one might be able to perform a task by consulting a GO yet learn nothing from the display (i.e., fail to later recall relationships depicted on the GO) because its high cognitive load had exhausted available mental resources, leaving none for learning to occur.

The current study explored the possibility of reducing the cognitive load of a GO by substituting some verbal descriptions with their non-verbal equivalent. Typically, GOs employ only the two "planar" variables (i.e., the x and y axes) for signaling conceptual relationships through the spatial relationship among verbal labels. By contrast, our study incorporated "retinal variables" (Bertin, 1983) whereby variations in the color or size of an icon, for example, replaced the names of colors or numerical values, respectively. Doing so, we speculated, would diminish cognitive load in two ways. First, this would reduce the number of elements in the array since one icon could represent color and size while the equivalent depiction in words would require twice the number of objects. Second, this strategy "offloads" some linguistic components for imaginal processing (Mayer & Moreno, 2003) resulting in more even distribution of the mental task between the two components of working memory, the "phonological loop" and the

"visuospatial sketchpad" (Baddeley & Hitch, 1974) that respectively handle verbal and visual encoding.

Method

Design and Participants

The study was a 3 Display (Labels vs. Size vs. Size + Color) x 2 Trials x 2 Mental Task (Comparisons vs. Inferences) factorial design with Display varied between subjects and both Trials and Mental Task acting as repeated measures. Forty-eight undergraduates enrolled in a sophomore-level educational technology class volunteered to participate in the study. Those participants who completed the study received extra credit points toward their course grade. As participants arrived at the study classroom they were randomly assigned to computer programs that presented one of three versions of GO: a) verbal labels only (Labels), b) labels plus circles depicting fish size (Size), and c) labels plus colored circles indicating fish size and coloration (Color).

Materials

Text. Central to this study is a 204-word prose passage that describes several fictitious species of fish along with several attributes of these fish. This passage, or its precursor, has been used in previous research on graphic organizers (Kealy, 2000; Kiewra, Kauffman, Robinson, Dubois, & Staley, 1999) Robinson & Schraw, 1994; Robinson & Skinner, 1996). Fish characteristics related by the text include each species' social grouping, size, preferred depth, coloration, and diet. Readability metrics for the passage include a Flesch Reading Ease of 83.7 and a Flesch-Kincaid Grade level of 4.3.

Displays. The display identified as "Labels" (i.e., the display showing only textual cues) was derived from one used in a previous study (Kealy, Tada, & von Eberstein, 2000). The Labels display served as a baseline for the remaining two displays used in the study. The display identified as "Size" built upon the Labels display (see Figure 2) by using circles to represent the relative size of fish—larger species of

	LIFESPAN OF BUFFALO		
	20 years	25 years	30 years
Name:	American Bison	African Buffalo	Asiatic Water Buffalo
Color:	golden brown	dark brown to black	medium brown to gray
Height:	6 ft.	5 ft.	4 ft.

The North **American Bison**, characterized by its a great shaggy coat of curly **golden brown** fur, lives in the Rocky Mountains from Colorado to sub-arctic Canada. A typical male lives about 20 years and stands 6 ft. tall. The African Buffalo has a sparsely haired hide that is brownish to black in color. It roams the open grasslands of the Sahara in eastern Africa, has a lifespan of about 25 years, and stands 5 ft. tall. **Asiatic Water Buffalo**, which range between **medium-brown to gray** in color, grow to about 4 ft. high and have an average lifespan of 30 years.

fish were depicted using circles with greater diameter when compared to smaller species of fish. The display identified as "Color" built upon both the Labels and Size displays, with the added cue of color: the word representations of color in the Labels and Size displays were replaced with actual colors in the Color display, whereby the color of a particular circle represented the color of the corresponding fish species.

The study took place in a technology-equipped classroom at a major southeastern university. The room was outfitted with twenty-five computer workstations, each running the Microsoft Windows XP Professional operating system. Each workstation was equipped with a 15" (diagonal) flat panel liquid crystal display (LCD) configured at a video resolution of 1024 x 768 pixels. The three treatments (Labels, Color, and Size) were installed in equal numbers on twelve of the workstations, with sufficient space between them to reduce the chance of participants inadvertently viewing an alternative experimental condition. As an additional preventative measure, the simpler GOs (i.e., the Labels treatments) were on the front-most workstations, with the more complex GOs (i.e., the Color) treatments) on the rear-most workstations. The GOs with intermediate complexity (Size) were installed on workstations roughly in the middle of the room. Hence, with this arrangement we precluded participants from seeing, either inadvertently or intentionally, a more "interesting" GO on a neighbor's computer display.

Procedures

The prose passage and experimental graphic organizers were integrated into three separate computer-based treatments by means of the Macromedia Authorware CAI development program. Each of the three programs provided instructions about GOs and how they are used. Participants then practiced making two types of judgments by recalling the display information: comparisons (e.g., "which fish is larger?" [salmon or cod]) and inferences (e.g., "Fish living at greater depths tend to be____" [larger or smaller]).

Upon being seated at a computer (according to random assignment), participants were presented with a single field blue display—this display is the Authorware's "ready" screen. With the aid of a script, the study proctor gave the participants an overview of what they would be doing. They were then asked to press the TAB key to start. A brief paragraph of text appeared, giving an overview of the session while also reminding participants of the voluntary nature of their participation in the study. Each participant was then prompted by the program to enter his or her gender and major.

Participants were then presented with the first of five instructional screens explaining that they would have five minutes to study a 200-word passage about different types of fish. The participants were also told that a small clock icon would be displayed in the upper-left corner of their screens to aid them in managing their time as they read the passage. Participants then traversed the remaining instructional screens at a speed convenient for them. The fifth screen informed the participants that they would be answering comparison and inference questions about the fish passage that they had read. Participants were presented with examples of comparison and inference questions based on a text about buffalo (see Figure 1) adapted from a study by Robinson, Robinson, and Katayama (1999). Upon completion of this step, participants studied the experimental fish passage for five minutes. While studying the experimental fish passage, participants had the option of viewing (by means of a button labeled "View GO") their particular graphic organizer as often, and as long, as they chose (subject to the five-minute study period, however).

Immediately after the five-minute study period, three two-column simple addition problems were presented on the display. The experimental program prompted the participants to confirm the accuracy of each sum presented by pressing "Y" if correct or "N" if incorrect. This brief interpolated task was intended to prevent participants' rehearsal of target information in working memory before the experimental program administered the criterion measure.

Participants then viewed an exemplar of a comparison question based on a fish characteristic other than the ones contained within the previously studied text passage. During this portion of the participants' preparation stage, the lower half of the display contained two side-by-side shaded equal-sized rectangles, each with a single-word answer in the center. Participants were told to respond to the question shown ("Which fish typically weighs more?") by clicking on the box that represented the correct answer ("Cod" or "Dolphin" in this example). Once clicked, the video attribute of both the shaded rectangle and enclosed word was briefly inverted to signal that the experimental program had recorded the response. Next, participants were presented with an exemplar of an inference-type question (i.e., "Fish that weigh less tend to have a_____lifespan") with two response choices, each contained in a separate rectangle ("longer" and "shorter" in this example).

The program then presented information indicating that an asterisk symbol would appear in the center of the display for a two-second period immediately before each comparison and inference question were presented to the participants. Participants were encouraged to make their responses as quickly as possible, while still striving for accuracy. They were then directed to press the TAB key to begin a brief practice session in which they could become acquainted with some sample comparison and inference questions. Once the practice items session was complete, participants were presented with information indicating that the sample questions were similar to the questions that the participants were about to view. The instructions encouraged participants to work quickly and to do their best while performing the task. Participants were then presented with the 30 criterion questions, one at a time. Half of the questions were comparison-type questions; the other half comprised inference-type questions. The Authorware program was designed such that the 30 questions were presented in random sequence.

Upon completing the above steps, the participants immediately began a second trial, beginning with the fictitious passage/GO-viewing segment of the study.

After completing the two trials, participants were asked to rate the helpfulness of several attributes of the experimental program materials. As each helpfulness rating question was presented, participants

were presented with a slider bar which was labeled "0 Unhelpful" at its left end and "5 Helpful" at its right end. The helpfulness-related questions presented to the participants were: "How helpful was the text for recalling how fish compared to one another in their characteristics?"; "How helpful was the GO for recalling how fish compared to one another in their characteristics?"; "How helpful was the GO for recalling inferences about the way fish characteristics were interrelated?"; "How helpful was the text for making comparisons between fish in their various characteristics?"; "How helpful was the text for recalling inferences about the way fish characteristics were interrelated?", "How helpful was the text for forming inferences about the relationship between fish variables?"; "How helpful was the GO for making comparisons between fish in their various characteristics?"; and, "How helpful was the GO for forming inferences about the relationship between fish variables?"

Participants were then presented with a free-form text entry field, at which time participants were directed to "Please briefly describe any mental tricks or strategies used" by entering their responses in the text box, then pressing the Enter key.

Upon completion of the steps above, participants were presented with a statement of debriefing that provided experimenter contact information and also thanked the participants for their participation. Participants then left their computer workstations, were given their extra course credit vouchers, and left the study session.

Results and Discussion

Following the experimental sessions, we extracted the data from the computers and entered it into a spreadsheet to compute descriptive statistics. For the subsequent inferential statistical analyses, we chose an alpha of .05 as the level of significance.

Judgment Performance

Initially, we calculated means and standard deviations for participants' performance on comparative and inferential judgments. Table 1 shows the results of these calculations. Mean performance on question dealing with inferences was, much to our surprise, generally higher than for questions involving comparative judgment. With the exception of Trial 1 performance by those viewing the Color GO, this was true across all treatment groups during both experimental trials. Also evident from the table was the global improvement, of roughly ten percentage points, in performance on both criterion measures from Trial 1 to Trial 2.

We examined the relative differences in judgment accuracy across the treatment groups through a 3 GO Display (Color vs. Labels vs. Size) x 2 Trials x 2 Mental Task (Comparisons vs. Inferences) x 5 Question Type (Color vs. Depth vs. Feeding vs. Grouping vs. Size) repeated measures ANOVA. The analysis revealed significant main effects for Trials, $F(1,45)=38.27$, $p<.01$, $d=1.0$, Mental Task, $F(1,45)=11.72$, $p<.01$, $d=.92$, and Question Type, $F(4,180)=13.78$, $p<.01$, $d=1.0$. Additionally, the analysis reported a significant, $F(1,45)=6.13$, $p=.02$, $d=.68$, Trials x Mental Task interaction, where Trial 1 performance on comparisons ($X=.73$, $SD=.17$) and inferences ($X=.76$, $SD=.21$) was statistically equivalent whereas during Trail 2 comparative judgment ($X=.79$, $SD=.14$) was significantly lower than inferential judgment ($X=.89$, $SD=.15$).

Our analysis also revealed a Trials x Question Type interaction that was significant, $F(4,180)=2.58$, $p=.04$, $d=.72$, as well as a significant, Display x Mental Task x Question Type interaction, $F(8,180)=2.10$, $p=.04$, $d=.83$. The latter, depicted in Figure 3, was particularly interesting to us since it

suggested a complex interplay between GO design and the cognitive task for which it is applied. For example, performance on comparisons dealing with fish color was better when the Size GO was used, exceeding performance on inference questions. Comparative judgment was also superior to inferential judgment on questions related to the size of fish. In this instance, however, participants using the Size GO obtained the highest performance for both types of questions. This display also yielded the highest performance on questions pertaining to inferences about the socialization of fish while those using the Color GO answered comparisons about this fish characteristic better.

Mental Strategies Used

To analyze the strategies participants reported using to remember fish information, we assigned one or more codes to each participant's response, based on keywords or apparent meanings contained in participant responses. Our baseline codes were taken from a prior GO study (Spears & Kealy, 2005):

AC	acronym formation
CA	categorical assignment
CL	counting of letters on the display
CO	colors used – observing those
LE	letters of alphabet appearing on the display
ME	memorized the information provided
RE	repetition of the information provided
RL	relationships – noting those evident
VC	visualizing the chart
x	no meaningful response

Certain participant responses in the present study seemed to be novel or qualitatively different from responses collected in prior research. To accommodate these cases, several new codes were defined for the present study:

GA	game related
KW	key words
PA	patterns
RS	rhyme or song
SA	sound-alike words

By visual inspection, it was clear that the most popular strategies overall were "letters of the alphabet" (LE) and "memorized the information provided" (ME); each of these strategies had fourteen reported occurrences. The next most frequently occurring strategy was coded as "relationships – noting those evident" (RL) with twelve reported instances. The number of reported metacognitive strategies falling into these three categories comprised just over 57% of all reported strategies.

When considering the strategies with respect to treatments, we noted an interesting trend: as the representative complexity of icons in a treatment increased, so did the number of reported metacognitive strategies. That is, as icon complexity increased from Labels, to Size, to Color the total number of reported strategies also increased, with 20, 22, and 28 strategies reported respectively.

As noted above, participants frequently reported using letters of the alphabet (strategy LE) as a metacognitive strategy. Unlike the visualization and memorization strategies, the letters of the alphabet strategy was distributed fairly evenly across treatments (4, 4, and 6 for Labels, Size, and Colors respectively). Representative participant comments included, "I matched the names of the fish together using the first letters of each name…" or "I would use the first letter of each word of the different fish to remember whether or not they were solitary, lived in small groups, or lived in a school of fish."

The most striking outcome of the study was the generally better performance by participants in answering questions involving inference making versus questions that entailed comparative judgments. This contradicts the findings of Robinson and Schraw (1994) in which participants performed better using a GO than just a text, but without the differences between comparative and inferential judgment expected by the researchers. However, the better performance on inferences over comparisons that was observed in the

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current study was not evident for all question types. As previously stated, participants were more capable in making comparisons versus inferences when the question dealt with the size of fish. The fact that this was especially true among those using the Size GO is intriguing. Conceivably, the capacity of a GO for making a visual argument is enhanced when it employs retinal variables, such as size and value, that Bertin (1983) claimed were more effective than others (e.g., color, shape) for representing information.

There are several areas of future research with graphic organizers that have emerged from the current study. In this study we used a very short text and a corresponding GO that were fictitious; further research needs to examine the effectiveness of GOs that are adjuncts for longer, more authentic discourse. Another research issue pertaining to GOs is the timing of their use with respect to an accompanying text. In most studies on GOs, participants view the display and text on separate occasions. We believe our present study, in which participants were able to view the display at any time during the text reading, is more ecologically valid, but does this practice lead to better performance? A similar approach using pop-up computer graphics (Beâtrancourt & Bisseret, 1998) has been shown to be superior to text with integrated graphics; possibly a pop-up "GO on demand" would further improve the benefits gained from this class of graphic displays. Undoubtedly, graphic organizers will continue to be a subject of study for years to come.

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Investigating Hispanic Pre-Service Teachers' Self-Efficacy for Technology Integration on the Subscale Level

Michael Sullivan
Cheng-Chang Pan
Juan Hinojosa
The University of Texas at Brownsville/Texas Southmost College

Background & Introduction

Course Design

The course was created three years ago in order to prepare pre-service teachers to be able to use a variety of technology tools in both their undergraduate courses and in their student teaching field experience. The course is not intended as a "one shot" injection of technology skills for future teachers. The students are exposed to a variety of technology uses in subsequent coursework in the School of Education at the university, and in their coursework in other campus schools and colleges.

The course objectives closely align with the Texas State Board of Educator Certification (SBEC) Standards for what future educators need to know in order to be certified and to be effective classroom teachers. SBEC has delineated 13 competencies for future educators that are labeled "Pedagogy and Professional Responsibilities." Number nine of those competencies addresses technology use in the classroom and reads,

> The teacher incorporates the effective use of technology to plan, organize, deliver, and evaluate instruction for all students.

This statement (competency nine of the SBEC competencies for future teachers) is the terminal objective for students in the course in which the following study took place.

Research Questions

1. How much does the interaction between Time and Semester affect Self-Efficacy for Technology Integration on the subscale level?
2. To what extent do four personality traits affect Self-Efficacy for Technology Integration on the subscale level?
3. What demographics variables can affect Self-Efficacy for Technology Integration on the subscale level?

Methodology

The quasi-experimental study is intended to explore the change of Hispanic pre-service teachers' self-efficacy for use of technology in the classroom on a subscale level between the beginning and the end of each semester during the year of 2004 and 2005.

A total of 172 pre-service teachers participated in this study, which generated a response rate at 90% in the Fall Semester of 2004, 100% in the Spring of 2005, and another 100% in Summer I of 2005. A traditional in-class questionnaire was adapted and administered from the literature to collect and measure Self-Efficacy for Technology Integration (Wang, Ertmer, & Newby, 2004), Long and Dziuban Learning Style Inventory, e.g., personality traits (as cited in Bayston, 2002; Ouellette, 2000), and Demographics (Pan, 2003) at one time during the week after the add-and-drop day and anther time two weeks prior to the end of individual semester. A sample question on Self-Efficacy for Technology Integration scale is "I feel confident about grading technology-based projects." A sample personality trait on Long and Dziuban Learning Style Inventory measure is "Phobic," which is described using the following pointers:

- Thinks of all possibilities and contingencies before venturing into activates,
- "What if…" person,
- May see the negative side of things, and
- Unwilling to take risks.

Using Principal Component Analysis and Varimax with Kaiser Normalization as the extraction method and the rotation method in SPSS v.13, data reduction results showed that the Self-Efficacy for Technology Integration scale consisted of three subscales: Self-Efficacy for Clinical Teaching (SECT), Self-Efficacy for General Use (SEGU), and Self-Efficacy for Responsiveness (SER). Of all the 20 items, 12 were

clustered on SECT, 4 were on SEGU, and another 4 on SER. SECT deals with specific classroom settings where technology is incorporated, like "I feel confident about selecting appropriate technology for instruction based on curriculum standards." SEGU is concerned with general technology integration situations, like "I feel confident that I can maximize computer capabilities in my classroom." SER addresses items pertaining to learning contexts for technology responsiveness purposes, such as "I feel confident I can be responsive to students' needs during computer use." These three subscales or factors were explained by the total variance at 32%, 18%, and 17%, respectively. Concerning internal consistency testing, a Chronbach reliability alpha was calculated for six datasets (2 times by 3 semesters) with the highest value of .94 and the lowest value of .76, suggesting each clustered or latent factor was well-manifested through its contributing variables. Independent variables entailed time, personality trait, and demographics variables (categorical data); dependent variables included SECT, SEGU, and SER (interval data).

Results

Question 1 How much does the interaction between Time and Semester affect Self-Efficacy for Technology Integration on the subscale level?

Thirty cases from each of the six datasets were randomly selected and merged into a separate dataset, named D1, with a total of 180 cases.

Using SECT as the dependent variable, a two way ANOVA with Time and Semester as the two levels was performed. No statistically significant interaction effect between Time and Semester was found, $F(2, 174) = .74$, $p = .49$. No statistically significant difference among the group means for Semester was found, $F(2, 174) = .47$, $p = .63$. However, a statistically significant difference between the group means for Time One and Time Two was found suggesting that our data are unlikely, assuming that the null hypothesis is true, $F(1, 174) = 45.30$, $p < .001$. We therefore reject the null hypothesis in favor of the alternative which states that a difference exists between the Time means in the population ($R^2 = .20$).

Using SEGU as the dependent variable, a two way ANOVA with Time and Semester as the two levels was performed. No statistically significant interaction effect between Time and Semester was found, $F(2, 174) = 1.81$, $p = .17$. No statistically significant difference among the group means for Semester was found, $F(2, 174) = .46$, $p = .63$. However, a statistically significant difference between the group means for Time One and Time Two was found suggesting that our data are unlikely, assuming that the null hypothesis is true, $F(1, 174) = 37.96$, $p < .001$. We therefore reject the null hypothesis in favor of the alternative which states that a different exists between Time means in the population ($R^2 = .18$).

Using SER as the dependent variable, a two way ANOVA with Time and Semester as the two levels was performed. No statistically significant interaction effect between Time and Semester was found, $F(2, 174) = .59$, $p = .56$. No statistically significant difference among the group means for Semester was found, $F(2, 174) = .34$, $p = .71$. However, a statistically significant difference between the group means for Time One and Time Two was found suggesting that our data are unlikely, assuming that the null hypothesis is true, $F(1, 174) = 25.82$, $p < .001$. We therefore reject the null hypothesis in favor of the alternative which states that a difference exists between the Time means in the population ($R^2 = .13$).

Question 2 To what extent do four personality traits affect Self-Efficacy for Technology Integration on the subscale level?

Four personality traits from Long and Dziuban Learning Style Inventory: Phobic, Obsessive, Impulsive, and Hysteric were treated as independent variables and they are dichotomous variables. Dependent variables entailed SECT, SEGU, and SER scores.

A *t*-test for independent samples was conducted (see Table 1).

Table 1 *T-Test for Self-Efficacy for Technology Integration on the Subscale Level by Personality Trait*

Self-Efficacy	Phobic		Obsessive		Impulsive		Hysteric	
	df	t	df	t	df	t	df	t
Time 1								
SECT	169	-2.22*	167	1.90	167	-1.34	166	-1.62
SEGU	169	-2.46*	167	1.75	167	-1.23	166	-2.10*
SER	169	-2.34*	167	1.54	167	-1.82	166	-1.27
Time 2								
SECT	162	-1.60	160	1.11	160	-.137	160	-1.37

SEGU	162	-.10	160	.77	160	-.70	160	-.87
SER	162	-.11	160	1.20	160	-1.69	160	-1.42

Note. *$p < .05$.

Question 3 What demographics variables can affect Self-Efficacy for Technology Integration on the subscale level?

Four dichotomous variables were treated as independent variables: Sex (male vs. female), Work (no fewer than 20 hours vs. no more than 20 hours), PC Use (more than six years experience vs. no more than six years experience), and Internet Access (yes vs. no). Dependent variables entailed SECT, SEGU, and SER.

A *t*-test for independent samples was conducted (see Table 2).

Table 2 *T-Test for Self-Efficacy for Technology Integration on the Subscale Level by Demographics*

Self-Efficacy	Sex		Work		PC Use		Internet Access	
	df	*t*	*df*	*t*	*df*	*t*	*df*	*t*
Time 1								
SECT	167	.99	170	-.08	167	-3.27**	26.82	1.67[a]
SEGU	167	.48	170	.37	167	-3.13**	26.66	1.34 [a]
SER	167	.43	170	.18	140.1	-.2.63 [a] **	167	1.69
Time 2								
SECT	161	-.21	161	-1.45	161	-4.06***	161	1.57
SEGU	161	-.03	161	-1.3	161	-4.78***	161	2.35*
SER	161	-1.07	161	-2.12*	161	-4.45***	161	1.77

Note. [a]The assumption of equal variances was not met.
*$p < .05$. **$p < .01$. ***$p < .001$.

Conclusions

In attempt to investigate the interaction effect between Time One and Time Two across the three semesters and its impact on the students' Self-Efficacy for Clinical Teaching, we were not able to find any significant interaction between the two time occasions and the three semesters. However, the results showed that Self-Efficacy for Clinical Teaching on Time One is different from that on Time Two, suggesting that these student teachers' confidence in applying technology into specific classroom settings increased upon completion of the mandated computer literary course. A similar result was also found in both Self-Efficacy for General Use and Self-Efficacy for Responsiveness. Though, we were not able to find the difference among the three semesters on student confidence level of technology use in clinical teaching (SECT), general settings (SEGU), or responding to student needs (SER). All these suggested (a) students enrolled in Fall 2004, Spring 2005, and Summer 2005 were not different in the three areas of confidence from one another, and (b) students completing this course in all three semesters were not different from one group or another in their confidence in the three areas. The former may have been that education majors tend to be homogeneous in terms of their self-confidence in instructional use of technology. The latter may have been that the design and implementation of the course has been consistently carried out. As a matter of fact, these cross-semester datasets were collected in nine course sections instructed by one experienced field-based instructor. Our interview with the instructor indicated that the instructor managed to encourage a risk free learning environment. Students in his class received both individual attention from the instructor and personal assistance from their peer.

Using a *t*-test for independent samples, we were able to study the means difference in SECT, SEGU, and SER between student groups of each personality trait at each time point and in each semester. Results showed that (a) in the beginning of the class students with a Phobic type of personality tend to be less confident than their counterpart in all the three areas, (b) in the beginning of the course students with a Hysteric type of personality tend to be less confident than their counterpart in general use of technology in the classroom setting (SEGU), and (c) at the end of the class the previous two results were not found. Students who were not as adventurous as others appeared to have less confidence in them when it comes to integrating technology in the future classroom. After the treatment or intervention, i.e., the computer literacy course, students' overall confidence level seemed to increase to an extent where no significant difference between the two groups of student teachers was detected. A similar development may have

occurred to students with a Hysteric type of personality. Upon completion of the mandatory technology literacy course, Hysteric type students (who tend to lose control of their emotional boundaries more easily or are more likely to overreact in general than others) may have found a way to control their emotion and mood and to reduce the chances of allowing their personality to affect their learning. The instructor commented, "I first calmed them [being Hysteric type of personality] down and told them this is not the end of the world. I also said the same thing via the email..." As far as why such type of personality (Hysteric) did not affect the other two confidence areas, i.e., SECT and SER, in the first place, this may have been that the strengths of a hysteric learner, e.g., thinking creatively and artistically, were reinforced during the course, which, in turn, increased their confidence in general use of technology close to the end of the course. The technology course provided opportunities for students to demonstrate their creativity and artistic talent in course projects and assignments, e.g., newsletters and flyers.

Question Three deals with four demographics variables that possibly concealed moderating information on these pre-service teachers' confidence in using computer technologies in specific and general classroom settings for teaching and motivation purposes. The four dichotomous variables were Sex, Work, PC Use, and Internet Access. Using a t-test for independent samples, we found pre-service teachers working as full timers (no fewer than 20 hours a week) did not express as much confidence as their counterpart in the use of technologies to respond to their future students' needs and to motivate them. This lack of confidence may have been due in part to the fact that these future teachers and at least part-time (often full time) employees may have perceived that their efforts were simply spread "too thin" for them to feel that they were delivering to the best of their ability. Thus, they might not feel confident enough to ascertain that they were able to spend enough effort or time motivating their future students with the technologies in addition to using those technologies to teach (a minimum requirement). Furthermore, students with over six years of using a computer seemed to report a higher confidence level in the three self-efficacy areas when compared to those students with no more than six years of experiences using a PC. This finding may dissolve gradually as computers in the Lower Grande Valley become receptive and PC use receives attention. A continuing study of the computer use and self-efficacy for technology integration is recommended. Another significant finding was reported in that pre-service teachers with Internet access where they studied tend to have a higher confidence level of using technologies in the classroom setting in general. This may have to be the course design that required a large amount of the Internet use in the course projects. As the matter of truth, the course syllabus revealed that course projects and assignments involved Internet search for information like acceptable technology use, examples of technology's impact on society as a whole, and assistive technology for students with special needs. Most importantly, Blackboard course management system was adopted in these nine sections of the course. Lastly, Sex was not found a moderating factor in all three self-efficacy areas on either Time One or Time Two, suggesting the confidence levels for males and females did not differ to a significant degree. Aside from a longitudinal study previously suggested, a cross-tabulation of demographics and personality traits may help explain some blind spots in this study. To name one, student participants possess more than one personality trait. The six datasets were gathered in one university setting, so generalizablity of the results is limited to similar settings.

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A Preliminary Study of the Uses and Effects of Mobile Computing Devices in K-8 Classrooms

Karen Swan
Mark van 't Hooft
Annette Kratcoski
Kent State University

Darlene Unger
Virginia Commonwealth University

Abstract

This preliminary study employed mixed methodologies to explore students' use of mobile computing devices and its effects on their conceptual understanding, motivation to learn, and engagement in learning activities. Data was collected from students in four elementary and two 7th grade science classes in Northeast Ohio. Data collected included usage logs, student work samples, student and teacher interviews, and classroom observations of selected special needs students. Findings highlight the personalization of learning afforded by such devices both in terms of individuals and individual classroom cultures, as well as their usefulness in extending learning beyond the classroom. They also suggest that the use of mobile computing devices may help lessen the gap in academic achievement between special needs and regular students.

Objectives

The purpose of this study was to explore the uses elementary and middle school students make of mobile computing devices both within and outside of the classroom, and the effects such usage has on their achievement and motivation to learn. A particular focus of the study was the use of such devices by special needs students and the effects that might have on their achievement relative to other class members and on their motivation to learn and engagement in academic tasks.

Perspectives & Theoretical Framework

Handheld computers are becoming an increasingly compelling choice of technology for K-12 classrooms because they enable a transition from the occasional, supplemental use of classroom computers and school computer labs to the frequent, integral use of portable computational devices (Soloway, Norris, Blumenfeld, Fishman, & Marx, 2001; Tinker & Krajcik, 2001). Early evaluations suggest teachers and students favorably respond to handheld devices, and report that teachers believe handheld computers have the potential to impact student learning positively across curricular topics and instructional activities (Vahey & Crawford, 2002). Handheld computers moreover have the potential to support both individualized and collaborative learning, and to support learning outside the classroom, twenty-four hours a day, seven days a week (Roschelle & Pea, 2002).

However, students and teachers have deemed the limited size of handhelds to be a disadvantage (van 't Hooft, Diaz, & Swan, 2004). Screen size is an issue for some, but text input on handheld computers is a more pressing one. Unless students attach an external keyboard, which costs more money, takes up space, and affects mobility, text input is limited to the onscreen keyboard or text recognition software (Vahey & Crawford, 2002). In contrast, mobile computing devices such as AlphaSmart's® Dana™ are really the best of both worlds. For one, they feature Palm OS®, integrated wireless capabilities, and a full-size keyboard, thus functioning like handheld computers without the text input issues. Even so, they are relatively small and lightweight, and are cheaper and easier to use than full-blown laptop or desktop computers.

In addition, mobile computing devices have the potential to make a substantial impact on students with special needs (Bigge, Best, & Heller, 2001; Davis, Stock, & Wehmeyer, 2002; Elias & Friedlander, 2001; Furniss, 2001; Smith, Beard, Ezell, 2003; Zhang, 2000). Findings from investigations involving handheld computers have documented their effectiveness in assisting individuals with disabilities in remembering and sequencing tasks, and have also identified the fact that the use of these devices is less

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stigmatizing to individuals with disabilities (Furniss, 2001). Furthermore, the use of mobile computing devices by students with disabilities has the potential to increase students' independence and serve as a motivational tool for completing academic work they view as cumbersome, challenging, or not engaging.

Academic research on the impact of handheld computers on teaching and learning is still relative scarce; research on mobile computing devices like Danas[TM] is virtually nonexistent. This preliminary research study was designed to begin to explore such use and its effects by asking the following questions:

- How do students (especially those with special needs) use mobile devices to support learning?
- How does the use of mobile devices affect their motivation to learn and engagement in learning?
- How does student use of mobile devices support their learning, especially their conceptual understanding?

Methodology

Data were collected from two sites and two sets of subjects. The first site was a technology-rich laboratory classroom at a state university where local teachers bring their classes every day for six weeks to complete particular units of study. Classes and subjects involved in this study included one sixth grade class (28 students, 6 special needs), two fourth grade classes (41 students, 6 special needs), and one third grade class (16 students, 5 special needs). All students in these classes were given mobile devices which they were allowed to use anywhere and anytime for a six-week period. The second site was a suburban middle school where students in two (out of five) seventh grade science classes were given mobile devices to use in science and to take with them for approximately half the year. The classes given mobile devices were chosen for their high concentration of special needs students. Of the 50 students in these classes, 17 were identified as having special needs (34%).

Data collected from all classes included lesson plans, device usage data (collected using Rubberneck[TM] from GoKnow®), work samples (collected using PAAM[TM] from Go Know®), and teacher and student interviews. Usage data was collected from all students for which it was available (equipment failures made some data inaccessible and some students did not use the devices). These data were converted to usage in minutes per week and frequencies were compared across applications and classes. Student work samples were obtained from four students in each class identified by their teachers as special needs or as high, medium, and low achieving. The work was analyzed for conceptual understanding based on a framework developed by Newmann (Newmann & Wehlage, 1995; Newmann, Bryk & Nagaoka, 2001), which focuses on students' use of analysis skills, their depth of understanding, and their ability to communicate their understanding of material learned. Work samples were also compared within classes. Teachers and students in all classes were interviewed with regards to students' use of the mobile tools and their effects on learning and motivation. Data were analyzed qualitatively using a constant comparison approach to detect emergent themes (Glaser, 1978). In addition, eight special needs students in the middle school science classes were selected for behavioral observations using the Behavioral Observation of Students in Schools (BOSS) protocols (Shapiro, 2004). Five observations were completed before the mobile computers were introduced into the classes and four were completed during classes when the mobile devices were used, allowing for comparisons based on technology use.

Results

Mobile Device Use

All teachers in the study introduced their students to the use of the mobile devices, required their use of them for specific assignments (Table 1), and encouraged students to use them as needed both in class and outside of it. However, between October 2003 and March 2004 a total of 27 mobile devices (26.5% of the total number in the study) were returned for exchange or repair and two were repaired on-site. The teacher at the middle school experienced this as a major problem. Consequently, in February she no longer made use a requirement, but rather an option for her students. Despite the technical issues, most students continued to use the mobile devices, but such usage was not incorporated into regular class lessons. While equipment failure was less of a problem in the laboratory classroom because of on-site technical support, teachers there did not make as much specific use of the mobile devices because of the ready availability of desktop computers and other technologies (1:1).

Table 1: Assignments by Class

7	note-taking, T-charts, Venn diagrams, drawings

6	note-taking, journaling, first draft of autobiography
4	note-taking
4/3*	note-taking, journaling, worksheet

*classes worked on same unit

The most striking characteristic of the usage data is its variability, both between individuals and between classes, which highlights the ways in which mobile devices were appropriated by individual students and student cultures to personalize learning (Table 2). Notice for example the significant differences between the two fourth grades and between fourth and third grade students given the exact same assignments. This finding is supported by the student interviews. Over three-quarters of the students interviewed reported using their mobile devices outside of the classrooms in which they were explicitly assigned -- in other classes, at home, on the bus, and in after-school programs. Students in the middle school classes mostly reported using their mobile devices for note-taking, while elementary students said they used them for a variety of writing activities, noting that they preferred using the mobile devices to writing by hand. Many students also reported that they found the mobile computers to be most useful for various types of organizational activities (scheduling, creating "to-do" lists, outline ideas). Students also reported enjoying the use of drawing programs and games.

Table 2: Device Usage (Minutes/Week) by Class

	word processing	Palm applications	drawing programs
Grade 7	40:24	7:12	6:18
Grade 6	1:57:12	2:30	5:48
Grade 4	1:29:12	3:48	1:12
Grade 4*	3:34:42	7:48	17:42
Grade 3*	2:46:24	1:42	1:07:48

*classes worked on same unit

Table 3 compares usage by gender and by whether or not students were identified as special needs across classes. Again, these data indicate the variability between classroom cultures but do show a tendency for girls to use the mobile devices more than boys, although this collapsed data doesn't show the enormous variability between individuals and across applications. The data also reveal a disappointing slightly lower use of the mobile devices among special needs students in all but the seventh grade. Interestingly, the collapsed data here conceals greater usage among special needs students of drawing and applications programs, a finding that perhaps deserves further investigation.

Table 3: Comparison of Device Usage (Minutes/Week) by Gender & Special Needs

	male	female	regular	SN	all
Grade 7	49:30	87:28	63:04	66:10	61:48
Grade 6	2:39:06	2:03:36	2:12:36	1:09:48	2:12:36
Grade 4	1:15:24	1:53:48	1:51:42	1:07:30	1:38:24
Grade 4*	3:58:18	5:30:54	4:44:24	NA	4:44:24
Grade 3*	3:33:12	4:53:36	4:31:12	3:58:42	4:17:36

*classes worked on same unit

In a nutshell, our preliminary findings indicate that the use of mobile computing devices extends learning outside the confines of the classroom, and that individuals adapt the use of mobile computing devices to their own needs. Special needs students made greater use of drawing and organizational applications on their devices than did regular students. The data further suggest unique cultures of use evolved within classes and groups within classes, indicating higher levels of personal appropriation. Findings also indicate that mobile computing devices were used most often for writing activities and that in most cases students favored such use over pencil and paper. The data also show that girls tended to use mobile computing more than boys, and that regular students used them more than special needs students, although these findings seem related to cultures of use that evolved among particular students and subgroups.

Motivation

Teachers also stated that they believed that students' motivation was improved by the use of mobile devices. Most teachers also commented on increased student productivity as a result of this technology use. For example, the sixth grade teacher commented that taking the mobile devices home resulted in everyone's homework always being done. Behavioral observations of selected special needs students supports these findings and suggests that increased conceptual understanding and productivity may be related to increased engagement resulting from the use of the mobile devices. In comparing individual student data collectively, the data indicate that, for all of the students observed, the percentage of off-task behaviors were markedly reduced when the mobile devices were used. Not only were the behaviors reduced but they were virtually extinct, with off-task behaviors occurring less than 5% of the total behaviors observed for each student. Interestingly, the findings indicate that students displayed more actively engaged behaviors during the classes in which they were instructed to use their mobile devices, regardless of whether students were actually using the tool during the entire class period. In other words, if the mobile computers were on the students' desks and they were using them intermittently during class the students were more actively engaged with class lecture and activities.

It should be noted that for many of the special needs students observed, wide variations in the percentages of actively engaged behaviors were recorded across the total time period of observations during which mobile computing devices were used. For instance, four students with special needs demonstrated high percentages of engaged behaviors during four of the five observation periods but during one class period the percentage of engaged behaviors dropped noticeably. For three of the four students, however, this phenomenon occurred during the same class period, suggesting that this was probably a localized event. Nonetheless, future investigations should look more closely at classroom activity structures to explore events which both trigger disengagement and sustain engagement among special needs populations.

Learning Support

Most of the teachers interviewed discussed improvements in student work as a result of mobile computing use, focusing on increased productivity, improvements in writing (such as spelling and mechanics), and enhanced student approaches to the writing process. For example, one teacher remarked,

> *"The [mobile computing devices] shortened the time frame for getting work done. Having the [mobile computing devices] also improved the writing of all students."*

Another teacher commented that the use of the devices resulted in noticeable improvements in both writing and peer editing. She stated,

> *"The biggest change has been in their weekly journals. We have been journaling all year and they have always written them but in using the [mobile computing devices] , peer editing takes on so much more meaning when they can beam to someone rather than trading papers. With the [mobile computing devices] they are editing their own writing more and it keeps getting better."*

As previously noted, students in the laboratory classes reported that they preferred using mobile computers over writing things by hand and that using mobile computing for writing assignments made the work "*easier*" and "*more fun*". The majority of students in these classes also stated that they thought their written work in particular improved as a result of their use of the devices. For example, one student stated,

> *"My writing is poor and the [mobile computing devices] makes it easier to read my writing."*

Many of the teachers interviewed also commented on ways in which the use of the mobile computers seemed to lessen the gap in academic achievement between regular and special needs students. For example, one teacher stated,

> *"Having the [mobile computing devices] improved the writing of all students but special education students in particular;"*

while another noted that,

"The special education students were empowered to write."

These observations are supported by work samples obtained from 3-4 targeted students per class, representing high, average and lower ability levels, and when available, special needs students, and analyzed for evidence of conceptual understanding (on a scale of 3-12, with 12 being the highest). Across elementary classes, the artifacts averaged a score of 10.0 for higher ability students, 9.4 for students of average ability, 8.5 for lower ability students, and 9.3 for students with special needs. Across seventh grade science classes given Mobile devices student works samples averaged 7.2 for high ability students, 5.5 for average ability students, 4.0 for lower ability students, and 4.7 for special needs students.

Interviews with students also corroborate findings that the use of mobile computing devices may enhance student learning. Fifteen of the eighteen middle school science students interviewed stated that they believed their use of mobile computing tools helped them in their school work. These students particularly noted their use for taking notes, test review, calculations, and the ways in which keeping their work on the mobile computing devices helped them stay organized. Indeed, all students interviewed seemed to view mobile computing devices as a tool that could help them with their school work. This aspect of the use of such devices surely deserves further investigation.

In summary, findings from this preliminary study provide some indication that the use of mobile computing devices can improve student learning. In particular, they provide evidence of higher levels of conceptual understanding among students using mobile computing when assignments elicit it. Perhaps more importantly, the results suggest a lessening of the gap in conceptual understanding between regular and special needs students using mobile computing devices. Interviews with teachers suggest that the use of mobile computing resulted in greater productivity and improved writing skills among their students. Teacher interviews also suggest that mobile computing devices may provide increased support for the writing process. Interviews with students suggest that students likewise view mobile computing devices as a tool which can help them with their schoolwork. These findings surely deserve further investigation and moreover should inform future research.

Educational Significance

In conclusion, this preliminary investigation on the use of mobile computing devices shows that elementary and middle school students use them in a variety of ways, principle among these writing, both in and outside of class. The findings also suggest both the personalization of learning supported by such devices and their usefulness in extending learning beyond the classroom. They also hint at the influence of classroom cultures on such use. In addition, the results indicate that use of mobile computing devices may increase students' motivation to learn and their engagement in learning activities, especially among special needs students. Indeed, they suggest that the use of mobile computing devices may help lessen the gap in academic achievement between special needs and regular students. This is an important finding which clearly deserves further investigation.

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The Changing Nature of Learning in a Ubiquitous Computing Classroom

Karen Swan
Annette Kratcoski
Yi Mei Lin
Jason Schenker
Mark van 't Hooft
Kent State University

Abstract

This paper reports on preliminary findings from an ongoing study of teaching and learning in a ubiquitous computing classroom. This study employs multiple measures and mixed methods to document changes in teaching and learning that result when teachers and students have access to a variety of digital devices wherever and whenever they need them. It identifies ways in which ubiquitous computing environments can support both individual (conceptualizations) and social (uses) construction of knowledge. In particular, it explores the role that the unique representations of knowledge afforded through the use of a variety of ready-at-hand digital devices can play in supporting and bridging private and public knowledge construction

Background

The term "ubiquitous computing" was introduced by Mark Weiser (1991) who wrote, "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (p. 94). He envisioned computers embedded in the environments we inhabit – in walls, chairs, clothing, light switches, appliances, everything -- and connected to each other and the world through wireless communication. Alan Kay (in Johnstone, 2003), for example, argued as early as the late 1970s that computing would only make a difference in people's lives if it were to become universally available, which he equated with affordable and portable. He thus envisioned a handheld, notebook-sized computer for kids. Seymour Papert (1980) similarly predicted "a massive penetration of powerful computers into people's lives" (p. viii), and with it a paradigm change in teaching and learning. Papert's vision focused on 1:1 computing and learner-centered environments in which children programmed computers rather than being programmed by them.

It is important to note that while these three early visions of ubiquitous computing all view it as having the potential to induce paradigm change in education on the scale of that resulting from the introduction of printing, the three visions are quite different in focus. Weiser saw ubiquitous computing as involving many computers serving each individual and embedded in inhabited environments, whereas Kay envisioned mobile computers that could be carried into environments, and Papert saw one to one computing as the key element regardless of devices. It is also important to note that all three visionaries were writing before the World Wide Web was introduced, radically changing, according to Chris Dede (2000), the way that teachers and students think about learning with technology, and the possibilities inherent in ubiquitous computing (McClintock, 1999).

In our work, we view ubiquitous computing as encompassing all three notions of ubiquitous computing as well as the importance of connectivity via the WWW. We view ubiquitous computing environments as learning environments in which all students have access to a variety of digital devices, including computers connected to the Internet and mobile computing devices, whenever and wherever they need them. Our notion of ubiquitous computing, then, is more focused on many to many than one to one, and so includes the idea of technology which is always available but not itself the focus of learning.

Although ubiquitous computing research has involved differing technological implementations – 1:1 computing (Apple Computer, 1995; Honey & Henriquez, 2000); laptop computers (Stevenson, 1998; Ricci, 1999; Bartels & Bartels, 2002; Hill, Reeves, Grant, Want & Han, 2002; Rockman, 2003; Silvernail & Lane, 2004; Zucker & McGhee, 2005), handheld computing (Robertson, Calder, Fung, Jones, O'Shea & Lanbrechts, 1996; Inkpen, 2001; Sharples, 2002; Vahey & Crawford, 2002; Roschelle, 2003; Norris &

Soloway, 2004; Roschell, Penuel & Abrahamson, 2004) – and so perhaps differing visions, the changing nature of teaching and learning in ubiquitous computing environments that is therein documented appears relatively consistent across implementations.

Across implementations, for example, researchers have found much greater use of Internet resources (Honey & Henriquez, 2000; Hill, et al., 2002; Zucker & McGhee, 2005) and significantly more presentations communicating findings (Honey & Henriquez, 2000; Hill, et al., 2002). They have found a much greater variety of representations being used to explore, create and communicate knowledge (Apple computer, 1995; Honey & Henriquez, 2000; Bartels & Bartels, 2002; Danesh, Inkpen, Lau, Shu & Booth, 2001; Hill, et al., 2002; Roschell, et al., 2004) including the use of a much wider variety of visual representations, spreadsheets and databases, simulations, and exploratory environments.

Perhaps as a result, researchers are also documenting changes in interactions among students and between students and teachers (Apple Computer, 1995). They find that learning is becoming more efficient (Apple Computer, 1995; Hill, et al., 2002) and that students are becoming "experts" on particular topics (Apple, 1995; Norris & Soloway, 2004). In addition, researchers note significant increases in collaboration, among students and between students in teachers, in ubiquitous computing classes (Apple Computer, 1995; Robertson, Calder, Fung, Jones, O'Shea, & Lambrechts, 1996; Hennessey, 2000; Sharples, 2000; Roschelle & Pea, 2002; Vahey & Crawford, 2002; Norris & Soloway, 2004).

Happily, researchers are also documenting positive effects of ubiquitous computing on students. They are finding improved motivation (Apple Computer, 1995; Ricci, 1999; Vahey & Crawford, 2002; Zucker & McGhee, 2005); engagement (Silvernail & Lane, 2004; Zucker & McGhee, 2005); behavior (Apple Computer, 1995), and school attendance (Apple Computer, 1995; Stevenson, 1998) among students involved in ubiquitous computing initiatives. In addition, research shows such students are better organized (Ricci, 1999; Zucker & McGhee, 2005) and more independent learners (Apple Computer, 1995; Zucker & McGhee, 2005). Perhaps more importantly, researchers have documented increased media literacy (Hill, et al., 2002; Rockman, 2003), improved writing (Apple Computer, 1995; Ricci, 1999; Vahey & Crawford, 2002; Rockman, 2003), and, in some cases, increased scores on standardized tests (Stevenson, 1998; Honey & Henriquez, 2000). In addition, researchers are finding that ubiquitous computing "levels the playing field" for special needs and lower ability students (Stevenson, 1998; Honey & Henriquez, 2000; Hill, et al., 2002).

RCET's Ubiquitous Computing Classroom

The Research Center for Educational Technology (RCET) is exploring ubiquitous computing at the classroom level. Each year for the past five years, RCET has brought eight local teachers and their classes to spend half their day every day for six weeks in Kent State University's SBC Ameritech Classroom (SBCAC). Participating teachers are chosen through a selection process which begins with nomination by their principals and is based on the quality of their teaching and on the fit of their classes and curricula with the work of RCET.

The SBCAC is an ubiquitous computing classroom. It is currently equipped with enough desktop and wireless laptop computers to provide all students with access to up-to-date computing capacity and Internet access, enough handheld and mobile computing devices for all students to take with them beyond the classroom, distance learning capability, digital microscopes and scientific probes, and a wide variety of peripherals and software to support teaching and learning. Each year's cohort of teachers spend a week together in the classroom getting acquainted with its environment and the technology available and working with RCET staff and each other to develop lessons that integrate the use of this technology and the classroom itself into their regular curricular practices. They are encouraged to integrate whatever technologies they want into the units they create, but the choice of technologies and extent of their integration is entirely the teachers.

The SBCAC is also a laboratory classroom. The classroom has with four ceiling mounted cameras and stationary microphones located at all desks and tables throughout the room. From its observation room researchers can manipulate these to record as many as four simultaneous digital videos at a time. In addition, digital cameras are available for document class activities both within and outside the classroom. All student work is collected in electronic portfolios. The SBCAC classroom and its yearly program of extended residences for local classes thus gives RCET researchers a chance to study teaching and learning with ubiquitous computing in depth across a variety of grade levels, subject areas, teachers, and students.

To begin to make sense of the effects of ubiquitous computing on teaching and learning, RCET

researchers have developed a model, grounded in their SBCAC experiences, that locates such effects in three broad areas: in the ready availability in ubiquitous computing environments of a wide variety of external, material representations of knowledge; in the particular supports ubiquitous computing provides for individual students' internal conceptualization and construction of knowledge; and in the unique social interactions and shared uses of knowledge ubiquitous computing enables, through and around which knowledge is constructed. (Swan, Kratcoski, Diaz, van 't Hooft & Juliana, 2004). We use the terms "representations," "conceptualizations," and "uses" respectively to distinguish these domains, and view them as interacting and interdependent in their effects. Distinguishing them also allows us to refine our investigation into the effects of ubiquitous computing to exploring its effects in these three domains. Accordingly, the study reported in this paper was thus designed to explore the following research questions:

What kinds of external representations of knowledge do teachers and students employ to support learning when they have ubiquitous access to a variety of digital computing devices?

(How) does such ubiquitous access affect students' conceptualizations of knowledge?

(How) does ubiquitous access affect the ways students use knowledge and the social interactions around which knowledge is constructed?

Methodology

Subjects and Setting

The Research Center for Educational Technology (RCET) is located at Kent State University in northeast Ohio. Each year RCET brings eight local teachers and their classes to spend half their day every day for six weeks in Kent's SBC Ameritech Classroom (SBCAC). Participating teachers are chosen through a selection process which begins with nomination by their principals. Teachers are chosen by RCET staffed based on the quality of their teaching and their fit with RCET research interests. They are not chosen for technology integration experience. The study reported in this paper is based on classes visiting the SBCAC in the 2003/04 and 2004/05 school years. Table 1 below shows the classes that came to the SBCAC in the 2003/04 and 2004/05 cohorts. Participating teachers included three men and nine women ranging in age from their late twenties to late forties. Participating classes explored regular curricular subjects in integrated units that focused on topics in the areas of English language arts, science, and mathematics. Classes ranged from 14 to 27 in number of students, with approximately equal numbers of boys and girls. All classes except the seventh graders (who were selected to fit with scheduling needs) were regular, intact classes. Students in all classes ranged in ability levels and all but two included special needs students. Many classes included minority students.

Table 1 Participating SBCAC Classes

Grade level	Topic	N
2003-2004 COHORT		
7	Biography	22
6	Autobiography	27
5	What's wild?	20
4	Plant biology	25
4	Flight	16
3	Flight	14
K	Patterns	24
K	Space	20
2004-2005 COHORT		
K	Animal Sounds	18
1	Living/Non-living	20
2	Sound & Light	21
3	Force & Motion	21
4	Endangered Animals	25
5	Sound & Light	24
5	Sound & Light	23

Data Collection and Analyses

Data collected from SBCAC classes included structured classroom observations, student pre and post tests, student work samples, quasi-clinical interviews with students, structured teacher interviews, teachers' written reflections, and videotapes of selected SBCAC activities.   Data analyses included quantitative as well as qualitative methods centered on descriptive comparisons and thematic analyses.

Stuctured observations. To explore changes in teachers' pedagogical approaches, two structured observations were made of all teachers in their regular classrooms and in the SBCAC using an observation protocol that elicited categorizations of activity structure (4 categories), teacher activities (12), teachers' position in the room (4), student activities (12), student groupings (4), and technology use (18). Observers noted during each one minute interval of time which of the 50 activities listed occurred. Because observation periods were linked to lessons, and so varied in length, relative frequencies of each activity were calculated to reflect the percentage of time during the observation period that each behavior was observed. Relative frequencies were then compared within categories between classroom environments across classes.

Student pre and post tests. Pre and post tests were developed and administered to participating students in their regular classrooms one week before they came to the SBCAC and one week after they returned to their regular classrooms. For each class involved in this study, the teacher and RCET researchers developed content exams focused on the "big ideas" teachers wanted students to learn. Two similar versions of these tests were created for each classroom and half of the students were given each version on each administration. Overall scores for pre- and post-tests were calculated by totaling scores across all questions. Paired samples t-tests were then used to compare pre- and post-test scores and effect sizes for gains in each class were calculated

Student work samples. From each class, work samples were examined from students selected by the teacher, with each teacher being asked to select one student of average ability, one of high ability, one with lower abilities and a special needs student (if available).   All assignments they completed were collected and scored using the Newmann (Newmann & Wehlage, 1995) framework which evaluates students' conceptual understanding relative to three standards – analysis, disciplinary understanding, and elaborated communication. For each of the three standards, work samples were given a rating of 1-4, (1 the lowest and 4 the highest) for a possible score of 3-12. Conceptual understanding scores were averaged across classes by ability groupings and compared descriptively.

Student interviews. Quasi-clinical interviews were conducted with each student as students were working on computers. The interviews focused on that work and their conceptualizations around it, their technology preferences, and differences between the working in the ubiquitous computing classroom and their regular classroom. All interviews were audio-recorded, transcribed and analyzed qualitatively, using constant comparison to detect emergent themes (Janesick, 1994; Lincoln & Guba, 1985).

Teacher post-interviews and reflections. Teacher interviews were conducted with each classroom teacher following completion of their classroom experience. They focused on differences between the SBCAC and their regular classroom, effects of ubiquitous computing on their students' attitudes toward school, motivation to learn, and learning, and any changes they noticed in themselves or their students as a result of their SBCAC experiences. Teacher interviews were audio-recorded and transcribed. Teachers were also asked to submit written summaries of and reflections on their SBCAC experience. Data from teacher interviews and reflections were analyzed qualitatively, using constant comparison to detect emergent themes (Janesick, 1994; Lincoln & Guba, 1985).

Videotaped observations. All classes in the SBCAC were videotaped twice weekly to document the kinds of activities taking place in them. RCET staff doing the taping kept time logs of these activities in which they also noted interesting events and interactions. Classes of special interest, such as video conferences and student presentations, were also videotaped. The videotapes were reviewed with a particular eye toward exploring noteworthy representations, conceptualizations, and uses of knowledge evidenced in them.

Results

The study reported in this paper was designed to explore the changing nature of teaching and learning in ubiquitous computing environments in terms of changing representations, conceptualizations,

and uses of knowledge. In the sections which follow, research findings are organized around these research questions. The results suggest meaningful changes in the nature of teaching and learning in each of these areas.

Representations

      "Representations," as it is used here, broadly refers to the myriad of ways human beings externally represent what they know. As McClintock (1999) notes, digital technologies provide easy and flexible access to multiple ways of representing knowledge and expressing ideas, giving rise to new possibilities for teaching and learning. By examining what kinds of representations teachers and students in a ubiquitous computing classroom employ in their normal course of study, we can begin to explore how they make use of that potential.

      Indeed, teachers and students in 2003-2004 SBCAC cohort employed a remarkable variety of representations to support learning. For example, kindergarten students used digital photography, tessellation software, a music composition program, and the Logo robotic turtle explore patterns. Sixth graders used audio recorders and handheld computers to collect family stories and recipes. They used Inspiration to create family trees and family crests as well as for brainstorming ideas. One fourth grade classes used time-lapse photography to document carnations' absorption of water and the BugScope Electron Microscope at the University of Illinois to view plant samples in an experiment on water quality. These students created videos, webpages and Powerpoints to share their findings. Fifth graders participated in stream quality research using science probes to collect water temperature and Ph values, handheld computers to record their findings, and videoconferencing to communicate them with state officials and others students across the state of Ohio. And the list goes on.

      It is important to note that teachers were not required to use any technologies. They were introduced to what was available and encouraged to just use those that met their curricular goals. All teachers incorporated Internet research into their units, and all used Powerpoint presentations to share their findings. All teachers incorporated word processing and/or desktop publishing into their lessons. While these might seem mundane uses of technology, participating classes lacked the resources in their regular classrooms to incorporate these kinds of representations into whole class activities in a meaningful way. It should also be noted that even by choosing digital representations that in many ways were closest to traditional representations, teachers and students experienced new possibilities in terms of access to information, visual representation, and digital tools.

      Participating teachers also encouraged their students to use a variety of digital devices to help students explore their topics both in and outside the classroom. Many teachers helped their students communicate with others via email, and most used video teleconferencing to connect their students with experts on the topics they were studying, as well as with students in Mexico studying similar topics. Most classes used concept-mapping, graphing, and spreadsheets to organize and explore ideas and data. All but the kindergarten teachers developed extended projects in which students demonstrated their learning through technology-based presentations. One class created bound books using desk-top publishing software which included digital photographs and graphics.

      Most importantly, all the teachers in the 2003/2004 school year utilized the available technologies to support their teaching and learning goals. They used differing technologies to meet differing learning objectives, often in very creative ways. They also developed ways of assessing technological products and explored new ways to use technology to enhance assessment of student learning, including electronic portfolios, electronic journaling, and/or observational software on their handhelds to assess student learning.

      Table 2 below compares technology use in regular classrooms with technology use in the SBCAC. It should be noted that at least two observations were made of each class in each setting, and that the data is averaged across all classes in the 2003-2004 cohort. Thus the findings are derived from a sample of classes that may or may not represent "typical" classes. The findings given here are also averaged across classes and so obscure substantial differences between classes in both settings. Nonetheless, they do reveal a much greater use of digital technologies in the SBCAC and a much greater use of print technologies in regular classrooms. While that is, of course, to be expected, the results suggest that the kinds of representations teachers and students were employing in their teaching and learning were meaningfully different in the ubiquitous computing classroom. The findings suggest a much greater reliance on written language for representing knowledge in the traditional setting and a move towards more visual representations of knowledge in the SBCAC. It is interesting, to note that classes in the SBCAC even made more use of

video and art supplies than classes in their regular setting where they are presumably equally available.

Table 2
Uses of Technology Observed in Structured Classroom Observations in Regular and SBCAC Classrooms*

Technology Use	Regular Classroom	SBCAC
computers (C)	30.4	78.6
Internet (I)	13.6	54.4
handhelds (H)	0.0	2.2
video/film (V)	0.4	6.5
audio only (AO)	0.0	0.0
overhead (OV)	2.0	2.6
Elmo (E)	0.0	1.5
screen (SC)	2.3	4.8
presentation system (PS)	0.3	12.7
textbooks (T)	1.6	0.0
print materials (P)	34.6	15.3
manipulatives (M)	0.3	0.0
realia (R)	4.3	4.4
art supplies (A)	0.0	3.3
paper & pecil/pen (PA)	52.8	29.3
boards & chalk/markers (B)	31.3	0.9
microscopes/probes/sensors** (S)	0.0	0.0
other (O)	10.2	19.2

* as in many cases multiple technologies were simultaneously employed, numbers do not add up to 100

Indeed, in their post SBCAC interviews and reflections, teachers noted the effects of ubiquitous access to computing on the kinds of representations of knowledge they used in their classes. For example, one teacher stated, "The children all had electronic portfolios, and our "daily reflections" were done using the digital camera and my laptop." Another commented on ways digital representations enhanced students' learning about the writing process itself, "Students got a better idea of editing and publishing from being able to share their work publicly. Students also benefited from 1:1 access to computers in honing their information searching and evaluation skills. They became more reflective and better writers, perhaps through group revisions, and got good practice typing." Most teachers also commented on the ways ready access to digital technologies allowed them to incorporate visual representations more easily and more frequently into their lessons. For example, one teacher noted,

"Kids today are more visual learners than ever before. Lessons created by teachers need to visually rival video games, television, and DVDs. During my experience in the classroom, students had an opportunity to create digital representations of their knowledge via a website, PowerPoint and digital movies. Students were very engaged in these projects and took great pride in the quality of their work."

Indeed, interviews with students demonstrated the ways in which they thought seriously about knowledge representation, perhaps because they were given more choices. Students were able to discuss decisions they made with regards to technology choices when representing specific concepts or ideas in their product creation. For example, in discussing the webquest she had created on "The Wild West" a fifth grade student explained how she selected font and background colors consistent with Southwestern style art, while another classmate who created a webquest on hurricanes chose grays and blues for fonts and backgrounds to represent storms and clouds.

Conceptualizations

"Conceptualizations" as used here refers to the unique ways in which knowledge is organized, processed and manipulated in individuals' minds. Although it is, of course, impossible to examine the

inner workings of students' minds, we are exploring ways in which ready access to digital technologies affects student conceptualizations by examining a variety of evidence including gains on tests of important concepts, student work samples, quasi-clinical and student and teacher interviews. The evidence suggests that students in the SBCAC learned to use a variety of technologies as thinking and learning tools, and that such usage supported their conceptual learning.

For example, in the quasi-clinical interviews, the majority of students were able to describe in great detail the project they were working on including key concepts represented in their work. They also told us that they thought they learned more in the SBCAC and attributed their enhanced learning to the "fun" they had using digital technologies. One student told us, "I think you learn more if it's fun because if it's fun it helps you concentrate and listen." Another said, "You want to have fun and learn at the same time. If you are bored you don't learn as much because you don't want to focus in to it."

Teachers similarly commented on the (sometimes profound) effect ubiquitous computing had on student engagement and motivation, noting that these are a necessary first step in higher order learning. Indeed, all the teachers we interviewed mentioned their surprise at how much ubiquitous access to computers and handheld devices affected their students' engagement in learning. For example, one teacher stated, "From my experience in the SBCAC, I realized the excitement of students when they can see the quality of the work they are creating." Another teacher noted that when she gave homework assignments to be completed on mobile computing devices, all her students got them done, something she had never before experienced. Similarly, another told us, "The one benefit I've noticed is that they do write more with the Danas. And I believe that much as occurs with reading, the more you write, the better a writer you become." Still another teacher noted that the engagement generated around the ubiquitous computing classroom made it possible for her to change her pedagogical approaches, in particular, to individualize her teaching, "I was able to work one-on-one with a lot of students because the others were so completely engaged in their own projects."

One teacher summed the changes in motivation and engagement as follows, "Learning was more efficient, students were busier. There was some fooling around at the beginning, but in general students were more engaged, more motivated, more on task, freer."

Teachers also believed that ubiquitous access to digital technologies affected the quality of students' work, and attributed at least some of that increased quality to the kinds of supports differing technologies gave to particular kinds of learning. For example, several teachers spoke about using mobile devices to support peer editing which they thought "seemed to make individual sharing and peer tutoring work better." Teachers additionally noted that ubiquitous computing seemed to be particularly supportive of project-based and inquiry learning. One told us, "With my students, I've noticed they are really much more inquisitive. The higher achieving kids take learning to the next step, and I see the other kids trying to do the same."

Such comments provide further evidence of changing pedagogical possibilities in ubiquitous computing environments. One teacher's comments epitomize the ways working in such environments can expand teachers' notions of what is possible, "The importance of technology for young children was reaffirmed and I learned about the capabilities of the children when using technology. I learned to think of technology as a tool that adds another dimension to learning."

That students did use the technologies available in the SBCAC to learn is demonstrated by the gains students made on tests of factual and conceptual understanding (Table 3). The average effect size of gains across classes from pre to post testing was 1.00, or one full standard deviation, for the 2003/04 students, and 2.44 for those in 2004/05 classes. While it may not seem surprising that students learned what teachers wanted them to, it is important to document that students did learn the intended content and not just technological skills, and the gains are impressive. Analyses of selected student work samples provide further evidence of student learning at high levels (Table 4), and comparisons of these showed special needs students' work at levels equal to average students.

The high quality of student work, as previously noted, was remarked upon by all participating teachers. All teachers who had special needs students in their classes particularly commented on the "leveling of the playing field" for these students. Traditionally the special needs literature describes the use of assistive technology tools for supporting meaningful mainstreaming of struggling students or the use of intervention-based software to facilitate learning. In the SBCAC classroom, however, the students with special needs and lower abilities were achieving using the same technology tools as their peers rather than assistive technology. This finding has important implications for teachers and administrators with regarding to student integration and accommodation issues. It clearly deserves further investigation.

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Table 3 Average Pre/Post Test Gains in Effect Sizes by Grade Levels*

Grade Level	Effect Size of Gains 2003/04	Effect Size of Gains 2004/05
K	0.52	
grade 3	1.41	
grade 4	2.03	
grade 5	1.06	
grade 6	0.21	
grade 7	1.46	
grade 1		1.59
grade 2		1.61
grade 3		2.29
grade 5		2.75
grade 5		3.84
grade 6		1.30

* test scores were only available for one kindergarten and one fourth grade class in each cohort

Table 4 Average Conceptual Understanding Scores for Ability Groups Across Classes*

	Average Score Across Classes
high ability	10.0
medium ability	9.4
low ability	8.5
special needs	9.3

* overall scores out of a possible range of 3 (low) to 12 (high)

Student work samples were further studied to yield descriptive data regarding student performance. A number of the artifacts studied required students to utilize technology to organize, synthesize, or interpret information, describe patterns, create models or simulations, etc., suggesting that teachers were making use of digital technologies as tools for supporting higher order learning. In most of the artifacts, there was good evidence that students had developed a deep understanding of key concepts and ideas related to the content area they were studying, in that they were able to elaborate on specific concepts and make connections between concepts. In addition, the majority of the work samples encompassed details and examples in ways that demonstrated students' ability to communicate their learning including supporting details, facts, graphics, and symbolic representation.

Uses

In our work on ubiquitous computing, we use the term "uses" to refer to the activities and interactions through and around which knowledge is negotiated and constructed. As pedagogical possibilities change in ubiquitous computing environments, new social organizations evolve around new approaches to teaching and learning. By examining interactions among teachers and students in a ubiquitous computing classroom, we can begin to explore how classroom cultures are changing in response to such possibilities.

Indeed, comparisons of teacher and student activities and the organization of interactions among students and teachers in their regular classrooms with activities and social organization in the SBCAC revealed meaningful differences between settings. The most noticeable difference involved student groupings. In the SBCAC, students spent more than half their time working in small groups, while they spent less than a third of their time similarly engaged in their regular classrooms. In contrast, students spent almost 50% of regular class time, engaged in whole class activities, while in the SBCAC, they spent less than one third of their time working as a whole class.

Accordingly, teachers spent over two thirds of their time at the front of their classes in their regular classrooms, whereas in the SBCAC they alternated their time between teaching from the front of the room, orchestrating presentations from the teacher station and moving among students. These data together with findings comparing teacher and student activities in the two settings suggest a tendency for teachers to become more "facilitators of learning" in the ubiquitous computing classroom than "disbursers of knowledge." For example, teachers were much more likely to spend time lecturing, and asking and answering questions in their regular classrooms than in the ubiquitous computing classroom. They also spent a good deal more time on classroom management. On the other hand, in the SBCAC teachers were much more likely to spend their time giving directions and demonstrations, supervising activities and talking with their students than in their regular classroom.

Similarly, whereas students spent much more time in their regular classrooms answering and asking questions than in the SBCAC, in the SBCAC they spent much more time talking and listening to each other. In the SBCAC students spent fully four times as much time working on construction projects than they did in their regular classrooms. In their regular classrooms they spent almost twice as much time engaged in seat work.

Interviews with teachers support these observations. All teachers, for example, remarked on how much easier it was to manage their classes in the SBCAC. One teacher who was nervous about bringing her class to the SBCAC, remarked, "I learned classroom management is easier in technology-based teaching, not harder." Indeed, most teachers said they were surprised at the way they could work with individual students without worrying about what the rest of the class was doing. One teacher, for example, noted, "It's much more student-centered there; the technology keeps them engaged so I can go around and do one-on-one." Other teachers pointed out that because management issues were reduced, they could give their students more independence. One told us, "I tried to give the students more choices about projects because of the different ideas I saw in the classroom."

Teachers also commented on the way classroom dynamics changed in the ubiquitous computing classroom. For example, one teacher reported,

"Students interacted more and more freely. Bullying stopped and the class achieved a sense of itself, sooner she thought, than they would have in their regular classroom. At the beginning of the year, I gave students cards on which they told who they would like to sit near. I just redid them and found that they had changed dramatically. The SBCAC experience in some sense forced kids to interact with each other."

All teachers particularly noted that students who had been marginalized in their regular classrooms took on new and more central roles in the SBCAC. In a particular, all teachers remarked on the way ubiquitous computing seemed to "level the playing field" for students of varying abilities. For example, one teacher stated,

"In particular, the special education students bloomed. They could go at their own pace and technology seemed to emphasize their strengths as opposed to their weaknesses. It had a leveling effect. One special education student's autobiography was one of the best in class, much better than his earlier work."

All teachers also all found the SBCAC environment to be more supportive of collaborative learning than their regular classrooms. For example, one teacher noted, "It also seemed to make individual sharing and peer tutoring work better." Several teachers used handheld computers to support peer editing and found that students were much more enthusiastic about the process. One teacher's comments illustrate their observations,

"The biggest change has been in their weekly journals. We have been journaling all year and they have always written them but in using the Danas, peer editing takes on so much more meaning when they can beam to someone rather than trading papers. With the Danas they are editing their own writing more and it keeps getting better."

Another teacher noted that being able to share work on computer screens and over the presentation systems gave students increased pride in their work, "The SBC experience also taught me the value of sharing student work. Giving a grade for a project is not enough, students need peer affirmation of performance."

In their quasi-clinical interviews, many students mentioned another way ubiquitous computing was changing the ways they created and used knowledge. They told us that mobile computing was allowing them to take ubiquitous computing beyond the classroom. Students reported using handheld computers not only in the SBCAC, but on field trips, back in their regular classroom, at home, after school,

and on the bus. Many of the students reported that they found them to be most useful for organizational types of school-related activities. Most said that they preferred using mobile computers over writing things by hand and that using them for writing assignments made the work "easier" and/or "more fun".

Conclusions

In a recent article, Andy Zucker (2004) argued for the importance of rigorous research on ubiquitous computing, which he distinguished as belonging to three large categories – research on critical features of ubiquitous computing initiative, research on their ultimate outcomes (the purpose behind such initiatives), and research on intermediate outcomes, on teaching and learning in ubiquitous computing environments. The research presented here falls into this latter category. It documents changes in teaching and learning in a ubiquitous computing classroom and suggests that these changes are related to the supports such environments provide for new representations, conceptualizations, and uses of knowledge afforded by such environments. It thus adds to our theoretical understanding of teaching and learning in ubiquitous computing environments. Specifically, the classes we observed used multiple representations of similar concepts and visual as well as textual representations to explore topics. Teachers in these classes allowed students representational choice and encouraged student constructions and sharing in a variety of representations including presentation to audiences beyond the classroom. We also observed changes in interactions among students and between teachers and students that seemed to support the social construction of knowledge.   Finally, we found significant gains in conceptual understanding among students. Of particular interest in this regard were findings which suggest learning in ubiquitous computing environments may help close gaps in academic gains between special needs and regular students. These results clearly deserve further investigation.

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Online Learning Programs as Learning Organizations: A Case Study of

Information Management Programs at Anadolu University, Turkey

Deniz Tasci
Cengiz Hakan Aydin
Anadolu University, Turkey

Abstract

This presentation consists of the results of a study in which facilitators' attitudes toward effectiveness of various media used in the Information Management Associate Degree Program of Anadolu University, Turkey. The study has shown that although facilitators indicated that textbooks should still be used in online courses, they found textbooks as being not efficient as multimedia programs and web environments. The participant facilitators also found multimedia programs distributed on CDs more efficient than web environment.

Computer-Assisted Instruction Department

In order for researching and implementing the advantages of computer growth in education, Anadolu University took the first important step in 1989 (1). The idea of using computers for diversifying the programs and improving the services of Open Education Faculty both in quality and quantity had been developing among the faculty management for a period of time. Finally two persons started working for getting attention of the university management.

Unexpectedly, a long way was taken in a short time and 12 young people were employed. Except one, all of those employed were graduated from various faculties in the university. Not only were they lack of computer skills but also they were lack of experience on the use of computers in education. Majority of the staff, like the others employed afterwards, were working for different foundations that belong to university. A few students from engineering faculty in addition to these were working part-time.

In 1990, this team took responsibility to develop software for the Ministry of National Education under the contract of a signed project in cooperation with IBM Turkey. Because of the project and its advantages, the team was increased in number in a short time. According to the project, a primary school course was chosen and the courseware was developed for an academic year. The same year, with the help of some other faculties 200 school teachers were trained on computer-assisted instruction.

Because of the work intensity and diversity, the team experienced both increases and decreases in the number but continued its development. In 1991, another project was done again for the Ministry of Education but this time for secondary school programs. 4 courses were chosen and related courseware was developed. In parallel to the courseware development, authoring software was also developed by the staff in order for the development and presentation of the courseware. Teacher training went on in 1991, too.

This project started by the Ministry created a public awareness about computer use in education and also helped Anadolu University gain respect and experience after developing quality and sound courseware. During Fall 991, the team again showed efforts for holding a symposium at the Anadolu University and so got attention from Ministry bureaucracy and those researchers studying in the related field.

The young team had saved a good amount of know-how after 2 years of experience and gained popularity both at the university and in related communities overall in Turkey. In parallel to the respect and financial support it brought in to the university, the team moved in to its own building provided by the management and experienced no problems in getting necessary equipments, which was not the case in many other projects.

Here, some comments about the beginning phase of the team could be useful and elaborative for what is to be discussed later in this paper.

First, there were no standards among the team members about their status although they were employed by several foundations that belong to the university. And this was to be the case for a long time. Secondly, the team called Computer Assisted Instruction Department (BDE) had no formal status in the university, and this is still the case. Thirdly, staff had no job description and department did not have an organization structure either. And this is still the case, too. Finally, department was open to collaboration with any other departments on the campus basically with School of Communication, Open Education Faculty, and Education Faculty as long as it needs. For example, the writer of these sentences, herself, had

worked for the preparation of teacher/learner guides developed for the courseware under the project of Ministry and she also had been in the teacher training activities as an instructor.

The following year The Ministry of Education seized the department's activities after new government took over. As a result the number of people working in the department was decreased. This actually took place as drop-outs from the job. Some left upon seeing that there is no academic future in the department works and some left since there was no job guarantee. Actually this was the case in the previous years but since there was a big staff circulation it was not felt that much. After 1992 there was no employment at the department for a long time, so the number of the staff was very limited.

In 1993 and 1994 an original project was developed and started in order to diversify Open Education Faculty services. As a result, computer labs were established in various parts of the country of which each held 20-30 computers. In these labs, distance learners started studying the course materials that CBI department developed. A large number of these labs called Computer Assisted Academic Advisory Centers are still operating at the present.

At the same time the department continued to its services. Among these were the teacher training, computer-assisted instruction courses for face-to-face learners at other schools, various information and presentation software production, two instructional software productions for IBM Turkey, and last but not the least the computer use efforts for disabled learners.

The main function of the department until the year 1997 was developing projects for lab establishment in different cities, realizing these establishments and providing support activities, and producing advisory courseware for those schools which give distance learning courses. After a two-year bright period, 1992-1997 can be said to be a "non-productive" period for the department.

During this period, departments' usual services and issues were continued. Mehmet Emin Mutlu who is older than others and is more experienced comparing to others was assigned to the leadership of the department. But since the department had no formal status on the campus it did not a formal management and naturally a formal director either. Although Mr. Mutlu was drifted to this position by the willingness of his colleagues at the department, he was seen as a representative of the department by others outside the center.

Another thing that the department experienced at this time that it developed almost all the projects itself. In other words, without any demand from the university or faculty management all the projects were developed by the department and those which university management approved were implemented. In addition, relations with other faculties, especially with education faculty were strengthened.

Again during the same period, the department showed great efforts to remain up-to-date in both hardware and software issues. Mr. Mutlu had been experienced on this area and so he was assigned to follow the developments in technology in parallel to department's sensitiveness for developments. With such efforts his place was also strengthened in the department. Following the new management takeover at the university in 1999, the department moved in to its new place at Open Education Faculty building. Before long, it started tryout tests via internet and experienced an unexpected amount of attention. But this attention did not surprise them that much because the staff had closely observed the distance learners' needs while they were developing Computer Assisted Academic Advisory Services.

In the following year, multimedia cds were produced for various courses and delivered to the students along with the textbooks. Researches have shown that academic achievement of those who used cds increased significantly (Mutlu, Ozogut-Erorta, & Yılmaz, 2004).

Before long, the courseware that was presented in the framework of the Computer Assisted Academic Advisory Services was started to be offered online.

Today, Computer Assisted Instruction Department has 40 personnel in coherence with the eight-person core team. The department has diversified the distance learning activities of the university a great deal in 6 years. During this time, in courses at education faculty, successful students were observed and given a chance to work as interns of whom some were employed to work full time later times.

On the other hand, the department has not a clear status yet neither in the university nor in the faculty management. Meanwhile Mr. Mutlu completed his academic studies and was assigned to be Vice-Dean in the Open Education Faculty. Thus the place of the department became clearer in the university but it still does not have an organizational diagram that defines tasks and the jobs in the department. Technically, there is no difference between Mr. Mutlu and any member of the core team in terms of status and it's the same situation for those new comers' situations compared to experienced ones. But still a hierarchy is sensed because of reciprocal respect and habits.

Information Management Associate Degree Program

Maybe the biggest project that the department developed was the Information Management Program which is the first "associate degree" program offered online in Turkey (Mutlu & Aydın, 2004). Advantages of the way the department has been organized may be seen better by taking a look at the structure and development process of this program.

The idea of developing a program that will continue completely online goes far back to the first years of the department. By then, neither the university nor the country in general had required technical infrastructure to implement such a program, so the idea has been delayed for years but never put away on shelves. When tryout exams started online, distance learners have been better analyzed and it was recognized that more learners had access to internet than it was assumed. It was also found out that many of those students had been reaching internet from their work places but not from their homes.

In the framework of formal and informal relations with those students, it was concluded that an internet-based program was feasible and any program to be offered should consist a work-related content in order for increasing this feasibility. This idea was gradually matured in the department and structured by the end of 1999 as an internet-based two-year associate degree program. The program was presented to the university management upon getting approval from the faculty management. After the approval of the faculty, Microsoft-Turkey was contacted and with the cooperation of this institution program development process was started.

Support from Microsoft-Turkey came to the project as providing the registered students with the necessary software and software related booklets or guides with a discount. With this support textbook writing problem had been solved on the other hand.

In the following weeks, course content of the two-year program was clarified in the department and except the courses that are compulsory for any higher education learner in Turkey, courses such as Operating Systems, Desktop Publishing, Spreadsheets, Organizational Communication, Group work, and Multimedia Application were decided to be offered. Course instructors and advisors were determined at the same time.

Later on the following months, instructional materials were developed with an intensive work load and meanwhile the decisions were made about the operation of the program activities including the services to be provided, time schedule, instructors, and so on. It was planned that each learner would be given 5 assignments during the first year, and these assignments were to be related to a virtual company and its operations that was formed by course developers.

The name of virtual company formed was Anadolu Publication and it had operations same as any real company would have. In terms of financial, logistics, human resources and any other related operations, the department sought for help from other departments on the campus, but preferred to develop the company virtually itself after some problems related to work load of the other people asked for help.

An important issue to note here is that the department used its own work force and initiative to form such a virtual company so that the learners would do real world like projects. And of course this increased the staff's work load as a result.

Another point to note for is that during the time in which the idea of information Management Program evolved in to a well structured program, all decisions were made collaboratively. Besides, acting as a team in the department prevented competitive efforts and questions like "who made this decision?" was regarded strangely.

The most important difference of the Information Management Associate Degree Program is that all the works done are on a virtual company. This application gives learners a chance to apply their learning on a simulated real life example and provide permanent learning experiences to the learners. It is well known that such real life exercises provide richer learning outcomes. It is also well known that developing such real life examples and simulations is a hard job to do. This hard job was realized in the Computer Assisted Instruction Department in a very short time along with many other projects. The most important factor that is required for the development of a project is that the required efforts for such a project were shared among the department staff.

Although the program activities are based on a virtual company, the program has many other sound characteristics. On every course each first year student is given 5 assignments and these assignments are evaluated seriously. At the end each learner is given appropriate, elaborative feedback. Also, learners feel free in terms of time and space having the ease of reaching materials and advisors outside the working hours as well as reaching classmates anytime anywhere at their own ease. This helped the program overcome the possible routine problems encountered in traditional learning environments.

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Experts in the department, starting from the first year, had a chance to communicate to the learners face-to-face during the exam periods (2) of Open Education Faculty and thus they had a chance to get feedback from learners about the system. In fact, student assignments, advisor observations, and internet based communication provided the program with important feedback so far. But face-to-face communication with students during the exams provided valuable feedback which in no other case would have been provided. Efforts related to this are still continuing.

As a result of the observations for two years, during the second year, student assignments were decided to be a team work rather than being individual responsibility. Thus it was planned that a gap that is characteristic to distance learning was to be filled. During the second year of the program, learners take courses like Organizational Information Management, Planning and Control Tools, Internet Information Systems, Data Base Management Systems, Advertising and Marketing Tools, Graphics Applications, and Office Applications Development besides their higher education compulsory courses. For each of these courses learners are to complete 5 assignments.

In both first and second year courses, learners are provided with video cds and textbooks as well as internet-based instructional materials. Textbooks are provided by Microsoft Turkey, but all of the other materials are produced, reproduced and distributed by the department. For the distribution process the faculty's logistics are used.

Upon completion of the first year activities, second year's materials and activities were also started to be designed. Feedback provided till then was used in designing new materials. For example, it was decided at the end of feedback analysis that the assignments on virtual company should be related to each other in a complementary manner.

Evaluation

Computer Assisted Instruction Department of Anadolu University is one of the rare learning organizations in all around the world. In fact, the department must be very similar to those organizations that experts like Argyris and Senge were thinking while they were developing learning organizations theory. Hence, having a difference from efforts to overcome problems and to reach a better functioning organization structure at the present organizations, the department provides valuable information about the possibility of learning organizations.

It should be better stressed that while no other formal organizations met the requirements, the department had experienced changes in the personnel number changing from 8 to 200 from time to time and had got help from other faculties when necessary to direct 500 people to the same target, and had done all of these without an organization diagram and job descriptions.

Also, a limited number of people who were educated ordinarily and had not much experience in the area were able to realize quality works in nation wide in a short time when there was not enough know-how in the field. To better understand the importance of the works of the department, one should note that same projects in all around the world are done with many experienced and qualified personnel in longer periods of time. Excluding the option that such people with very special characteristics came together accidentally we can infer that this is a result of the organization style of the department.

Computer Assisted Instruction Department, on the other hand, served to the field by producing knowledge and experience which the country did not have beforehand and thus determined norms almost every phase. In other words the department in its 15 year history has become an organization that feeds outside environment rather than being an organization that was fed by outsiders.

For these reasons, if we evaluate the Computer Assisted Instruction Department as a learning organization, we can easily say that it is more efficient and successful comparing to traditional organization structure of the learning organizations. Especially, in a changing and wavy atmosphere of a new developing field, it is maybe the most important strength of the department that it could use the energy that environment produced to develop itself.

We now can take a look at the appropriateness of the structural characteristics of the department to the characteristics expected in learning organizations determined by experts like Argyris and Senge. At this point, it is necessary to review five factors determined as characteristics of learning organizations (Chawla & Renesch, 1995; Davenport & Prusak, 1998): Individual competence, intellectual models, shared vision, learning as teams, and system thought.

In terms of individual competence in the department, this concept should be handled somehow differently. Almost everybody among the personnel is not graduated from a well-known school in Turkey. It can not be said that they were graduated from top schools at the university as well. They are also not that

bright students graduated with degrees from their schools. Roughly, any institution that is to establish distance learning program today could hardly choose the present Computer Assisted Instruction Department personnel. But the value of the projects they developed, the quality of the papers and articles they presented at scientific platforms and knowledge they posses when talked to show that each of the personnel is competent about the use of computers as an instructional tool.

Senge indicates a correlation between individual competence and "learning effort" (Senge, 1992). At this point, department personnel are in a continuous learning process. Everyone working at the department has a natural motivation in order for following the developments in relation to the department operations. During the in-service training activities for 15 days every year, department staff helps each other's learning. But more surprisingly, almost everyone in the department can start making use of one another's learning in a short time. Thus, in spite of rapid technological changes, they were able to remain up-to-date as a whole.

According to what one of the staff told and what many of the others remembered at the same time, during the first year while they were attending to a meeting, one of them disagrees with another one saying "nonsense" to his opinion. One of the formers of the department disapproves his behavior and says: "It is free to speak nonsense here, but it is forbidden to say "nonsense" to anyone else." We can see even today that department personnel have conserved their intellectual flexibilities upon having grown in such a culture since the beginning. At this point it can be said that intellectual patterns and assumptions Senge talks about (Senge, 1992) are not effective on the Computer Assisted Instruction Department. Hence, intellectual models discipline can be told to exist at the department.

In the process Information Management Associate Degree Program was designed and implemented, a lady from the core team of the department stayed away for a while from the works upon having a baby. When she returned to department later on, she adapted herself easily in to a project that was just started. There are so many other values in the department that the staff has been sharing and the existence of such values helped that lady to participate in Information Management program easily.

When any new project is in question, the staff takes expectations and needs of those in the project into consideration. According to traditional organization structure understanding, the work that the organization is going to do is determined beforehand. Whether it is a service or product, the production characteristics are determined by experts. Tasks and steps to be taken in the process and individual responsibilities are determined explicitly in advance. Thus, everyone in the traditional organizations performs tasks and responsibilities determined by some other people according to a plan and they take their positions in the project according to this plan. On the contrary, in the Computer Assisted Instruction Department, everyone takes positions in coherence with each other with no other effects. Everyone tries to fill one another's gap and to fulfill the shared standards on the quality of the product. In other words, all processes of the department are "implicit" processes.

From this perspective, it can be said that there is a common point between the shared vision of the department and the learning as a team. Human brain is also consists of neurons which have no explicit plans and each taking positions according to others. Accumulation of the implicit relations among neurons by time means the whole brain learning. And this learning is the department's whole learning rather than people learning individually in the department.

It can be said that the Computer Assisted Instruction Department is not one that evolved to be a "learning organization" by time but rather it was established to be a learning organization with its formation and functions from the beginning. The most important structural difference that makes the department a learning organization is the fact that it was structured to function by "implicit" relations among staff rather than explicit plans. This helped the department have a shared vision in a short time, learn together, produce individual competences from shared learning and other synergic effects, change its environment and collect feedback from this environment, and change itself to new developments.

When compared to its equivalents in the world, Computer Assisted Instruction Department can be seen as a necessity at least for some sectors taking into consideration that it was able to realize productions, to help the field with its know-how and to develop standards with a limited budget and personnel.

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Footnotes

1. This particular attempt happened in my office. I witnessed the most amount of the history here in this part. Also, I did interviews recently with related people in order to prepare this paper. As a resource to the summarized history in this part following address can be visited:
http://www.bdeb.aof.edu.tr/bde/index.html

2. In order for diplomas can be valid in Turkey, exams must be given face-to-face. For this reason open education Faculty holds three exams for each academic year throughout Turkey.

Effects of Computer Integration Training and Computer Literacy Training on Preservice Teachers' Confidence and Knowledge Related to Technology Use

Jeremy I. Tutty
Boise State University

James D. Klein
Howard Sullivan
Arizona State University

Abstract

The purpose of this study was to examine the relationship between computer technology training experiences and preservice teachers' confidence and knowledge. Partcipants enrolled in either a basic computer literacy course or a computer integration course completed a survey developed to measure their confidence and knowledge of computer skills and integration. Findings revealed that the preservice teachers who completed courses on both computer literacy and computer integration had more confidence for computer skills and integration than when they completed only one of the two courses. Results also indicated that participants who completed the computer literacy course by itself or in combination with the integration course had significantly more knowledge of productivity tools and basic operations than those who did not complete the literacy course. Implications for training preservice teachers on how to integrate technology are provided.

Introduction

Background

Preparing preservice teachers to use technology in the classroom is a daunting task facing teacher training institutions. Preservice teachers should not only learn to operate various technologies, but also how to use them effectively in the classroom (Brush, 1998; U.S. DOE, 2001). Research on technology integration training indicates that preservice teachers are not being adequately prepared in educational technologies. A decade ago, a report by the Office of Technology Assessment (OTA) showed that only three percent of graduating teachers felt "very well prepared" to use technology in their teaching (U.S. Congress, 1995). In 2000, the situation was unchanged. The U.S. Department of Education reported that new teachers were still not being adequately trained to use technology (U.S. DOE, 2000).

Since these reports were released, the International Society for Technology in Education (ISTE) (2002) developed the National Educational Technology Standards for Teachers (NETS-T). These standards provide the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings.

In addition to these standards, many colleges and universities have revised how they train preservice teachers to use technology. A survey by five of the six Regional Technology in Education Consortia revealed that introductory courses in technology are relatively common, and that student skills tended to mirror their exposure during training (ITRC, 1998). There has been some debate over whether requiring an introductory technology course in preservice teacher preparation is the appropriate means to achieve the desired technology competencies (Fox, Thompson, & Chan, 1996; ISTE, 1999; Leh, 1998; Wetzel, 1993; Wenglinsky, 1998; Willis & Sujo de Montes, 2002). The opponents of a required course argue that a single course characterizes computers as a non-integral part of instruction, and that technology should be integrated across all teacher education courses (Fox, Thompson, & Chan, 1996). A study conducted by the ISTE questions the effectiveness of these courses: "We assumed formal course work would lead to the ability to integrate technology into instruction; this is not the case" (ISTE, 1999, p. 20).

Proponents argue that preservice teachers do not learn basic technology literacy skills in their teacher education programs without a dedicated literacy course (Dugger, 2001; Leh, 1998; Simonson & Thompson, 1997; Wright & Shade, 1994). Others point to the positive impact of basic computer literacy on the attitudes and self-efficacy of preservice teachers toward technology (Savenye, 1993). Willis & Sujo de Montes (2002) suggest that: "One answer may lie in implementing a…skills course in addition to (an

integration course). In this way, the first course would focus on technology skills, while the second course would focus on technology integration into the curriculum" (p. 80).

The purpose of the current study was to investigate the effects of two such courses (Computer Literacy and Computers in Education) on preservice teachers' self-reported computer integration confidence and knowledge.

Confidence

Confidence is concerned with the judgment of what one can do with whatever skills one possesses. If teachers are to integrate technology into their teaching, they must feel confident in using it (Ertmer, 1994; Wetzel 1993). Positive attitudes toward technology are common among preservice teachers (Karsten & Roth, 1998; Knezek & Christensen, 1998; Ropp, 1999; Selwyn, 1997; Wenglinsky, 1998), but few teachers consider themselves ready to teach with technology. Several studies have found positive effects for instruction on computer confidence (Ropp, 1999; Yildirim, 2000).

Knowledge

In addition to confidence, teachers must possess basic knowledge and skills required to operate and integrate technology (Brush, 1998; Leh, 1998; U.S. DOE, 2001). Both the National Council for Accreditation of Teacher Education (NCATE) and ISTE specify that, "Teachers should be able to demonstrate a sound understanding of technology operations and concepts" (ISTE, 2002 p. 9). According to Trotter (1999) many classroom teachers still do not have adequate technology skills. The literature is replete with examinations of attitudes toward computers, computer anxiety, computer self-efficacy, computer coping strategies, and required competencies (Delcort & Kinzie, 1993; Flowers & Algozzine, 2000; Hudiburg & Necessary, 1996; Karsten & Roth, 1998; Savenye, 1993). However, research that assesses computer integration knowledge is sparse. Fields, Millard-Mann, & Waryanka (2000) indicate that the need for quality assessment tools, which measure the technology proficiency of teachers is great: "Preparing technology-savvy, academically sound teachers requires proper assessment to ensure that technology will be effectively integrated into the schools" (p. 7).

Method

Participants

The participants for this study were 180 preservice teachers enrolled in either a computer integration or computer literacy course at a large university in the southwestern United States. The computer integration course was required for students enrolled in one of nine initial teacher certification programs. The computer literacy course satisfied a general studies requirement and was recommended for students in the teacher certification program. The participants were predominantly Caucasian female (85%) preservice teachers from all major content areas. The average reported computer use of the participants was 7-10 hours per week.

Three groups of preservice teachers were used for comparisons. The groups were determined based upon the combination of their technology training experience: computer integration course, computer literacy course, or the computer integration course plus the computer literacy course.

Course Descriptions

Two different courses, Computer Literacy and Computers in Education, were the focus of this study to examine the relationship of differing computer technology training experience and preservice teachers' computer integration confidence and knowledge. Computer Literacy introduces basic technology skills in word processing, spreadsheets and web development. Assignments are related to the basic function of each software package, productivity and data analysis. Computers in Education introduces technology integration. Assignments include evaluation of educational software, lesson plans and the development of a technology-integrated lesson plan.

Both courses are designed for learner-centered classrooms and are taught in a similar manner. Instruction in both courses features illustrated lectures, in-class discussions, on-line research and discussion, demonstrations, hands-on lab activities, and active student participation. Both are offered through an Educational Technology program housed in the College of Education.

Computer Literacy. Computer Literacy is a general studies course in basic computing skills. In any given semester, approximately 40%-60% of the course enrollment is preservice teachers. It is

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recommended, but not required, that preservice teachers complete Computer Literacy before enrolling in Computers in Education. Computer Literacy has two areas of concentration: general computing knowledge and computer productivity applications. Students receive instruction in basic computer operation and in word processing, spreadsheets and web development.

Class projects and activities are designed to develop skills in real world problem solving and data analysis. The class also uses BlackBoard course management software to facilitate learner-centered research groups. Students participate in an on-line research group on one of the following topics: computer security, copyright for students, adaptive/assistive technology, or emerging technologies.

It is intended that students completing Computer Literacy will: approach computer-based tasks with greater confidence, demonstrate sound file management, and select and use appropriate software to find or present solutions

Computers in Education. Computers in Education is a teacher-preparation course in computer integration. Computers in Education is required in all teacher-certification programs at the university. This course is designed to provide preservice teachers with experiences that facilitate effective and appropriate integration of computer technology into teaching and learning activities. The Computers in Education course focuses on key concepts and methods for implementing these types of activities with students. Students receive technology-integrated training experiences in instructional development, assessment, management, evaluation, and lesson planning.

Class projects and activities are designed to develop skills in development of technology-integrated lessons, proper alignment of instruction to objectives and state standards, and the use of appropriate forms of computer technology to meet objectives and to place technology in the hands of students. The class also uses the TaskStream educational tool system to build and display an e-portfolio of completed work.

It is intended that students completing Computers in Education will apply 'backwards design' principles to develop lessons that focus on a set of instructional objectives; use appropriate forms of computer technology to meet the objectives; and develop assessment items aligned with content objectives, state and technology standards, and student needs.

Computer Integration and Basic Skills Instrument for Preservice Teachers

The Computer Integration and Basic Skills Instrument for Preservice Teachers (CIBSI) was developed and administered to students enrolled in both courses during the Fall of 2004. The CIBSI contained 40 items comprising two 20-item subscales: confidence and knowledge. Each of the two subscales was divided into a computer skills and computer integration topic category. Additional demographic items identified the participant as a member of the computer integration group, computer literacy group, or computer integration + computer literacy group. Items for the scale were developed through a review of the literature and the ISTE NETS-T (ISTE, 2002; Knezek & Christensen, 1998; Selwyn, 1997).

The confidence subscale consisted of 20, five-choice Likert-type items ranging from very confident (scored as 5) to not confident at all (scored as 1). The complete list of confidence items are shown in Figure 1. The Cronbach alpha reliability coefficient for the 20 confidence items was .93.

Figure 1. PTCIS Confidence Items

Item

Skills Topics:

Productivity Tools
- Performing a cut or copy and paste between documents
- Attaching files to email
- Developing a presentation with graphics and sound
- Sorting data in a database
- Using functions in a spreadsheet to perform calculations

Basic Operations
- Saving and retrieving files from a folder
- Accessing information on a CD-ROM, diskette or hard drive
- Accessing user settings: i.e. desktop wallpaper, screensaver, sounds
- Connecting peripheral devices: i.e. printer, pda, portable audio device
- Performing disk maintenance: i.e. disk defragmenter

Integration Topics:

Tool Application
- Communicating with peers via multiple electronic means i.e. email, discussion board/forum…
- Designing technology-enhanced lessons
- Evaluating instructional units that integrate technology
- Aligning objectives to national technology and content standards
- Discussing issues related to equitable access to technology in school

Professional Practice
- Using the Internet for lesson plan ideas
- Delivering a lesson with presentation software: i.e. PowerPoint
- Using a database in a discovery lesson for students
- Creating digital concept maps
- Writing a WebQuest

The knowledge subscale consisted of 20 multiple-choice questions distributed evenly among the two topic categories of skills and integration. Items from each topic category were distributed randomly on the survey. The reliability coefficient for the 20 knowledge items was .78.

Content of the knowledge items was aligned to ISTE performance indicators and to factors identified by the National Survey on Information Technology in Teacher Education (Moursund & Bielefeldt, 1999). The complete instrument is available on request from the first author.

Procedures

Three subgroups of 60 participants each were selected among preservice teachers enrolled in Computer Literacy and Computers in Education: computer integration only (n=60); computer literacy only (n=60); and computer integration plus computer literacy (n=60). The groups were selected to represent the three different types of technology training experiences of the participants.

Members of the computer integration only group were participants enrolled in the Computers in Education course who had not previously completed the Computer Literacy course and were not currently enrolled in it. Thus, the training experience of this group consisted solely of computer integration training. Members of the computer literacy only group were participants enrolled in the Computer Literacy course that had not previously completed or were not concurrently enrolled in Computers in Education. Thus, the training experience of this group consisted solely of computer skills training. Members of the computer integration + computer literacy group were participants enrolled in the Computers in Education course who had previously completed Computer Literacy. Thus, the training experience of this group consisted of both computer integration and computer skills training.

The researcher contacted each course instructor via email and personally arranged to deliver and collect the CIBSI from each instructor. Each instructor received a packet containing directions for

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administering the instrument and sufficient copies for the instructor's students. Course instructors administered the instrument to all students in their classes near the end of the Fall 2004 semester.

Data Analysis

Mean scores were calculated for each topic category for the three respondent groups. Separate one-way multivariate analysis of variance (MANOVAs) were conducted to analyze the survey scores of the three groups for significant differences in confidence and in knowledge. Analyses of variance (ANOVAs) on the two topic categories (skills and integration) were conducted as follow-up tests to each MANOVA. The univariate ANOVAs were followed by post hoc analyses consisting of Dunnett C pair-wise comparisons to identify significant differences between pairs of topic category scores. Alpha was set at .05 for all significance tests. A Pearson product-moment correlation coefficient was also computed between the overall confidence and knowledge scores.

Results

Confidence

Table 1 shows the mean confidence scores by topic category and respondent group. The overall mean confidence score for all groups and topic areas was 3.84 (5 = very confident to 1 = not confident at all). Overall mean confidence scores by respondent group were 4.06 for the integration + literacy group, 3.78 for the integration only group, and 3.68 for the literacy only group. Participants had higher overall confidence for computer skills ($\underline{M}$ = 4.02) than for computer integration ($\underline{M}$ = 3.66).

Table 1. Mean Confidence Scores by Topic Category and Respondent Group*

Topic Category	Integration Only	Literacy Only	Integration + Literacy	Overall Topic Mean
Skills	3.87_a	3.96	4.22_a	4.02
Integration	3.69_a	$3.40_{a,b}$	3.91_b	3.66
Totals	3.78_a	3.68_b	$4.06_{a,b}$	3.84

Note. Scores are based on a 5-point scale (5 = Very Confident, 1 = Not Confident at All) Means in the same row denoted with subscripts differ significantly from each other (p < .05).
* n = 60 for each group

A one-way multivariate analysis of variance (MANOVA) conducted on the data in Table 1 yielded a significant main effect for the three technology training groups, Wilks's Λ = .87, $F(4,352)$ = 6.56, p <.05. ANOVAs conducted as follow-up tests yielded a significant effect for computer skills, $F(2,177)$ = 3.50, p <.05, and for computer integration, $F(2,177)$ = 6.69, p <.05.

Post hoc analyses consisting of Dunnett C pair-wise comparisons yielded three significant differences between groups. For the category of computer skills, the integration + literacy group reported significantly higher confidence (M = 4.22) than the integration only group (M = 3.87). For the category of computer integration, the integration + literacy group reported significantly higher confidence (M = 3.91) than the literacy only group (M = 3.40). Furthermore, the integration only group reported significantly more confidence (M = 3.69) than the literacy only group (M = 3.40) for items in the computer integration category.

Knowledge

Table 2 shows the mean knowledge scores by topic category and respondent group. The overall mean knowledge score for all groups and topic categories was 13.90 (70%) out of 20 items. Mean scores on the overall test were 14.70 (74%) for the literacy only group, 14.65 (73%) for the integration + literacy group, and 12.34 (62%) for the integration only group. Participants received higher overall knowledge scores in the skills topic category ($\underline{M}$ = 7.94), and lower overall knowledge scores in the integration topic category ($\underline{M}$ = 5.96). The integration only group scored lowest in both topic categories.

Table 2. *Mean Knowledge Scores by Topic Category and Respondent Group**

Topic Category	Integration Only	Literacy Only	Integration + Literacy	Overall Topic Mean
Skills	$7.12_{a,b}$	8.57_a	8.13_b	7.94
Integration	$5.22_{a,b}$	6.13_a	6.52_b	5.96
Totals	$12.34_{a,b}$	14.70_a	14.65_b	13.90

Note. Scores are based on 1 point each for 10 questions per topic category. Means in the same row denoted with subscripts differ significantly from each other ($p < .05$).
* n = 60 for each group

A one-way multivariate analysis of variance (MANOVA) conducted on the knowledge scores yielded a significant main effect for the three groups, Wilks's $\Lambda = .86$, $F(4,3352) = 7.01$, $p < .05$. ANOVAs conducted as follow-up tests yielded a significant effect for both skills topics, $F(2,177) = 11.27$, $p < .05$, and integration topics, $F(2,177) = 6.51$, $p < .05$, within knowledge.

Post hoc analyses consisting of Dunnett C pair-wise comparisons yielded four significant differences between groups. For the category of computer skills, both the literacy only group (M = 8.57) and the integration + literacy group (M = 8.13) scored significantly higher than the integration only group (M = 7.12). For the category of computer integration, both the integration + literacy group (M = 6.52) and the literacy only group (M = 6.13) scored significantly higher than the literacy only group (M = 5.22).

Relationship between Confidence and Knowledge

A Pearson product-moment correlation coefficient was computed between overall confidence and knowledge scores. The calculated *r* of .33 revealed a significant correlation (*p*< .01) between scores on the confidence scale and scores on the knowledge scale.

Discussion

The purpose of this study was to examine the relationship between computer technology training experiences and preservice teachers' confidence and knowledge.

Confidence

Findings reveal that when preservice teachers complete courses on both computer literacy *and* computer integration, they have more confidence for computer skills and integration than when they complete only one of the two courses.

The higher confidence of students who took both courses indicates the importance of including the combination of training experiences in preparing preservice teachers. Students in this study who received both integration and skills training typically completed the computer literacy course before enrolling in the integration course. This combination may have led to higher confidence scores because training on how to integrate technology provided students with additional opportunities to use the computer skills they acquired in the literacy course in an applied integration context. This opportunity was not available to the students who received only one of the two training experiences. Several other studies suggest the importance of providing applied practice in computer integration (Fox, Chan, & Thompson 1996; Wetzel, 1993; Wenglensky, 1999).

As expected, the findings of the current study also revealed that students who received only integration training had significantly more confidence for computer integration than students who received only literacy training. But contrary to expectations, students who received only literacy training did not have significantly more confidence for computer skills than those who received only integration training. This later finding does not support other research suggesting that when preservice teachers receive computer literacy training, it leads to greater confidence in regard to skills items (ITRC, 1998; Karsten & Roth, 1998).

A plausible explanation for the results of the current study may be found by examining the items used to measure confidence. The confidence items were based on the National Education Technology Standards for Teachers (NETS-T) developed by the International Society for Technology in Education (ISTE, 2002). The integration items included questions about designing technology-enhanced lessons and

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aligning objectives to national technology standards. The preservice teachers who completed the integration course were expected to master these skills and were given instruction and assessment related to them. Instruction on these topics should have led to increased confidence for students who completed the technology integration course.

However, the items used to measure confidence for skills were more general than those used to measure confidence for integration. The items for skills confidence included questions about basic operations and tools such as attaching files to email messages and saving and retrieving files from a folder. It is possible that a difference was not detected between the integration only and literacy only students in skills confidence because the items referred to technology commonly used by, or at least familiar to, the typical college student.

Knowledge

Preservice teachers in the current study who completed the computer literacy course by itself or in combination with the integration course had significantly more knowledge of productivity tools and basic operations than those who did not complete the literacy course. This result is not surprising since the computer literacy course provided instruction and assessment on topics such as file management and software applications.

In addition, the preservice teachers in the literacy only group had significantly more knowledge for computer integration topics than those in the integration only group. This is contrary to expectations considering the literacy only group was not trained on how to integrate computers and the finding that the integration only group reported higher confidence for integration tasks than the literacy only group.

It is possible that preservice teachers experiencing only literacy training may lack exposure to the integration vocabulary because their training focuses on general computing knowledge and computer productivity applications. This may impact their integration confidence, but due to their knowledge of technology tools, they are able to proficiently apply their knowledge to address integration tasks (Dugger, 2001; Leh, 1998; Simonson & Thompson, 1997; Wright & Shade, 1994).

Differences between the participants who enrolled in each class may also have contributed to the results. At the university where this study was conducted, the computer literacy course is an elective while the integration course is required. Students taking the computer literacy course may have done so because of an interest or motivation towards technology that students taking only the required course do not possess.

Conclusion

If teachers are to integrate technology into their teaching, they must feel confident in using it (Ertmer, 1994; Wetzel 1993). In addition to confidence in using technology, teachers must possess the basic skills required to operate and integrate technology (Brush, 1998; Leh, 1998; U.S. DOE, 2001).

The motivation for conducting the current study was to examine the preparation of preservice teachers at one university with the expectation that the results would inform educational technology faculty and administrators of the effectiveness of the current methods being used. The results do suggest certain approaches that may be useful in directing teacher education programs in such a task.

This study seems to corroborate existing research that a single technology class focusing on either computer literacy or computer integration may not be sufficient to adequately prepare preservice teachers to integrate technology (ISTE, 1999; Willis & Montes, 2002; Willis & Tucker, 2001). The results for knowledge seem to support the inclusion of a computer literacy course in the preparation of preservice teachers. The general pattern of responses indicates that knowledge of tools is necessary to appropriately select and apply technology in the classroom. Several states have recognized this need and implemented technology competency standards and assessments for teachers (NASBE, 2003). While the results for confidence indicate that in order to graduate teachers both confident and capable to integrate technology into their teaching, they should have the opportunity to practice technology integration in an applied environment.

One alternative to the format examined in this study might be a combination of the literacy and integration courses. This arrangement would accommodate the teaching of basic skills in the context of technology integration projects and assignments. A second alternative is that advocated by ISTE and others of a totally infused teacher preparation program in which technology is integrated into all existing courses and assignments (ISTE, 1999). This method is certainly more demanding, principally because it requires more faculty members to be skillful with technology, and was not examined in this study. The

results of this study indicate that even in such an environment, a dedicated computer literacy course may still be necessary.

This research is limited to the extent that the impact of the training experiences examined in this study is not known for teachers in their own classrooms. Further research on technology integration following these preservice teachers into their first year of teaching is needed to determine whether the preservice educators who completed the computer literacy or computer integration course are actually using technology in their classroom.

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Developing and Evaluating an Interactive Multimedia Instructional Tool: How Is the Learning Quality of Optometry Students Impacted?

Ling Wang
Bai-Chuan Jiang
Nova Southeastern University

Background

As multimedia teaching technologies become more widely advocated and employed in higher education, researchers strive to understand the influence of such technologies on student learning. Advances in technology enable pedagogical enhancements that some believe can revolutionize traditional methods of teaching and learning (Gatlin-Watts, Arn, Kordsmeier, 1999). Studies of multimedia-based instruction reported a variety of outcomes (Ehrmann, 1995; Feeg, Bashatah, & Langley, 2005; Frey, 1994; Homer, Susskind, Alpert, Owusu, Schneider, Rappaport, & Rubin, 2000; Mayer, 1997; McKethan & Everhart, 2001; Moreno & Valdez, 2005; Neuhoff, 2000; Sekuler, 1996; Smith, 1997; Smith & Woody, 2000; Sneddon, Settle, & Triggs, 2001; Welsh, 1993; Welsh & Null, 1991). When reviewed collectively, these studies reported that advanced technologies, especially multimedia instruction, which often involve introducing or enhancing the visual aspects of the presentation of course contents, created an active learning environment, improved students' performance, fostered positive attitudes toward learning complex concepts, increased communication, and could be adapted to all learning styles and levels of instruction (Harris, 2002). Researchers suggest that, compared with classes with a traditional teacher-leading approach, those using multimedia are better liked by students and yield slight but statistically significant improvements in student learning as measured by both student self-report and objective outcome testing (Feeg, et al., 2005; Frey, 1994; Mayer, 1997; McKethan & Everhart, 2001; McNeil & Nelson, 1991; Moreno & Valdez, 2005; Petty & Rosen, 1990; Sekuler, 1996; Sneddon, et al., 2001; Welsh & Null, 1991; Worthington, Welsh, Archer, Mindes, & Forsyth, 1996). Such encouraging findings have precipitated the adoption of these technologies on a widespread basis. Despite many studies suggesting that multimedia instruction benefits students, there are also some that found no significant differences between multimedia classes and traditional classes (Homer, Susskind, Alpert, Owusu, Schneider, Rappaport, & Rubin, 2000; Lee, Gillan, & Harrison, 1996; Stoloff, 1995). Therefore, there is need to further educators' understanding of the effect of multimedia technologies on students' learning quality.

The effectiveness of multimedia-based instruction was studied in a variety of disciplines, such as Biology (Sneddon, et al., 2001), Nursing (Feeg, et al., 2005), Pediatrics (Homer, et al., 2000), Physical Education (McKethan & Everhart, 2001), Science Education (Moreno & Valdez, 2005), Physics (Zacharia & Anderson, 2003), Psychology (Lee, et al., 1996; Petty & Rosen, 1990; Stoloff, 1995; Worthington, et al., 1996), etc. Each discipline has its own characteristics that may influence the evaluation of the effectiveness of multimedia-based instruction. Therefore, it is not feasible to rely on the findings from the evaluation of the effectiveness of a particular multimedia-based instruction when evaluating a discipline different from the one that is reported in the findings. When it comes to the discipline of Optics, there are few studies that specifically address the effectiveness of multimedia-based instruction in Optics. The only two studies that studied the effect of using multimedia computer-aided programs in the broad field of Physics are not directly relevant to the evaluation of the effectiveness of multimedia-based instruction in optics. One of these two studies (Tao, 2004) was conducted to see how the use of collaborative learning mediated by multimedia computer-assisted learning programs helped students improve understanding of image formation by lenses. It was in the direct field of Optics, but what it examined was not the effectiveness of the multimedia programs, but the nature of the collaborative learning carried by such programs. Another study (Zacharia & Anderson, 2003) examined the effectiveness of multimedia-based instruction, an interactive computer-based simulation, but it was designed to evaluate the effect of such instruction on students' understanding of Physics (e.g., the laws of force and motion). Moreover, a review of the literature shows that there is so far no multimedia-based instruction program that has been produced for performing laboratory inquiry-based experiments of Optics. Therefore, it is believed that it is imperative that such a program be developed and its effectiveness be evaluated.

The combined outcomes of the majority of studies across disciplines indicated that multimedia-based delivery systems offered ways to optimize the advantages and minimize the disadvantages of

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traditional methods of teaching and learning. It is expected to be true in Optics. Optics labs are designed to help students understand the basic concepts and their applications by setting up experiments, collecting data, using data in calculations to identify unknown variables, and writing an adequate lab report. Many factors, such as the limited time for setting up, the unavailability of materials, and the inflexibility of light sources, limit the function of the labs in the traditional laboratories. The disadvantages elicited by these factors can be potentially addressed with the use of multimedia-based delivery systems.

Purpose of the Study

This study developed a multimedia-based instructional tool which is expected to overcome the imperfection of traditional labs. It also evaluated the effectiveness of the multimedia-based instruction, i.e., the virtual optics labs, in students' learning process. The study finally explored the users' perceptions of their experiences with the virtual lab tool and made recommendations for educators who may consider the adoption of virtual labs in their instruction of Optics. The findings of this study will further understanding of the use of multimedia technologies in Optics.

Research Questions and Hypothesis

It is hypothesized that the use of multimedia technologies, which will involve supplemental visual stimuli incorporated into lecture material, will have at least reinforcement effects, if not primary beneficial impact, on the students' learning process.

Specifically, the study asked the following research questions:

1. What are the effects of virtual Optics labs on the students' learning outcomes as measured by their performance in the end-of-lab quizzes?
2. How do the students perceive their experiences with the use of the virtual Optics labs?
3. What recommendations can be made for educators who may consider the adoption of the virtual Optics labs?

Methodology

Research Design

This research study used an experimental design. To be specific, it will be a pretest-posttest control group experiment. The four sections of the participants were divided into two groups. For the first part of the experiment, one group (two lab sections) was used as the experimental group and was given the treatment, i.e., using the virtual lab tool, and the other group (the other two lab sections) was used as the control group and did not receive the treatment, i.e., conducting the lab in the traditional laboratory. For the second part of the experiment, the two groups switched the role, namely, the group that received the treatment before conducted their lab in the traditional way and the group that did not receive the treatment before used the virtual lab tool.

Participants

Participants were students (112 for Part I of the study and 103 for Part II) enrolled in the first year optometry program in 2005 at a private university in the southeast of America. The students were somewhat randomly assigned into four sections (A, B, C, and D) upon registration for Basic Optics by the university administration. The assignment was somewhat random because all students who enrolled into the five-year program (instead of the regular four-year program) were deliberately assigned into Section D due to administration eases. Except for this deliberation in section assignment, the other students were randomly assigned into the four sections using a systematic method based on their last names.

The Instructional Tool

The multimedia-based tool used for the study was developed by a professional software programmer using Flash software (for the animated interaction of the program) and other webpage development software. The product was called "Virtual Optics Labs" and consists of two Optics labs: "Reflection and Refraction of Light at Plane Surfaces" and "Prism – To Investigate the Refraction of Light through Prisms." Each lab starts with general instruction notes of the laws and principles involved in the labs and provides formula, graphs, diagrams for better illustration. Then the program continues with interactive experiments. The experiments are interactive in the sense that the users can select different angles of the light source, different materials above and below the plane surfaces, different thickness of the plane surface, and with each selection, the program will generate and show with simulated figures the

reflected rays, refracted rays, etc., just like what the users can see in a traditional lab. The program also calculates the angles of all the different rays generated, such as the reflection angle, refraction angle, angle of deviation, and angle of dispersion. All the calculated results are shown in the "Results Table" in the program as soon as the user makes one trial of the experiment. The first lab contains 3 experiments and the second lab contains 2 experiments.

Data Collection

In the Optometry program, Basic Optics is a major basic course. All four sections (A, B, C, and D) of the Basic Optics were taught by the same instructor. For the first part of the study, Section A and Section D were used as the control group and conducted their lab experiments in the traditional laboratory and in the tradition way. Section B and Section C were used as the experimental group and conducted their lab experiments in a computer lab using the Virtual Optics Labs tool developed by this study. For the second part of the study, Section A and Section D became the experimental group and was given the treatment, i.e., using the virtual lab tool, and Section B and Section C were the control group and did not receive the treatment, i.e., conducting the lab in the traditional laboratory.

The study was conducted during the fall semester of 2005. Two weeks after the start of the semester, students in each lab section was given a diagnostic test (i.e., the pretest) to examine their basic Optics knowledge level before the study. The test consisted of 12 questions with a total score of 10 points. During the fifth and the seventh week, the two parts of the study were conducted respectively. The experimental group conducted their lab experiments using the Virtual Optics Labs tool in a computer lab and the control group conducted their lab experiments in the traditional Optics laboratory. After the completion of the lab experiments, both the experimental group and the control group received a quiz (i.e., the posttest) examining their learning outcomes of the specific Optics labs. The test of the first part of the study consisted of 6 questions with a total score of 100 points, and the test of the second part of the study consisted of 12 questions with a total score of 100 points. Also at the end of the lab experiments, the experimental group completed an open-end questionnaire (see Appendix) evaluating their perceptions of the experiences with the use of the Virtual Optics Labs.

Data Analysis Strategies

The pretest scores were used to determine if there were any differences among the four sections to begin with. The posttest scores were used to assess the effect of the Virtual Optics Labs on the students' learning outcomes. The data collected using the open-ended questionnaire, asking for students' perceptions of their experiences with the Virtual Optics Labs, were qualitative type of data, and were analyzed using the standard pattern-seeking methodology for qualitative research.

<div align="center">

Results

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Effects of Virtual Labs

Pretest results. Means and standard deviations for each lab section were first calculated for pretest measures. Analysis of Variance (ANOVA) was then used to determine between-conditions differences on pretest measures. The results (in Table 1) showed no significant between-conditions difference which means the four sections were not significantly different from each other before the treatment.

Table 1. Pretest Measures of the Four Lab Sections

Section	Section Size	Mean	Standard Deviation	F Value	p-Value
A	28	8.61	1.71	0.25	0.86
B	29	8.31	1.67		
C	27	8.56	1.67		
D	28	8.64	1.34		

In order to see if the experimental group (Section B and C) and the control group (Section A and D) are significantly different from each other before the treatment, another ANOVA was run to examine the between-conditions difference of the two groups. Again, the results (Table 2) showed that the two groups were not significantly different from each other before the treatment.

Table 2. Pretest Measures of the Two Groups

Group	Group Size	Mean	Standard Deviation	F Value	p-Value
Experimental	56	8.43	1.66	0.43	0.52
Control	56	8.63	1.52		

Part I results.   For the first part of the study, 112 students of the total of 116 students in the program participated. Part I of the study focused on the first lab in the Virtual Optics Labs.

Since the ANOVAs of the pretest measures did not indicate pre-existing differences among the lab sections or between the experimental groups, another set of ANOVA was run on the posttest data to determine the differences between the experimental group and the control group in their learning outcomes due to the treatment, i.e., the use of Virtual Optics Labs. The results of the ANOVA on posttest scores (Table 3) did not show any significant difference between the experimental group and the control group.

Table 3. Posttest Measures of the Experimental Group and the Control Group (Study Part I)

Group	Group Size	Mean	Standard Deviation	F Value	p-Value
Experimental	56	77.25	14.53	1.10	0.30
Control	56	79.95	12.59		

Part II results.   For the second part of the study, 103 students of the total of 116 students in the program participated. Part II of the study focused on the second lab in the Virtual Optics Labs. The students who used to be in the experimental group during Part I formed the control group now. The previous control group now became the experimental group.

Another set of ANOVA was run on the posttest data collected after the completion of the second lab to determine the differences between the experimental group and the control group in their learning outcomes due to the treatment, i.e., the use of Virtual Optics Labs. The results of the ANOVA on posttest scores (Table 4) did not show any significant difference between the experimental group and the control group.

Table 4. Posttest Measures of the Experimental Group and the Control Group (Study Part II)

Group	Group Size	Mean	Standard Deviation	F Value	p-Value
Experimental	53	50.15	14.57	0.28	0.60
Control	50	48.52	16.95		

Users' Perceptions of the Experiences with Virtual Optics Labs

In the open-ended questionnaire, the students were asked four questions about their perceptions of the experiences with using the Virtual Optics Labs. The questionnaire response rate is very high. Out of the 116 students in the program, 112 students completed the questionnaire. The overall feedback to the use of the tool was dominantly positive. Almost all users indicated that they welcomed the use of such a tool in the Optics lab instruction, except for two students. One student expressed clear resistance to the use of such a tool and deemed it as a waste of time, and another student has mixed feelings about the tool. The responses of the participants to the four questions were analyzed. The following are the most commonly occurring responses for each of the three themes that emerged from the analysis of the data.

Theme 1: Advantages, or benefits of the Virtual Optics Labs

1. The multimedia program is user-friendly, reliable, easy to manipulate, and provides enjoyable experiences;
2. The labs are time efficient: the users don't need to set up the equipment and therefore they can quickly get into the experiments, and have more time to focus on actually doing the lab experiments. Also, there is no waste of time on easy calculations;
3. With the time saved from handling lab equipment, the instructor can focus on the questions or illustration of concepts that will make learning more meaningful;

4. Accuracy and precision: the labs allow for less human errors, for example, in calculations, or in setting up the variations for the experiments;
5. The labs allow for the use of wider range of data, such as more detailed angle variations, or using the medium that is not normally available in traditional labs, therefore, the virtual labs can allow for the results that are not normally achievable in traditional labs;
6. The lab results are instant: the users can almost try the ray from any single angle and get instant results;
7. Better accessibility: users can choose when to do the lab experiments;
8. Multiple trials of the experiments allow the users to perceive trends in data, and therefore, get the big picture of the theory in application;
9. Users can proceed with the experiments on their own pace; they can repeat the experiments as many or as few times as they want;
10. The labs stimulate independent work and independent thinking. Independent work may be more productive for some learners. Unlike team work, in independent work, individuals have the opportunity to complete every aspect of the task;
11. The labs are cost-effective and can reach more learners: with these virtual labs, the schools that can't afford actual Optics labs can still providing learning to their students through the use of this program;
12. Visual learners can benefit much from such experiences;

Theme 2: Disadvantages, or challenges of the Virtual Optics Labs

1. The labs may be overwhelming for the users who are not computer literate and don't feel comfortable navigating through the program;
2. The instructor may have to spend much time helping the students with the computer technical questions;
3. Real world visualization of the actual Optics lab may be hard because of the lack of the tangible aspect of a lab. The lack of the tangible aspect may affect the comprehension of the theory because some learners learn things better only by doing them hands-on;
4. Users may miss the opportunity to learn about the technical aspects of setting up the equipment;
5. Users may miss the opportunity to work as teams as they do in the traditional labs;
6. The Virtual Optics Labs have technical errors and computer glitches;

Theme 3: Important things to consider for the adoption of the Virtual Optics Labs

1. Make sure the users are computer literate and feel comfortable with the use of the type of advanced technology involved in the Virtual Optics Labs;
2. Users should become familiar with the lab purpose, theoretical concepts, and procedures ahead of time;
3. Make sure the directions in the Virtual Optics Labs are very clear;
4. Users should be directed not to rush through the program;
5. Allow students opportunities to see what incorrect results may happen in traditional labs;
6. Complement the virtual labs with the actual traditional hands-on labs;
7. Have better help/support available;
8. Always keep in mind that computer glitches could be present;
9. Make the virtual labs three dimensional;
10. Improve the program and produce better simulations;
11. Find a way to test the users' understanding of the concepts being learned because commanding the computer to do the work and then copying down the results generated by the computer may not guarantee real understanding;
12. Investigate whether the virtual labs are at least as effective as the traditional labs in learning;

Discussions

The statistical analyses of the posttests of Part I and Part II of the study both showed no significant differences between the experimental group and the control group. The no significant differences results proved that the multimedia-based instruction for Optics labs is as effective as the traditional labs. The

multimedia-based instruction should be safely adopted by educational institutions to teach the Optics labs.

The specific benefits identified by the users of the multimedia-based instructional tool are of great interest to the study. Mainly, the advantages and benefits can be grouped into 3 categories: usability (Theme 1, Items 1 and 6), usefulness (Theme 1, Items 2, 4, 7, 9, and 11), bringing about better learning quality (Theme 1, Items 3, 5, 8, 10, and 12). Although most of the users are consensus on the perceived advantages categorized in these three themes, some people shared different perceptions over certain aspects. For example, some people think that, with the virtual labs, users can get too tied up manipulating the functions of the multimedia program and fail to relate the tasks performed on computer to the real world applications. So it seems that some people think that the users may actually fail to look at the big picture of the Optics theories in application.

There are also some specific disadvantages or challenges perceived by the users of the program. The biggest challenge perceived is the challenge to the users who may not be comfortable with using the advanced technology that is involved in the program and therefore, may feel lost during the use of the program. Another important challenge involves the perception of the lack of the actual tangible experience in the traditional Optics labs and some users think that this lack may affect the understanding of the lab concepts. However, once again, there is mixed perception over the second challenge. Contrary to the response regarding the lack of the tangible aspect of a traditional lab, some students believe that the hands-on experiences provided by the Virtual Optics Labs are excellent and the experiences are so hands-on that they helped them understand the labs very well.

The recommendations made by the users can also be categorized into several aspects: prepare the users (Theme 3, Items 1, 2, and 8), prepare the program (Theme 3, Items 5, 9 and 10), smooth the use (Theme 3, Items 3, 4, and 7), and evaluate the use (Theme 3, Items 6, 11, and 12). These recommendations made by the users, as the first tryout group of this multimedia-based instructional tool, should be carefully considered when educators or school teachers evaluate the potentiality of the program to be adopted by their educational institutions.

Conclusions

This study developed an interactive multimedia-based Optics instructional software program. The program is the first developed multimedia tool to be used for conducting Optics labs. The program only consists of two Optics labs in its current version. More labs will be added to the program in the future.

The study evaluated the effectiveness of the program. The results show that the program is as effective as the traditional Optics labs in terms of the student's learning outcomes. The study also investigated the users' perceptions of the experiences of using the program. The advantages and challenges were both discussed. More importantly, the study provided valuable recommendations for educators to consider if they see the potential of adopting the program in their instruction.

For future research in this field, more Optics labs will be developed and the effectiveness of the program will be further evaluated using different participants in order to gain some vision about the potential populations for whom the program may be suitable and useful.

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Intertwining the Fabrics of Learning Styles, Personality Types, Bloom's Taxonomy, and Multiple Intelligences

Rosalie Carter Ward
The University of Southern Mississippi

Silverstein wrote a poem, Invisible Boy. "And here we see the invisible boy In his lovely invisible house, Feeding a piece of invisible cheese To a little invisible mouse. Oh, what a beautiful picture to see! Will you draw an invisible picture of me?" (1974, p. 82). Just as you can only imagine what is going on in the invisible house, we can only imagine what is in the minds of people with whom we work. Drucker believes knowledge and understanding of behaviors of people and institutions are keys that will ultimately determine society's ability to perform tasks and produce results (1999). He also believes people are the world's number one resource (1999). If these two statements are true, individuals in design and development need to understand as much as possible about people.

Since the qualities that distinguish individuals from one another are invisible, yet observable through different behaviors, it is helpful to examine and combine the concepts of ability and intelligence with three theories/models designed to create and describe pictures of you and me. Each of the three assumes the existence of intelligence and generally defines intelligence as the ability or abilities allowing individuals, in varying degrees of strength, skill, and limitation, to solve problems or create products that are valued by a society or culture and to adapt to changing environments. Intelligence is also the idea of having the ability to think which, as a mental activity, involves understanding, manipulation, and communication. Individually, these theories/models have had profound effects on the development of instruction. Each of them focuses on the process of learning and how "people absorb information, think about information, and evaluate the results" (Silver, Strong, & Perini, 1997, p. 22). While some individuals might say these theories/models demonstrate differences, I believe combining them and recognizing their similarities creates a powerful tool to be used by the instructional designer.

Instructional designers create instructional materials and programs designed to meet the needs of individuals in different professions. This design process is a rational, logical, and sequential process, which deals with human experience, skills, and knowledge. It is intended to solve problems, initiate change, or enhance what is occurring. For instructional designers, design is a discipline concerned with instructional strategies; developing and implementing strategies; identifying problems and finding solutions; creating detailed and specific criteria to assess learning; coordinating resources and procedures to facilitate training and learning experiences; improving performance; and applying strategies and techniques derived from behavioral, cognitive, and constructivist theories. When combined, Bloom's taxonomy, Jung's personality types, and Gardner's multiple intelligences, appropriately used, may greatly improve and enhance the effectiveness and applicability of instruction and training programs. The purpose of this paper is to give a brief overview of the theories/models, and how they can assist the instructional designer to be more client-oriented and to generate greater interest in learning about personality types, multiple intelligences, learning styles, and their usefulness and application to instructional design.

Jung's "pioneering work on the nature and structure of the human psyche presented the concept of healthy personalities having four developed functions: two perceptions, sensing and feeling, and two judgment functions, thinking and feeling" (Shields, 1993, p. 2).

the four functions			
perception functions		**judgment functions**	
sensing	**intuiting**	**thinking**	**feeling**
• Prefers action to wonder. • Prefers a standard way of doing things. • Interested in activities that have immediate, practical use. • Works steadily when given a realistic idea of how long a task will take. • More comfortable with concrete details than abstract ideas.	• Prefers wonder to action. • Prefers own way of doing things. • Interested in activities that generate possibilities and go beyond what is. • Works in bursts of energy powered by enthusiasm. • More comfortable with abstract ideas than concrete details.	• Prefers to make decisions. • Thinks things through before taking action. • Decides independently of others. • Needs to be right and treated fairly. • Responds to logic and reason.	• Prefers to make decisions based on personal feelings. • Responds to feelings and is spontaneous. • Seeks approval of others before making a decision. • Needs to be liked and treated in a friendly manner. • Responds to own likes and dislikes and other people's reactions.

Figure 1. Description of the four functions. (Silver Strong & Thoughtful Education Press, 2004, p. 1)

The extent to which these four functions are integrated by the individual enables someone to identify his or her primary functions, a process "known as individuation" (Ormrod, 1999, p. 330), which determines how a person views and reacts to various situations and circumstances. Jung also identified two attitudes toward life called introversion and extraversion that also influence personality traits and behaviors. His theories "emerged from his observations of how people collected information, and how they made judgments about that same information in terms of personal significance. A central theme in Jung's theory is that much apparently random variety in human behavior is due to the preferences for certain functions over their opposites" (Hanson & Silver, 1996, p. 12). The combination of the functions results in what we call learning styles.

Figure 2. Combined functions resulting in learning styles. (Silver Strong & Thoughtful Education Press, 2004, p. 7).

A visual summary of the four learning styles, sensing-thinking (mastery), sensing-feeling (interpersonal), intuitive thinking (understanding), and intuitive-feeling (self-expressive) is illustrated Figures 2 and 3.

Figure 3. Description of Combined Functions to Create Learning Styles (Silver Strong & Thoughtful Press, 2004, p. 10).

Bloom's taxonomy, primarily created for academic education, is relevant to all types of learning (Chapman, 2005). The taxonomy "is in three parts or overlapping domains: cognitive domain (intellectual capability); affective domain (feelings, emotions, attitude); psychomotor domain (manual and physical skills)" (p. 4). Each of the domains is structured and sequenced creating hierarchies of development. The cognitive domain hierarchy consists of knowledge, comprehension, application, analysis, synthesis, and evaluation (Krathwohl, Bloom, & Masia, 1964). The affective domain consists of receive, respond, value, organize or conceptualize values, and internalize or characterize values (1964). The third domain is psychomotor. Its levels include perception, set, guided response, mechanism, complex overt response, adaptation, and origination (1964).

Cognitive Domain	Examples of Key Words	Affective Domain	Examples of Key Words	Psychomotor Domain	Examples of Key Words
Knowledge: recall data or information	defines, describes, identifies, matches, names, outlines, states	**Receiving Phenomena:** awareness, willingness to hear, selected attention	asks, chooses, describes, follows, locates, names, points to, selects, sits, gives	**Perception:** ability to use sensory cues to guide motor activity	chooses, describes, detects, differentiates, isolates, relates, selects, distinguishes
Comprehension: understand the	comprehends, converts, defends,	**Responding to Phenomena:**	answers, assists, aids, complies,	**Set:** readiness to act; includes	begins, displays, explains, moves,

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meaning, translation, and interpretation of instructions and problems	explains, predicts, rewrites, interprets, estimates	active participation by learners; outcomes may emphasize compliance, willingness to respond	greets, helps, labels, performs, practices, tells, presents, reports	mental, physical, and emotional sets	shows, volunteers
Application: applies what is learned in the classroom	applies, changes, construct, relates, shows, uses, operates	**Valuing:** value or worth attached to something; internalization of specified values	completes, demonstrates, differentiate, follows, forms, initiates, joins, invites, justifies, selects, chooses, shares, works	**Guided Response:** early stages in learning a complex skill; includes trial, and error, and practice	copies, traces, follows, reacts, reproduces
Analysis: separates material or concepts into parts; distinguishes between fact and inferences	analyze, compares, compares, diagrams, illustrates, infers, outlines, separates	**Organization:** organizes values into priorities by contrasting, resolving conflict, creating unique value systems;	adheres, alters, arranges, defends, orders, formulates, integrates, modifies, prepares, synthesizes, combines, generalizes	**Mechanism**: intermediate stage in learning a complex skill; learned responses become habitual	assembles, calibrates, fastens, fixes, grinds, heats, manipulates, mixes, mends, sketches
Synthesis: builds a structure of diverse parts, creates a new meaning or structure	categorizes, combines, devises, designs, explains, generates, relates revises, reconstructs	**Internalizing Values:** value system controls behavior; is pervasive, consistent, predictable, characteristic of the learner	acts, qualifies, discriminates, displays, solves influences, modifies, verifies, performs, practices, proposes, revises, serves,	**Complex Overt Response:** skillful performance of motor acts that involve complex movement patterns	assembles, builds, mixes, mends, plays, fastens, grinds, heats, manipulates (words are like mechanism but the performance is better)
Evaluation: make judgments about the value of ideas or materials	appraises, compares, concludes, contrasts, defends, describes, discriminates, interprets, justifies, summarizes,			**Adaptation:** skills well developed; can modify movement patterns to fit special requirements	adapts, alters, changes, rearranges, revises, varies
				Origination: creating new movement patterns to fit situation: outcomes emphasize creativity and highly developed skills	arranges, builds, combines, composes, creates, designs, initiate, makes, originates

Figure 4. Bloom's Taxonomy and Its Three Parts: Cognitive, Affective, and Psychomotor. (Clark, 1999, p. 2-6)

Using these different categories, educators and designers can develop clear and specific learning outcomes resulting in effective and comprehensive curriculums and assessment instruments for individuals at various levels of development and skills. The descriptor words associated with each of the domains serve

as guides for the instructional designer creating instruction with certain expectations for completion and performance.

Gardner's Theory of Multiple Intelligences provides several potential pathways to learning. Gardner identifies the following pathways as bodily-kinesthetic, (physical experiences or body smart), interpersonal (social experiences or people smart), intrapersonal (self-reflection or self smart), logical-mathematical (numbers and logic or number reasoning smart), musical (music smart), naturalistic (experiences in the natural world or nature smart), verbal-linguistic (word smart), and visual-spatial (picture smart) as well as existentialist (one's relationship with God depending on one's philosophy), moral (one's relationship with other living things and their well-being; ethics, humanity, value of life); and intelligence type (capability and perception) (Armstrong, 2000; Chapman, 2005). Gardner indicates the intelligences are independent because "they develop at different times and to different degrees in different individuals" (Dickinson, 1998, p. 1). It is important to point out all intelligences are present in all people. Just as individuals possess varying degrees of Jung's four basic functions, they also possess varying degrees of the intelligences. Chapman makes the point "well-balanced organizations and teams are necessarily comprised of people who possess different mixtures of intelligences. This gives the group a fuller collective capability than a group of identically able specialists" (p. 9). The Multiple Intelligences Theory is an effort to examine and understand how cultures and disciplines shape human potential and mold their environment.

Figure 5 provides an overview of Gardner's original multiple intelligences. Figure 5 indicates where the strength of each intelligence lies, and how an individual preference learns best.

INTELLIGENCE AREA	IS STRONG IN:	LIKES TO:	LEARNS BEST THROUGH:	FAMOUS EXAMPLES INCLUDE:
VERBAL-LINGUISTIC	reading, writing, telling stories, memorizing data, thinking in words	read, write, tell stories, talk, memorize, work at puzzles	reading, hearing and seeing words, speaking, writing, discussing and debating	T. S. Eliot, Abraham Lincoln
LOGICAL-MATHEMATIC	math, reasoning, logic, problem-solving, patterns	solve problems, question, work with numbers, experiment	working with patterns and relationships, classifying, categorizing, working with the abstract	Albert Einstein, John Dewey
VISUAL-SPATIAL	reading, maps, charts, drawing, mazes, puzzles, imaging things, visualization	design, draw, build, create, daydream, look at pictures	working with pictures and colors, visualizing, using the mind's eye, drawing	Pablo Picasso, Bobby Fischer
BODILY-KINESTHETIC	athletics, dancing, acting, crafts, using tools	move around, touch and talk, body language	touching, moving, processing knowledge through bodily sensations	Charlie Chaplin, Michael Jordan
MUSICAL-RHYTHMIC	singing, picking up sounds, remembering melodies, rhythms	sing, hum, play an instrument, listen to music	rhythm, melody, singing listening to music and melodies	Mozart, Beethoven
INTERPERSONAL	understanding people, leading, organizing, communicating, resolving conflicts, selling	have friends, talk to people, join groups	sharing, comparing, relating, interviewing, cooperating	Mohandas Gandhi, Mother Theresa
INTRAPERSONAL	understanding self, recognizing strengths and weaknesses, setting goals	work alone, reflect, pursue interests	working alone, doing self-paced projects, having space, reflecting	Sigmund Freud, Eleanor Roosevelt
NATURALIST	understanding nature, making distinctions, identifying flora and fauna	be involved with nature, make distinctions	working in nature, exploring living things, learning about plants and natural events	Charles Darwin, Mark Cullen, Shelley Merth

Figure 5. Description of Multiple Eight Multiple Intelligences (Patterson, 2002, p. 45)

The question for us now is, "How are these theories/models useful to instructional designers"? Silver and Hanson (1996) developed The Thoughtful Education Model, which combines Jung's personality types with teaching and learning styles. It outlines specific teaching, learning, instructional, and assessment strategies. By using the information provided in Figure 6, you can easily determine which instructional strategies and environments should be developed to accommodate the diversity of end users by using a variety of teaching and learning styles and outlining specific teaching, learning, instructional, and assessment strategies.

Sensing-Feeling	*Sensing Thinking*	*Intuitive Thinking*	*Intuitive Feeling*
Teachers may be characterized as:	**Teachers may be characterized as:**	**Teachers may be characterized as:**	**Teachers may be characterized as:**
• Nurturers • Supporters ▪ Empathizers	▪ Trainers ▪ Information givers ▪ Instructional managers	▪ Intellectual Challengers ▪ Inquirers ▪ Theoreticians	▪ Facilitators ▪ Stimulators ▪ Creators/Originators
Learners may be characterized as:	**Learners may be characterized as:**	**Learners may be characterized as:**	**Learners may be characterized as:**
• Sympathetic • Friendly • Interpersonally ▪ Oriented	▪ Realistic ▪ Practical ▪ Matter of fact	▪ Logical ▪ Intellectual ▪ Independence	▪ Curious ▪ Insightful ▪ Imaginative
Curriculum objectives emphasize:	**Curriculum objectives emphasize:**	**Curriculum objectives emphasize:**	**Curriculum objectives emphasize:**
▪ Positive self ▪ Socialization	▪ Basic skills ▪ Acquisition of content	▪ Critical thinking ▪ Concept development	▪ Creative thinking ▪ Moral development
Learning environments emphasize:	**Learning environments emphasize:**	**Learning environments emphasize:**	**Learning environments emphasize:**
▪ Personal warmth ▪ Interaction and collaboration	▪ Purposeful work ▪ Organization and competition	▪ Discovery ▪ Inquiry and Independence	▪ Originality ▪ Flexibility and Imagination
Instructional strategies emphasize:	**Instructional strategies emphasize:**	**Instructional strategies emphasize:**	**Instructional strategies emphasize:**
▪ Personal and social awareness ▪ Group projects ▪ Personal sharing ▪ Oral reports ▪ Communications	▪ Behavior modification ▪ Practice and drill ▪ Convergent thinking tasks ▪ Demonstrations ▪ Producing products	▪ Information processing ▪ Research ▪ Inductive reasoning ▪ Written reports ▪ Problem-solving	▪ Self-expression ▪ Imagination ▪ Divergent thinking ▪ Creative-artistic expression ▪ Values clarification
Teaching strategies include:	**Teaching strategies include:**	**Teaching strategies include:**	**Teaching strategies include:**
▪ Group investigations ▪ Pair-share ▪ Classroom meetings ▪ Reciprocal learning ▪ Peer tutoring ▪ Sequencing faces ▪ Lab training ▪ Semrad's Steps ▪ Pre-modeling ▪ Team games ▪ Tournaments	▪ Programmed instruction ▪ Command style teaching ▪ Mastery learning ▪ Team games, tournaments ▪ Drill and repetition ▪ Graduated difficulty ▪ Memorization	▪ Inquiry training ▪ Concept attainment ▪ Concept formation ▪ Reading for meaning ▪ Use of Socratic methods of questioning ▪ Problem-solving ▪ Main idea ▪ Tangrams ▪ Comprehensive Planning	▪ Inductive learning ▪ Synectics ▪ Information search ▪ Boundary-breaking (breaking mind sets) ▪ Analyzing and working with moral dilemmas ▪ Creative problem solving
Assessment procedures include:	**Assessment procedures include:**	**Assessment procedures include:**	**Assessment procedures include:**
▪ Personal journals ▪ Sociograms ▪ Oral reports ▪ Ranking procedures ▪ Trained observations ▪ Collection of unobtrusive data ▪ Self-reporting	▪ Objective tests ▪ Checklists ▪ Behavioral objectives ▪ Use of mechanical devices ▪ Demonstrations of specific skills ▪ Criterion referenced	▪ Open-ended questions ▪ Essays ▪ Demonstration of abilities to apply, synthesize, interpret, integrate, analyze, evaluate	▪ Fluency of expression ▪ Flexibility of response ▪ Originality of response ▪ Elaboration of detail ▪ Development of aesthetic criteria ▪ Producing creative

- Think divergently

products
- Observations of value systems in action
- Unobtrusive data collection

Figure 6. Teaching, Learning, Instructional, and Assessment Strategies (Hanson & Silver, 1996, p. 15)

When combining these strategies and assessment procedures with multiple intelligences, their unification serves as a compass for observing and directing strategies aimed toward the design and development of instruction and training. The integration minimizes any of the individual models' limitations and enhances their strengths. Bloom's taxonomy serves as the structure and quality control mechanism for directing and determining the depth of the acquisition of content and skills via different levels of an individual's, cognitive, affective, and psychomotor domains. When we focus on process, the multiple intelligences theory adds to the mix focus on the context of learning and its relation to the individual. Learning styles emphasis on the individual learning process and Gardner's content-oriented model are complimentary. Without multiple intelligences, learning style is rather abstract. Without the learning styles, multiple intelligences theory proves unable to describe the different processes of thought and attitude. By adding Bloom's taxonomy, we are able to observe the levels of thought and direct the instruction to the development of higher order thinking, attitudes, performance, and design activities to preferences and intelligences. The outcomes are greater participation and better learning and training results.

How do we put the models together and utilize them as one framework?

Figure 7. Verbal-Linguistic integrated assessment menu. (Silver, Strong, & Perini, 2000)

Figure 7 indicates four personality types based on a combination of Jung's four functions: mastery or sensing-thinking, interpersonal or sensing-feeling, understanding or intuitive-thinking, and self-expressive or intuitive feeling (See Figures 2 and 3). For an example, using the multiple intelligence of verbal-linguistic menu, each personality type is matched to the kind of career an individual might choose based on the personality and the intelligence type. Beside each personality type square in Figure 7, a circle is drawn which contains an example of behavior or product that might be exhibited. Notice the verb beginning each observed behavior comes from the verbs suggested by Bloom's taxonomy (Figure 4) for

describing desired behaviors and expectations. In addition, by looking at Figure 6, we can determine the characteristics of learners, teachers, curriculum objectives, emphasis of learning environments, suggested instructional, teaching, and assessment strategies and procedures best suited to a personality type, and desired outcomes. Figure 5 also provides a visual representation and description of eight of the multiple intelligences indicating strengths, likes, best way to learn, and examples of famous individuals having a particular type of intelligence. Using the information provided, we can also match the type of intelligence to a possible personality type by seeing the types of products and activities that are preferred and produced. Figure 8 offers another example of the type of activities preferred by different intelligences which are similar to the activities found in Figure 6.

Types of Activities

Verbal	Visual	Logical	Musical	Interpersonal	Intrapersonal	Bodily	Naturalist
Symbols	Mosaics	Mazes	Performance	Group projects	Journals	Role-playing	Field trips
Printouts	Paintings	Puzzles	Songs	Group tasks	Meditations	Dramatizing	(farm/zoo)
Debates	Drawings	Outlines	Musicals	Observation	Self-assess-	Skits	Field studies
Poetry	Sketches	Matrices	Instruments	charts	ments	Body language	Bird watching
Jokes	Illustrations	Sequences	Rhythms	Social interac-	Intuiting	Facial expres-	Observing
Speeches	Cartoons	Patterns	Compositions	tions	Logs	sions	nests
Reading	Sculptures	Logic	Harmonies	Dialogs	Records	Experiments	Planting
Storytelling	Models	Analogies	Chords	Conversations	Reflections	Dancing	Photographing
Listening	Constructions	Timelines	Trios/Duos	Debates	Quotations	Gestures	Nature walks
Audiotapes	Maps	Equations	Quartets	Arguments	"I Statements"	Pantomiming	Forecasting
Essays	Storyboards	Formulas	Beat	Consensus	Creative	Field trips	weather
Reports	Videotapes	Theorems	Melodies	Communicat-	expression	Lab work	Star gazing
Crosswords	Photographs	Calculations	Raps	ion	Goals	Interviews	Fishing
Fiction	Symbols	Computations	Jingles	Collages	Affirmations	Sports	Exploring
Nonfiction	Visual aids	Syllogisms	Choral	Murals	Insight	Games	caves
Newspapers	Posters	Codes	readings	Mosaics	Poetry		Categorizing
Magazines	Murals	Games	Scores	Round robins	Interpreta-		rocks
Internet	Doodles	Probabilities	Acappella	Sports	tions		Ecology
Research	Statues	Fractions	choirs	Games			studies
Books	Collages			Challenges			Catching
Biographies	Mobiles						butterflies
Bibliographies							Shell collect-
							ing
							Identifying
							plants

Figure 8. Examples of Activities for Multiple Intelligences. (Patterson, 2002, p. 36).

Figure 8 and Figure 9 provide excellent guidance for making decisions concerning the types of expectations of products and performance desired from instructional and training activities. The designer can also see where the various preferences overlap in regard to preferred activities and products and choose ones which will be most meaningful serve the diversity of individuals being served. This knowledge is extremely valuable and eliminates much of the guess work which often accompanies design and develop of instruction, materials, and activities.

Design models are tools of organization and structure illustrating how the designer goes about his or her plan for successful training of individuals or creation of products. Instructional designers need to concentrate on the factors that affect individuals; reflect the way our clients learn; utilize and appreciate diversity; and combine individual strengths to bring about a stronger, more functional, and dynamic organization. By integrating these major theories, we can utilize Jung's personality types, identify learning behaviors by style, examine curriculum and learning environments, and learn words and products that indicated the type and level of cognition, attitudes, and the required physical skills.

Visual/Spatial
- Make a photo album
- Create graphic organizers
- Make a videotape or slideshow
- Make architectural drawings
- Create a cartoon or story using visuals
- Make a map
- Create a mural

Verbal/Linguistic
- Create audiotapes
- Write letters, essays, poems, stories, parodies
- Give oral presentations
- Conduct an interview
- Create a slogan
- Produce a radio show
- Write or present a news report
- Write a skit

Logical/Mathematical
- Conduct an experiment
- Solve logic problems
- Analyze data
- Create a time line
- Use deductive thinking skills
- Compute or calculate
- Create computer programs or graphics

Bodily/Kinesthetic
- Perform as an actor
- Role-play
- Create a board game
- Use your physical skills
- Make a model
- Perform a movement pattern
- Assemble a puzzle
- Perform a skit

MULTIPLE INTELLIGENCES PROJECTS

Musical/Rhythmic
- Create a musical collection
- Use music to communicate
- Alter the words to a song
- Compose a musical selection or tune
- Use a song to present information
- Create a musical game
- Create a dance

Intrapersonal
- Maintain a journal
- Set goals for yourself
- Complete a self-evaluation
- Work independently
- Prepare an autobiography
- Express your view on an issue
- Compile a scrapbook

Interpersonal
- Conduct an interview or survey
- Work cooperatively
- Assist someone in learning
- Understand another's viewpoint
- lead a committee in planning
- Participate in a debate, panel discussion, group discussion

Naturalist
- Create posters for environmental concerns
- Prepare survival kits
- Perform science projects
- Care for animals
- Observe, discover, and report data
- Role play explorers
- Plan a journey

Figure 9. Multiple Intelligences Projects. (Patterson, 2002, p. 46)

The implications for the instructional designer are that the instructional design used should function as a process of thinking that systematically, broadly, and reflectively centers on the end users and the diversity of their needs. The effectiveness of instructional design corresponds to whether or not the designer meets and accomplishes the goals of the stakeholders and end users. It seems to be common sense to validate the individual approaches to learning by being familiar with and knowledgeable of learning styles, models of intelligence, and personality types.

Equally important for the designer is the need to examine his or her own preferences. Often times, we may unconsciously develop training and products based on our own preferences. Examining ourselves to determine our own styles and preferences helps us to realize that we must be more accommodating to clients by developing diversified training, materials, and products to reach the greatest number of users possible. We will be more effective, efficient, and successful in reaching the goals and expectations established. Also by being aware of preferences, through our training and development of materials and products, we will strengthen and cultivate the development of skills and acquisition of knowledge for our clients and for ourselves by providing well-designed instructional experiences.

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Tablet PC Initiative: Impact on Students and Learning

Douglas C. Williams
Denise Benton
University of Louisiana at Lafayette

Susan Pedersen
Texas A&M University

Introduction

Reformers have urged educators to make schooling relevant to students through emphasis on learning through experience and making connections to the world outside of the school walls (Dewey, 1938). Popularization of current learning theories, such as constructivism (Duffy & Jonassen, 1992) and situated cognition (Brown, Collins, & Duguid, 1989), further emphasize the value of providing opportunities for students to engage in authentic activities (i.e. critical thinking, reflection, problem solving) in authentic contexts (i.e. real world situations) using the same types tools (e.g. computers) that experts use.

Technology literacy skills have changed over the years. More jobs than ever require the use of information technology to engage in problem solving and critical thinking. During the 1960s, skills emphasized grammar, typing, accounting, and shorthand. In the 1980s, computer literacy shifted to competencies in word processing, databases, and spreadsheets. Today, the workplace requires skills in online communication/collaboration, digital media creation (i.e. animations, graphics, video, audio), and simulation tools for the purpose of information analysis, problem solving, and critical thinking (International Society for Technology in Education [ISTE], 2002).

Emerging technologies, such as Tablet PC computers, provide unique capabilities for enhancing learning in the secondary classroom. Though little research exists on using Tablet PCs to enhance learning, many studies on using laptops to enhance K-12 and higher educational settings highlight potential benefits. Lowther, Ross, and Morrison (2003) found that providing fifth, sixth, and seventh grade students 24-hour access to laptop computers resulted in (a) more frequent and independent use of the computer, (b) significantly higher scores on writing assessments, and (c) significantly higher scores on a problem-solving task. An evaluation of the Maine Learning Technology Initiative, which provided 7th and 8th grade students a laptop, showed that student engagement and attendance has increased and classroom interactions have become less didactic and more constructivist in nature (Silvernail & Harris, 2003). Muir, Knezek, and Christensen (2004) found that 8th grade students performed significantly higher in science, math, and visual/performing arts.

These studies indicate that, when implemented appropriately, portable computing devices have the potential to enhance learning when used in conjunction with changes in teaching practices. It is clear from research and best practices that availability of technology is not sufficient to enhance learning. Changes in the way teachers teach and students learn are essential for improving learning outcomes.

Design of Study

Project Context

The project was carried out in a rural high school with an enrollment of 2,196. Approximately 70% of the students were white, 23% African American, and 4% Latino. All teachers were certified in their respective teaching areas. The school had won numerous awards for its innovative approaches to teaching and technology integration. For example, in 2004, the school was selected as a Twenty-First Century School of Distinction in the "Best of the Best" category. All classrooms are technology rich, with interactive boards, projectors, big screen monitors, and educational software. In addition to traditional computer labs, the school has 12 mobile wireless labs.

Sample Selection

A list was generated of 9th grade students who scored in the 76th national percentile on the Criterion Referenced Competency Test (CRCT). Since the resulting sample was insufficient in size, the selection window was broadened to include students who scored between 66th and 86th percentiles. Next, the

following students were excluded:

- Those who were being served in the gifted program. (Their schedules would preclude them from meeting scheduling needs.)
- Those who were taking geometry as their math course
- Those who were scheduled to take band 1st through 4th period. (These are audition only classes and are only offered once per day. Students would have to drop band to participate.)

The result was a list of 70 students. Next, every 5th student was classified as an alternate resulting in 56 participants and 14 alternates. Students on the participant list were identified as belonging to Group A or Group B (e.g. The first student was assigned to Group A and the second to Group B and the third to Group A). Finally, the treatment group was randomly selected by the flip of a coin resulting in Group A as the experimental group and Group B the control group. If parents did not agree that their child participate, an alternate was chosen, in sequential order, from the alternate list.

Intervention

In order to explore the impact of Tablet PC technology on learning, students were selected to participate in the research project and randomly assigned to either the treatment group (students given a Tablet PCs) or the control group. As an incentive to participate, a microprocessor vendor agreed to give the top performing student in the treatment group and the control group a new laptop at the end of the project. Teachers and students were provided training on the technical operation of the Tablet PCs. Minimal pedagogical or technology integration training was provided.

Research Questions

1) Do students provided with Tablet PCs demonstrate higher levels of achievement?
2) Do students provided with a Tablet PC have significantly better computer skills, more often use the computer as a tool, have better attitudes toward computers in education?
3) Does increased access to technology result in higher self-efficacy?

Dependent Measures and Analysis

In order to answer evaluation question 1, "Do students provided with Tablet PC computers demonstrate higher levels of achievement?", two data sources were utilized: ACT ASSET standardized test and final course grades.

ACT ASSET measures the following:
- *Writing Skills:* Tests students' understanding of punctuation, grammar, sentence structure, strategy, organization, and style.
- *Numerical Skills:* Assesses basic numerical skills in operations with whole numbers, decimals, and fractions, and basic word problems.
- *Reading Skills:* Measures reading comprehension.

Each student completed the ACT ASSET before the project started and at the conclusion of the project. Each testing session resulted in three scores (i.e. writing, numerical, reading). For each score (i.e. writing score, numerical score, reading score) a simple analysis of covariance (ANCOVA) was calculated with the post ASSET score as the dependent variable, group (Tablet PC or control) as the between-subjects independent variable, and the pre-ASSET score as the covariate. Independent two sample t-tests were calculated on final grades in the subjects of algebra, biology, civics, and English.

In order to answer evaluation question 2, "Do students provided with a Tablet PC have significantly better computer skills, more often use the computer as a tool, and have better attitudes toward computers in education?", two data sources were used: *Student Survey* and focus group interviews.

The *Student Survey* is a self-report instrument based on one utilized in the Maine Learning Technology Initiative (Muir, Knezek, and Christensen, 2004). For the sake of clarity, two versions of the instrument were created. The surveys differ in language (i.e. "computer" was used in the control group version and "Tablet PC" for the treatment condition version) and items that were not relevant to students in the control group, (e.g. Do you bring your Tablet PC home?) were eliminated from the control group's

survey. The survey consists of the following sections:

- *Computer Skills:* Rate skill level (i.e. never used, beginner, intermediate, advanced, don't know) in using computer software (e.g. word processing, email, spreadsheet, simulation software).
- *Computer as a Tool:* Rate frequency (i.e. never used, less than monthly, one or more times per month, one or more times per week, every day or almost every day) on computer related tasks (e.g. finding information, organizing information, taking notes).
- *Attitude Toward Computers in Education:* Gauge students' beliefs about the use of computers for teaching and learning (e.g. Computers make schoolwork more fun/interesting, I believe that the more often teachers use computers to teach, the more I will enjoy school).

In order to analyze the results of the *Student Survey*, average scores for each item were calculated for each group. Next, nonparametric Mann-Whitney U tests were performed to identify significant differences in scores between the Tablet PC group and the control group.

Focus group interviews were conducted with the teachers and students involved in the project. Interviews were transcribed and then coded independently by two researchers. A starting list of themes was generated from the research questions. Statements were then coded and nested under an existing theme or a new theme was created when no existing themes were appropriate. Once all statements were grouped in this manner, statements within each theme were grouped into subcategories. Patterns and relationships between themes and subcategories throughout the data were examined in order to note interesting findings. Disagreements between the researchers were discussed until full agreement was reached.

In order to answer evaluation question 3, "Does increased access to technology result in higher self-efficacy?", average scores for each item on the *Measure of Academic Self-Efficacy* were calculated for each group (i.e. Tablet PC and control). Next, nonparametric Mann-Whitney U tests were performed to identify significant differences in scores between the two groups of students. Note that the nonparametric Mann-Whitney U test is appropriate for ordinal data.

The *Measure of Academic Self-Efficacy* assesses students' academic self-efficacy and their attitudes toward learning in three subject areas: science, mathematics, and English. Self-efficacy refers to an individual's beliefs about his/her ability to learn or perform tasks (Bandura, 1986). Previous research suggests that self-efficacy influences achievement (Schunk, 1995).

Findings

Achievement: ACT ASSET

Analysis of covariance (ANCOVA) results indicate that there was a grouping effect with regards to the writing skills test of the ASSET ($p = 0.010$), with the control group having a significantly higher mean post-writing score. That is, the control group performed significantly better than the Tablet PC group on the ASSET measure of writing skill. ANCOVA results revealed that there was no group effect on posttest reading skills ($p = 0.641$) and posttest numerical skills ($p=0.146$) scores. Table 1 provides a summary of the analysis for writing skills.

Random assignment of participants, in particular with large sample size, should result in equivalent groups. In this case, the control group had slightly higher scores on ASSET prior to the start of the study, though the difference was not significant. In the chance that the groups may have been significantly different prior to the start of the study, we chose to utilize an ANCOVA since it corrects for pre-study differences between the groups, should they exist. In other words, the ANCOVA procedure eliminates the effect of differences between the treatment and control groups prior to the start of the study.

Table 1: ANCOVA of ASSET Write Skills Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power
Corrected Model	584.629	2	292.314	29.589	.000	59.177	1.000
Intercept	21.387	1	21.387	2.165	.148	2.165	.302
Pretest Write Score	530.138	1	530.138	53.661	.000	53.661	1.000

GROUP	**71.267**	**1**	**71.267**	**7.214**	**.010**	**7.214**	**.748**
Error	434.690	44	9.879				
Total	78476.000	47					
Corrected Total	1019.319	46					

Achievement: Final Grades

The analysis of final grades in the subjects of algebra, biology, civics, and English, independent sample t-tests revealed no significant differences in average grades between the Tablet PC and control groups. Table 2 provides a summary.

Table 2: Independent T-test of Final Grades

Subject	Group	N	Mean	Std. Deviation	Std. Error Mean	p-value
English	*Tablet*	26	73.7523	17.7469	3.4805	.134
	Control	24	80.3371	11.9522	2.4397	
Biology	*Tablet*	26	76.4858	10.7030	2.0990	.200
	Control	24	80.3879	10.5129	2.1459	
Civics	*Tablet*	25	91.6432	5.8344	1.1669	.167
	Control	24	87.0838	14.6937	2.9993	
Algebra	*Tablet*	26	68.39	17.36	3.41	.230
	Control	23	74.09	15.18	3.17	

Student Survey: Computer Skills

The *Computer Skills* section of the Student Survey asked students to rate their perceived skill level in using various software applications. The nonparametric Mann-Whitney U tests performed indicate no significant differences in all areas of computing skills (See Table 3). Not all students completed the survey since those with an A average were exempt from the final exam. The survey was administered prior to the final exam.

Student Survey: Computer as a Tool

Students were asked to indicate how often they used a computer to accomplish specified tasks. Results indicate significant differences only in the area of Taking Notes (p = .063). That is, students in the Tablet PC group are more likely to use the computer for taking notes than the students in the control group.

Student Survey: Attitude Toward Computers in Education

Nonparametric Mann-Whitney U tests indicate significant differences for all items pertaining to attitude toward computers in education.

The data indicate great disparities between students in the Tablet group and students in the control group. Overall, students in the control group had a much more positive attitude about using a computer for various aspects of school when compared to students in the Tablet PC group and their attitudes about using a Tablet PC for various aspects of school.

Table 5: Comparision of Tablet PC Group and Control Group on Attitude Toward Computers in Education (Section IV of Student Survey)

Statement	Tablet PC Average	Control Average	Mann-Whitney p-value

I prefer to use a computer to do my schoolwork.	2.0	4.89	.001
Computers make schoolwork more fun/interesting	2.0	4.89	.007
I believe that the more often teachers use computers to teach, the more I will enjoy school.	2.13	4.78	.001
I believe that it is very important for me to learn how to use a computer.	2.13	5.56	<.001
Computers make schoolwork easier to do.	2.00	5.00	.001
Computers help me improve the quality of my schoolwork.	1.93	4.89	.001
Computers help me understand my classes better.	1.87	4.78	<.001
I do more homework outside of school if I am able to use my computer.	1.93	4.67	<.001
I would like to use my computer more often.	2.06	5.44	<.001
Computers allow me to get my work done more quickly.	2.44	5.11	<.001

Note: Each "no response" was excluded from summary statistics for each topic.

Measure of Academic Self-Efficacy

Nonparametric Mann-Whitney U tests indicate significant differences on many survey items with students in the control group most often demonstrating higher levels of self-efficacy than the Tablet PC group. For example, the following are some of the items found to be statistically significant at the .05 level:

- I am confident that I can complete most school work successfully.
- I am confident that I can excel in most school subjects.
- Time spent learning is time that is well spent.
- I am confident that if I wanted I could make the honor role each semester.
- I am able to do schoolwork that other students find difficult.

Interview Data

Coding of interview data resulted in four major themes: need for better training, technical issues, teaching with Tablet PCs, impact on personal organization.

Many statements by teachers, technical support staff, and students indicate that the lack of sufficient training was a major hindrance to the project. Students and teachers were provided minimal training on the use of the Tablet PC. Teachers indicated they were told 3-days prior to the start of the school year that they would participate giving them insufficient time to prepare lessons to leverage the technology. Little training was provided on how the equipment may be used to enhance teaching and learning. Some support was provided in monthly meetings with the Tablet PC teachers. During these meetings, Instructional resources were provided (e.g. web site resources, web quests) and teachers had an opportunity to share what they were doing with the Tablet PCs in their classroom. As the project progressed, these meetings resulted in being a time for teachers to vent frustrations. Teachers felt they had to spend valuable instructional time teaching children software applications such as Microsoft PowerPoint.

All students, teachers, and technical support staff found the equipment reliability to be a major problem in the study. By the forth month of the project, all were experiencing significant levels of frustration. It was common to have 20% of a class without a working Tablet PC. Technical support staff reported that 1-2 computers per week were sent for repair

Teachers noted that the addition of the Tablets created a "classroom management nightmare". The poor battery life required charging during the school day. Students required time to take out the Tablets, find a power outlet, start the computer, and shutdown the computers at the end of the period. These tasks

often took up 7-10 minutes of instructional time each period. Additional time was lost dealing with technical problems. All of the teachers noted that Instant Messenger, games, and surfing the Internet distracted students. One student stated, "I think the control group's grades are so much better because they do not have so many distractions as we did during the class." Teachers noted an increase in plagiarized assignments since students were creating work on the Tablets and sharing with each other.

Teachers and students noted that problems arose since no clear set of ground rules for appropriate use were articulated prior to the start of the study. Teachers felt that everyday "some new issue would surface" making it difficult to provide a fair and consistent enforcement of appropriate use policies." Tablet students stated "…they did not tell us the policies beforehand so some students got into trouble [unfairly]".

On a positive note, all teachers interviewed believed that, if the technical problems were resolved and the project was well planned, Tablet PCs could have a positive impact on teaching. One teacher noted the following, "The potential is amazing. For their record keeping, Outlook has a daily planner. The calendar can be synchronized with the teachers to make sure deadlines are clear. Buddy lists can be used so students know who to contact about homework. And providing a PowerPoint for kids to use when taking notes…".

All students felt that, if working properly, the Tablet PCs would be beneficial in helping them stay organized. With the many different assignments, notes, and papers from each class, students felt the storage capacity for documents, note-taking tools, email, and calendar features would help them become better students.

Discussion and Recommendations

It appears that the large number of technical problems negatively affected academic performance of the Tablet PC group resulting in no significant difference on final course grade and measures of reading and numerical skills. The significantly higher performance by the control group on measures of writing skills could also be attributed to the same factor. As noted in the qualitative data, both teachers and students reported that the Tablet PCs took away from valuable instructional time (e.g. start up/shut down times, technical problems) and that the Tablet PCs were often a distraction (e.g. surfing the Internet, playing games).

Even though teachers and students felt the Tablet PC group would have superior computer skills, the survey data do not support this. This anomaly may be attributed to the fact that the school already uses technology extensively. Additionally, the self-report survey may not be an accurate measure of computer skills. In future projects, a set of performance tasks would provide a more accurate measure.

The significantly lower positive attitudes toward computers in education exhibited by the Tablet PC group appears to be due to the negative experiences in the project. The Tablet PC group experienced a year of technical problems in addition to the added expectations of being in a research study.

An interesting finding is how the negative project experience seems to have resulted in significantly lower levels of academic self-efficacy in the Tablet PC group. These findings seem to highlight that a project with significant design and technical problems can adversely affect student learning, attitudes toward computers in education, and academic self-effiacy.

Recommendation 1: Provide Appropriate Training

Training should be provided in the following areas: pedagogical training on integrating the Tablet PCs into teaching, technical operation of the Tablet PCs (for teachers and students), and technical support training for support staff. We strongly recommend that the intervention be combined with training on a proven instructional strategy such as problem-based learning (PBL). PBL immerses students in complex, interesting problems where they take charge of identifying their learning needs and their process for meeting those needs. Because students drive this process, all learning takes place within a context where it is meaningful to them (Hannafin, Land & Oliver, 1999). This supports the development of problem-solving skills and enhances motivation (Barrows & Tamblyn, 1980). PBL is a challenging instructional approach, one that can be enhanced with technology such as the Tablet PC. The Tablet PC can support PBL by providing access to a rich variety of informational resources, scientific instruments to gather data and test hypotheses, and tools to structure findings and communicate results. Teachers, charged with facilitating students' process without directing it, must support diverse learners engaged in a wide variety of activities, provide rapid, ongoing feedback on both process and products, and collect and assess evidence of how well students are meeting established standards. Many of these instructional challenges can be

addressed through use of Tablet PCs. Adopting a model, such as the iNtegrating Technology for inQuiry (NTeQ) model (Morrison & Lowther, 2002) would provide a framework for teachers as they develop student centered learning activities.

Recommendation 2: Develop Appropriate Use Policy
        Develop an acceptable use policy that addresses the unique issues associated with each child having a computer during class and after school hours. Clear punishments should be defined for violation of the policy. Students and teachers should be required to read and sign the policy prior to the start of a project.

Recommendation 3: Utilize Robust Hardware
        As documented in the interview data, the Tablet PC computers utilized for the project had major hardware and software problems. Considering the product was a first generation Tablet PC, later versions of the hardware are likely to be more durable. Consider exploring other hardware options.

Recommendation 4: Keep Sufficient Spares on Hand
        Have spare Tablet PC computers on hand (approximately 10% of the total number being used in the project) for exchanging with students when technical problems arise. In order to simplify exchanging equipment with students, provide students a USB Flashdrive for daily backup.

Recommendation 5: Prevent Changes To System Settings, Installation of Software, Block Inappropriate Sites, Limit Applications Available
        Utilize a third party product to prevent students from modifying system settings and installing unauthorized software. Examples include Faronics deepFreeze (http://www.faronics.com/) and RiverDeep's FoolProof (http://www.riverdeep.net/). Utilize Internet site blocking or filtering software to prevent access to inappropriate sites. Develop technique for blocking instant messenger usage during school hours. The optional solution is to install network software at the school that blocks instant messenger traffic.

Recommendation 6: Clearly Articulate Technical Support Plan
        Develop a plan, prior to the start of the project, for providing technical support. This plan would include the following:
        Standard Configuration Image: Development of a standard Tablet PC software configuration, imaged for rebuilding machines. The standard configuration should include required software applications, software for preventing changes to the machine's system settings, and Internet blocking or filtering software.
        Process for Exchanging Computers: Develop a process for providing spare computers to students and teachers.
        Planning Maintenance Schedule: Develop a calendar of planned maintenance periods, such as Christmas holiday, where all machines are brought in for rebuilding.
        Sufficient Technical Support Staff: Ensure sufficient technical support personnel are available to support ongoing project issues and complete scheduled maintenance.

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Understanding Computer Anxiety and Computer Related Experience: The Model and Practices

Harrison Hao Yang
State University of New York at Oswego

Abstract

Computer anxiety has been reasonably well defined in the literature, with relatively valid instruments developed to measure it. Yet much of the research on correlates of computer anxiety, such as experience, gender, and age remains inconclusive. What do we know about computer anxiety? Where is the literature inconsistent, and what do we need to know? What can we do to reduce the prevalence of computer anxiety? This paper suggests a more complex view of computer anxiety and the various factors associated with it, and proposes a model for synthesizing what we do know. Questions for further research about what we need to know are derived from the model, and implications for teaching computer literacy are shared.

Computer Anxiety

Most researchers define computer anxiety as an emotional response of apprehension or fear of computer technology "accompanied by feeling of nervousness, intimidation, and hostility. Negative cognition and attitudes towards computers may also accompany such feeling of anxiety and include worries about embarrassment, looking foolish, or even damaging computer equipment" (McInerney, McInerney, & Sinclair, 1994, p.28). Gardner, Discenza and Dukes (1993) provided a similar definition, and empirically compared four scales of computer attitudes, concluding that any of the four measures provide reliable, reasonably valid information.

An array of theoretical stances towards computer anxiety appear in the literature, some of which are rooted in a social learning model, and others which are rooted in more clinical models (McInerney, McInerney, & Sinclair, 1994). The way one views computer anxiety shapes the way one seeks to address it. For example, if computer anxiety is seen as a social learning phenomenon, one might seek to address it by "enhancing self efficacy through skill building and success experiences" (McInerney, McInerney, & Sinclair, 1994, p.29), whereas if it is conceived as an intra-individual construct, clinical approaches including desensitization, relaxation, or counseling might be used. Leso and Peck (1992) differentiated between trait (stable, individualistic) anxiety and state (changeable, situational) anxiety, noting that computer anxiety has been typically regarded as state anxiety. Researchers have long been concerned with measuring the levels of computer anxiety among teachers and students toward better technology integration. Self-report Likert-type instruments such as the Computer Anxiety Scale (CAS) have been continually developed and examined (George, Stocker, & Marcoulides, 2004)

Computer Related Experience and Computer Anxiety

Sociocultural variables such as class, ethnic culture, age, gender, and academic major or teaching field shape the way we experience the world, and influence our access to and attitudes about computer technology. Even though a significant body of studies on the relationship of sociocultural variables and computer anxiety has been done, the results from these studies are inconsistent (Maurer, 1994). Several studies have suggested that examining the relationship between computer anxiety and sociocultural variables should take prior computer experience into account (Chen, 1986; Maurer, 1994; McInerney, McInerney, & Sinclair, 1994).

The direct relationship between computer-related experience and computer anxiety seems clear (Bohlin & Hunt, 1995; Chen, 1986; Hadfiedl, maddux, & Love, 1997; Heinseen, Glass, &Knight, 1987; Maurer, 1994; Reed, Ervin, & Oughton, 1995; Yang, Mohamed, & Beyerbach, 1999). Much research indicates that as time passes and students become more familiar with computer technology, their anxiety decreases. Studies found that with increased experience with computers, anxiety decreased (Chen, 1986; Heinssen, Glass, & Knight, 1987; Howard & Smith, 1986; Loyd & Gressard, 1984).

However, that is not always the case. In some reports anxiety increases with more experiences, and in others it stays the same (Gos, 1996; Mehmond & Medewitz, 1989; Rosen, Sears, & Weil, 1987).

Weil, Rosen and Sears (1987) argued "during repeated exposure to the computer, the computer-phobic is being reconditioned at increased levels of anxiety which, in turn, increases discomfort and anxiety" (p.180). Exploring this complex relationship has led researchers to examine quality of the experiences with computers, suggesting that certain types of computer experiences (e.g. applications vs. programming), environments (e.g. lab vs. lecture setting), and teaching strategies (e.g. responsive, hands-on, relevant) are related to changes in computer anxiety over time (Gardner, Discenza, & Dukes, 1993; Leso and Peck, 1992). Negative experiences with computer are likely to increase anxiety, whereas positive experiences are likely to reduce them.

Leso and Peck (1992) compared students in introductory programming and applications courses and found that though their anxiety levels were similar when they began, reduction of student anxiety was greater in the tool's course than in the programming course. It may be that by presenting relevant applications that are relatively easy to use, perceived self-competence (a negative correlate of computer anxiety) will increase and anxiety will decrease. Beginning word processing application, graphics, spreadsheet, database, and Internet explorations prior to introducing programming may decrease computer anxiety. They also found however, that large numbers of subjects in both courses experienced no reduction of computer anxiety as a result of their experience.

In summary, computer anxiety is related to experience but not simply related. It is not merely a function of time, nor of particular types of experiences. There are intra-individual variations in instructional contexts and responses to these contexts that may be a function of sociocultural variables and prior experiences. Given this, we must consider a more complex approach for reducing computer anxiety.

The Model of Computer Anxiety

Based on our review of the relevant literature, we found instructional implications can be drawn from literature delineating the scope and sequence of computer literacy (what is easier to learn and when to learn?), the literature on effective teaching (what are general pedagogical principles to be applied whenever providing computer instruction?), and the literature on sociocultural influences on learning (what is the relationship between access, stereotypes, and computer anxiety? what strategies are particularly effective with marginalized groups?) The literature suggests a reconceptualization of varying computer anxiety in learners. Our model is composed of two complementary processes.

Process One: Time and Computer Knowledge

There are several different levels of computer knowledge in general, such as:

- Application – Typing/keyboarding, word processing, spreadsheet, graphics, database, and communication software.
- Advanced Software Package Operation – Multimedia authoring, problem solving software, Internet design and development software.
- High Level Language Programming – BASIC, PASCAL, and UNIX Shell.
- Low Level Language Programming – C, C++, and Assembler.
- Theoretical Understanding (Physical and Logical) – Data Storage, CPU Register, Memory Access.

Let the maximum learning hours for an average person below level 1 of computer knowledge is t_1. After some number of hours (t_i), this person will advance to level i+1 of computer knowledge. Then the level of computer knowledge is a function of time (t) as depicted in Figure 1.

Figure 1. Ideal function of computer knowledge level

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Process Two: Time, Computer Anxiety, and Computer Knowledge

The level of computer anxiety fluctuates over time depending on the content (computer knowledge). Computer anxiety (CA) as a function of time (t) is defined as:

$$CA(t) = \frac{t_i - t}{t_i - t_{i-1}} K_i + M_i \qquad \text{for t in } [t_{i-1}, t_i)$$

Here K_i and M_i are the computer anxiety scale factor and minimum computer anxiety level in interval $[t_{i-1}, t_i)$, respectively. Therefore, the graph of computer anxiety as function of time can be represented in Figure 2.

Figure 2. Ideal function of computer anxiety level

In the Figure 2, it has been assumed that computer anxiety scale factor (K_i) is constant in each interval except the last interval $[t_4, \infty)$, where computer anxiety ($CA(t)$) approaches minimum computer anxiety (M_5) infinitely. It is also assumed that the minimum computer anxiety (M_i) is different in every interval with no particular pattern. However, the actual computer anxiety scale factor (K_i) is very likely to be non-constant in any of the intervals and the minimum level of computer anxiety (M_i) may vary with certain patterns instead of what is presented in the above graph. In reality, computer anxiety over time ($CA(t)$) will most likely to be continuous, since the level of computer knowledge ($L(t)$) is probably continuous, and computer anxiety over time ($CA(t)$) should decrease differently in each interval.

Proposed Model

Computer anxiety is a function of time and computer knowledge **BUT** fluctuates over time and knowledge level. Figure 3 depicts the connection between Process One (the relationship between time and computer knowledge) and Process Two (the fluctuation of computer anxiety across levels of computer knowledge).

Figure 3. Probable graphic depiction of the computer anxiety level Implications

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Implications
    Our model illuminates several implications in education.

1. There are levels of computer knowledge (application, advanced software, programming, etc.) and
    anxiety is likely to increase each time learners move to a new level. This pattern can also be seen
    within the same level or interval of computer knowledge/skills (for example, at the application
    stage, computer anxiety levels may fluctuate from word processing to spreadsheet, or from
    desktop publishing to database).
2. Effective strategies are likely to minimize computer anxiety, regardless of background, at each
    level of computer knowledge. These include hands-on learning, relevance to learners' interest,
    opportunities for feedback, supportive and caring instruction, and active learning where students
    work on their own projects and see the application to their area of study. The transition across
    different levels of computer knowledge should be as gradual and painless as possible.
3. For most pre-service and in-service teachers, programming may not be a major concern. Their
    computer experience may not move past the application stage. There is nothing wrong with that,
    since the application level is where most computer use or integration occurs in teaching and
    learning. The National Educational Technology Standards for Teachers (NETS.T) prepared by the
    International Society for Technology in Education (ISTE) have attested this aspect. These
    standards emphasize technology integration, of which personal and professional use of
    productivity tools in communicating, collaborating, conducting, researching, and solving problems
    has been highlighted (ISTE, 2000).
4. Sociocultural factors must be considered in planning instruction. Because of early lack of
    opportunity and sociocultural expectations, some learners will need more one-on-one support,
    more time, and different experiences tailored to their background. For example, research on girls
    indicates that they favor a collaborative (not competitive nor individualistic) learning environment,
    and are more engaged in using computers as tools with an eye toward community service (rather
    than as toys for engaging in competitive games).
5. A rich conception of "computer anxiety", which locates the "problem" within the context, rather
    than within the learner's demographic variables, is likely to serve all learners better, ensuring
    increased competence and decreased computer anxiety. How we define computer anxiety has
    implications on how we teach and on who learns and how learners learn.

Practices
        Following our computer anxiety model, four related studies have been conducted at State
University of New York at Oswego. The conceptualization and implications of the proposed computer
model have held steady from these studies.

Study One: Applied Instructional Technology for Student Teachers
        The purpose of this study (Yang and Shindler, 2000) was to investigate the effects of the short-
term applied technology training on computer attitudes and anxiety among pre-service teachers. In spring
1998, 40 student teachers were randomly selected and divided into workshop group (n=19) and control
group (n=21). Nineteen student teachers in workshop group were invited to participate the one-day applied
computer technology workshop. Workshop was organized on two categories: professional and personal use
of technology.
    Professional use of technology included:
- Using word processing, graphics, spreadsheet on lesson plan, unit development and grade book,
  etc. (activities: presentation, discussion)
- Using Internet educational resources (activities: presentation, discussion, and hands-on
  experience)
- Using the multimedia software to develop slide show and class teaching (activities: presentation,
  discussion, and hands-on experience)
    Personal use of technology included:
- Developing the portfolio (activities: presentation, discussion)
- Creating the resume (activities: presentation, discussion)
        Both workshop and control groups' attitude and anxiety as indicated by the Mueller's Computer
Attitudes Inventory and the Oetting's Computer Anxiety Scale (short form) were measured after one day

applied technology training workshop. Results showed that there was no statistically significant difference related to computer attitudes between workshop and control groups. However, a marginal difference (p < .074) related to computer anxiety between workshop group and control group was evident.

The finding of this study confirmed that computer anxiety might be more directly related to what kind of computer knowledge learners are learning rather than how much time learners are spending.

Study Two: Minds on, Hands on – The Linear-Nonlinear Approach to a Multimedia and Internet Course

This study (Yang, Shindler, & Keen, 2000) examined the adaptation of a combination of both linear and nonlinear strategies implemented into an applied technology course in summer 1999. A linear approach was characterized by a direct, sequential and outcome-driven strategy. A nonlinear approach is characterized by an indirect, random and process-driven strategy (Forcier, 1999). The class was limited in size (16 students, 4 males and 12 females) and met for 3 hours twice a week for 6 weeks. The course covered three major topics:

1. Use of the major Internet tools for K-12 teaching and research
2. Design and development of multimedia projects
3. Design and development of basic educational web projects

To initiate each of three new topics, a problem was introduced to the student in the form of a case study. Both instructor and students collaborated to analyze the problem, seek the solutions, apply related computer technologies, evaluate the final product, and discuss possibilities for integrating new technologies into real-world problems/projects.

With each topic, after an outcome-driven grounding using a direct linear problem-solving approach, student started for a transition to a nonlinear collaborative-inquire approach. The nonlinear approach allowed students the room to determine their own path to goal attainment without having a hierarchical structure or predetermined outcome imposed on them. This approach was to let students operate in a flexible environment that would be more comfortable for more random thinkers and challenging and exciting to the more concrete and sequential thinkers. In addition, this approach had the added factor of being motivational, given that students selected their own direction and projects.

The results of this study suggest that using a purposeful combination of both linear and nonlinear strategies within a problem-based approach provides students with dimension of learning that neither one alone can achieve. To reduce students' computer anxiety and enhance technology integration, computer-based courses/programs should be relevant to students' interests and learning styles, and incorporate an instructional model that employs a cognitive developmental framework most suited to the needs of the learners.

Study Three: Mission Possible: Project-Based Learning Preparing Graduate Students for Technology

This study (Yang, 2001) examined the adaptation of project-based learning principles into a applied technology course in summer 2000. The class was restricted only to graduate students and was limited in size (17 students, 9 males and 8 females). Students and instructor met 3 hours twice a week for 6 weeks at computer-enhanced classroom.

Previous researches have shown that project-based learning can capture the complexities of real life situations. Not only does it provide an effective way for students understanding the connection of knowledge to the context of its application, but it also provides students with opportunities for self-reflection and a sense of agency. Barron and the Cognition and Technology Group at Vanderbilt (1998) have identified four major design principles that appeared to be very important for project-based learning: a). defining learning-appropriate goals that lead to deep understanding; b). providing scaffolds such as beginning with problem-based learning activities before completing projects; c). including multiple opportunities for formative self-assessment; d). developing social structures that promote participation and a sense of agency (p. 306). Following these four principles, the course structured three projects:

1. Webliography - to understand how to search, evaluate, and organize educational Internet resources
2. WebQuest – to use educational Internet resources creating the inquiry-based learning activities
3. Electronic Course Portfolio – to foster self-assessment, reflection, and analysis of their learning on the course

The findings of this study indicate three major positive effects: 1). the usefulness of extended learning. Students reported that interrelated learning-appropriated goals, authentic projects, and interactive

learning atmosphere made them emerging as active, engaged learners; 2). the effectiveness of production. Students reported that working on their own real and related projects made their understanding deeper than simply "doing" without "understanding"; 3). the proficiency of technology integration. Students reported that by experiencing project-based learning, they had better idea on how to locate, evaluate, and use information and technology in their classrooms.

Study Four: STEP on Developing Active Learning Community for an Online Course

While the asynchronous distance learning programs are expanding, and the participants are mounting, the question of how best to foster community among learners to learners and learners to instructors who are physically and timely separated from each other has been raised (Rovai, 2002; Palloff and Pratt, 1999). Such separation may increase social insecurities, anxieties of communication and computer related technology, and feelings of disconnectedness (Jonassen, 2000; Kerka, 1996), as a result, "the student become autonomous and isolated, procrastinate, and eventually drops out" (Sherry, 1996).

In order to meet such challenge, this study (Yang & Maina, 2004) examined how a sound practical approach was designed and then implemented in one on-line course, including **s**caffolds before initiating class and starting new learning topics; **t**ransitions during the learning process in order to avoid the lack of personal touches and no-verbal cues; **e**valuations during and after each learning topic, and **p**resentations on outcomes through the website (STEP). Since spring 2001, this course was joined State University of New York Learning Network (SLN) as one of asynchronous learning network (ALN) courses offering for both on and off campus students. The class has been restricted only to graduate students and been limited in size (n=20) for each section.

The results of this study indicate that the systematic approach with a variety of strategies such as the STEP is effectively related to establish the active learning community for ALN courses. It confirmed that active learning community which relates to interactivity, sense of well-being, quality of the learning experience, and effective learning is essential for successful online courses (Rovai, 2002; Rourke, Anderson, Garrison, and Archer, 2001).

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Evaluation of Literacy Log and Discussion Board Postings in Online Learning

Yuanming Yao
Yedong Tao
Vassiliki Zygouris-Coe
Donna Baumbach
University of Central Florida

The Florida Online Reading Professional Development (FOR-PD) program is funded by the Florida Department of Education (DOE) and housed at the University of Central Florida (UCF). This staff development project functions as a primary statewide delivery mechanism for improving teaching methods in reading instruction in preK-12.

Literacy Log and Participants' Postings

Developed collaboratively with literacy and technology experts, school districts, professional organizations, and teacher educators across the state of Florida, the online course content was modularized and designed based on research and grounded in current theory. Each online module introduced a reading or reading instruction strategy to participants, who were also guided on how to use the strategies included in their literacy log with online links, templates and other scaffolds. FOR-PD's purpose of creating the literacy log strategies and the reason for requiring participants to use the literacy log strategies was to motivate teacher participants to better implement reading/reading instruction strategies in their own classrooms.

Assessments used for the FOR-PD course include pre and post assessment of participants' knowledge, discussion board postings, quizzes, and literacy log as an ongoing assignment. Posting assignments on participants' discussion board were therefore intended for developing an e-community for teacher and non-teacher participants, and for fostering collaboration and cooperation among them for their individual professional development through interaction with FOR-PD course content and section facilitators.

Qualitative Evaluation of Literacy Log and Postings

In alignment with in the Request for Proposal (RFP) from the Florida Department of Education (FL DOE), the FOR-PD evaluation plan highlighted literacy log and discussion board as major components of FOR-PD qualitative evaluation. Qualitative analysis could be used as a research strategy to explain reasons for observed differences (Gunawardena, Lowe, & Carabajal, 2000). Moving beyond the preliminary evaluation, this qualitative evaluation concentrated in participants' learning, their satisfaction, their plan to implement or their implementation of what they learned from FOR-PD content, based on the analysis of the log and the postings for the evaluation of the FOR-PD participants.

According to the internal documents such as the FOR-PD facilitator survey, value of the log in helping participants master content was ranked 4.2 (5 highest), due to the relevance, effectiveness, quality and value of literacy log strategies incorporated. Likewise, FOR-PD facilitator's perception of the assignments/BBS discussions was highly positive too, a ranking of 4.7 out of 5.

Another reason for examining both log and participants' discussion board to evaluate FOR-PD participants was that they complemented each other as a source of data in terms of breath and depth. The log and the postings, both as required assignments, were better than survey as a self-report of choices of actions when observation was not feasible for evaluating FOR-PD participants' actions in their own classroom. Comparatively, the log documented participants' better-focused responses to their assignments. Participants' discussion board was used as a supplemental data source for the qualitative evaluation however, mainly because it provided an effective platform for the communication and interactions among participants, and between facilitators and participants. Lieblein (2000) explored the role of threaded discussion board as s critical factor for successful delivery of online programs based on nearly 10 years of academic and administrative experience with online programs. Earlier, Moore (1989) proposed an effective

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instructional design for distance education based on three types of interaction: (a) learner–content interaction; (b) learner–instructor interaction; and (c) learner–learner interaction.

This qualitative evaluation therefore, would focus on the questions drawn from the RFP by FL DOE and the FOPR-PD content experts in relation to participants' learning of content based on Blooms' learning outcome categories (Bloom & Krathwohl, 1956), including what participants learned from FOR-PD lessons and what they thought of the content. Another focus of the analysis of the log and the postings was to evaluate whether and how FOR-PD participants planned to implement or were implementing what they learned from FOR-PD lessons.

Methods

Data Source

As of April 2004, FOR-PD has in total enrolled 5728 participants statewide from 64 school districts and 5 participating universities. Altogether, 289 sections have been conducted, including school district sections and university 'for-credit' sections. There was a variation in specific decisions on the implementation of the literacy log as an assignment made by different participating district sections. Some districts required participants to complete literacy log assignments and some did not. UCF 004 and 005, as university graduate or 'for-credit' sections, used the log as an ongoing assignment and collected it at the end of the course.

The major data for this qualitative evaluation of phase two was drawn from the UCF FOR-PD course sections in fall 2003, as recommended by the FOR-PD content experts, who designed the content, developed the literacy log strategies and created the participants' posting assignments. More than a half number of FOR-PD lessons (8 out of 14) were used for detailed analysis, including Lesson 2, 3, 4, 8, 9, 10, 11 and 12. Besides, Lesson 1 discussion board postings were used for analyzing participants' demographics. Common to all of the eight selected lessons, the assignments emphasized how participants were applying or planned to apply their new knowledge from FOR-PD lessons in their own classrooms.

Sampling

Purposive sampling of participants was used for this qualitative evaluation of FOR-PD participants. All the postings and literacy log strategies submitted by 20 out of 62 total participants were analyzed, based on the eight selected lessons in the two course sections, including participants with various roles such as teachers, counselors, pre-service teachers and others. Among the 20 participants, 13 were in-service preK-12 teacher participants with teaching experience ranging from 1 to more than 10 years. The subject they taught included literacy/reading and non-literacy/reading content area in exceptional or regular classrooms. The other seven participants were school counselors, pre-service teachers and the Florida Literacy and Reading Excellence (FLaRE) coordinators. Specific information of the participants is depicted by Table 1.

Table1: Participants' Details

Participants	Teaching experience (years)	Teaching level	Teaching subject	Teaching classroom
1	1-4	Secondary	Content	Exceptional
2	1-4	Secondary	Content	Regular
3	10+	Elementary	Content	Regular
4	N/A	Pre-K	VE: pre-reading skills	Exceptional
5	10+	Secondary	Reading	Exceptional
6	1-4	Secondary	Content	Exceptional
7	1-4	Elementary	Reading	Regular
8	1-4	Elementary	Reading	Regular
9	10+	Elementary	Reading	Exceptional
10	5-10	Elementary	Content	Exceptional
11	5-10	Secondary	Reading	Regular
12	N/A	Pre-K	Pre-reading skills	Exceptional
13	1-4	Secondary	Content	Regular
14	Product Marketing Manager for reading/language arts and math in a software company			

	with 26 years of teaching experience in Prek-12
15	School counselor
16	Area Coordinator for FLaRE, also reading resource teacher with 15 years of teaching experience and 3 years of reading curriculum experience
17	Full time graduate student at UCF, majored in varying exceptionalities (VE)
18	Future school guidance counselor
19	Associate Professor at UCF in exceptional education
20	Area Coordinator for FLaRE with life-long experience of teaching

Data Analysis

Robert Yin's pattern-matching, one of its dominant modes of case study analysis was used for the design for this qualitative evaluation and was applied to analyze and examine the log and participants' postings. Pattern matching "compare an empirically based pattern with a predicted one (or with several alternative predictions) for dependent variables" (1994, p.107) . The learning outcome of FOR-PD participants was therefore matched with the requirements of the RFP from FL DOE and the content features depicted by the UCF proposal for FOR-PD program. Specifically, the use of literacy log was to motivate teacher participants to better implement reading/reading instruction strategies in their own classrooms and the use of postings to develop an e-community for teacher and non-teacher participants for their individual professional development through interaction with FOR-PD course content and section facilitators.

Automatic and hand coding were conducted. First, the hand-written literacy log strategies were first transcribed into electronic files. Each participant' postings were compiled and downloaded from the online section into one complete file and then copied to ATLAS-ti, a software for organizing and coding qualitative data, as an individual primary document. Based on the focus of this evaluation, three categories addressing the specific questions drawn from the RFP and the content experts were used, including a) what participants learned from FOR-PD lessons, b) how participants liked FOR-PD lessons, and c) how participants implemented/planned to implement what they learned from FOR-PD lessons.

Using open coding in ATLAS-ti, the category of what participants learned was first coded reading/reading instruction strategies, content reading strategies, reading instruction principles, reading resources, and assignments, focusing on the content of FOR-PD lessons. Meanwhile, another set of codes based on Bloom's taxonomy (1956) of learning outcomes in the cognitive domain, i.e., Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation were adopted for this category. Next, using cross-search for both the codes based on Bloom's learning outcomes and those indicating the different aspects of the FOR-PD lessons, quotations from each participant depicting what participants learned were identified and located. In the same way, quotations from each participant were also produced, illustrating how participants liked FOR-PD lessons and how participants implemented or planned to implement what they learned from FOR-PD lessons in terms of reading strategies, instruction principles, assignments, and resources.

Findings

The analysis of the log and the corresponding participants' discussion board postings revealed that participants made significant gains in their understanding and familiarity with the reading strategies, principles, and resources that they learned from FOR-PD lessons. Participants like the research-based FOR-PD lessons including its large on-line reading resources and the challenging assignments. Furthermore, participants were implementing or planned to implement the strategies and techniques that they learned from FOR-PD in their own classroom instructions.

First, participants have learned or become more familiar with reading strategies, principles and resources from FOR-PD, achieving all the learning outcomes including the lower-level and the higher level learning in the cognitive domain (Bloom & Krathwohl, 1956). When participants were required to do their literacy log or BBS posting assignments, most of them would describe and summarize the reading principles, strategies, or resources, displaying their knowledge' and comprehension. Then they would analyze the instructional situations for proximal application, considering their students' specific characteristics. Next, participants would synthesize the strategies, principles or resources by combining the new with the old or just integrate them into the subject content, and at last evaluate how the strategies, principles or resources could work in different instructional situations. Table 2 consists of juxtaposed

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quotations selected from the postings and the log, displaying how a participant comprehended and applied FOR-PD resources.

Table 2: Participants' Learning

FOR-PD Resources Discussion	Log Strategy: K-W-L
I have been an elementary teacher for 14 years, and thought I had a pretty good idea of how to teach reading. However, this course has provided me with more questions than answers. It was difficult to choose three. These links are such good resources I have spent way too much time reading them. I teach at a Magnet school that focuses on Math, Science and technology, so my first question is #1: how I can use available technology to teach reading. In searching through the websites, I have discovered that technology "is a small piece of the pie" in teaching reading but can be a good reinforcement of skills taught. It is important to have good quality programs. Programs provided to the children should have clear instructions to navigate easily. Some programs provide a record keeping system so that the teacher can monitor each child's progress. Technology can add unique experiences for children to interact with literature. http://www.suite101.com/article.cfm/reading/38568l http://www.fcoe.k12.ca.us/techprof This year my county replaced our balanced literacy testing with the DIBELS test. So my next question is #2: what is the DIBELS test? I found out that the DIBELS is given in K-3 grades three times per school year. It tests the "big three" of literacy: phonological awareness, alphabetic understanding, and automaticity/fluency. DIBELS is time effective taking 3 minutes per component, per child to score and assess. According to the article, DIBELS can identify children who are most at risk for reading difficulty, so that interventions can be planned in the early grades. URL http://reading.uoregon.edu/big_ideas/trial_bi_index.php My third question is #3: how can we get children to read more? I found an article entitled "Why read to Children". This article bases its research on a study by the Commission on reading which states "Reading aloud to children is the single most important activity...It is a better teaching tool than anything else in the home or classroom." The article continues to state that we must condition the child's brain to associate reading with pleasure so that we teach children to become "lifetime readers" instead of "school time readers." Besides reading aloud to children everyday, the article suggested ways to provide a print rich environment for children. One suggestion that I really like and plan to use in my classroom is using rain gutters on the walls to display books with the covers facing out. http://www.sdcoe.net/pdop/trec/support/html/prog_4.htm	What I Know: 1) Reading is making sense of written text. 2) Reading is an essential life skill. 3) Phonics and phonemic awareness are important factors in children learning to read. 4) Reading for pleasure is important. 5) Struggling readers need intensive strategies to correct problems. What I Wanted to know: 1) How important are standardized tests to the process of learning to read? 2) What is DIBELS? 3) How can I use technology to teach reading? 4) How can we get children to read more often? What I Learned: 1) We must teach children to become lifetime readers instead of school time readers 2) DIBELS can help identify "at risk" reader early so interventions can be implemented in early grades. 3) I can use technology to reinforce skills taught. It can be another medium for children to discover literature.

Second, participants like FOR-PD lessons, including its research-based content, large on-line reading resources, and motivating and challenging assignments. Most participants, experienced or inexperienced

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teachers, valued the FOR-PD lessons highly and planned to utilize more strategic instruction in their classrooms. A few participants claimed that their attitude towards the highly challenging strategies like SCAMPER (see Appendix 1) became more positive after using them for their FOR-PD assignments or in their own teaching. Moreover, participants, who were teaching content area also positively perceived the strategies they were using or would be using from FOR-PD. Following are a few quotations about what experienced or inexperienced, or what content area or literacy/reading teacher participants thought of FOR-PD lessons in terms of content, resources and assignments. A reading resource teacher from Hernando Elementary School in Citrus County, with over 25 years of teaching experience, commented on FOR-PD lessons: "This lesson has been a wonderful learning experience for me. I've been teaching 25 years and didn't realize how much I did not know about reading. I also now understand why we are doing the things we are doing in education and how these things were developed. This made everything very clear for me. The resources that are available to us are unbelievable! I am sharing this with everyone I know. I also believe administrators and school board members should be required to take this course. The choices they make about educating our children should be from an informed perspective and this would provide that". A beginning Kindergarten teacher also liked the strategies very much and planned to utilize them in her own classroom, "I enjoyed using the 6 Hat Strategy! I plan to use this strategy in many different areas. This strategy is great for organizing my lessons! I think that the SCAMPER strategy is a great way to analyze a unit or lesson. I have found that many of the things that I thought would work in the classroom have not gone well. Using this type of strategy will be a great way to organize the entire unit". An area Coordinator for the Florida Literacy and Reading Excellence program (FLaRE) and also an 8th grade Language Arts teacher has become more positive towards the highly challenging strategies and assignments, e.g., SCAMPER, after using them for her FOR-PD assignments. She commented, "As I worked with the (SCAMPER) strategy, I realized that it does have some merit, especially for provoking deeper thinking for the students. I will try it when I again teach this book...after I completed it, I decided that it was good. I am sure I will use it and share it with others now that I have it:)"

Third, participants were implementing, or planned to implement, what they learned from FOR-PD lessons.

FOR-PD teacher participants addressed both instructional situations and instructional methods/reading strategies, when they discussed how they implemented or planned to implement strategies in their teaching. Situations consisted of their students' characteristics; and the advantages, constraints and other environments for applying the strategies. Different teacher participants tended to focus on different strategies to meet their students' grade levels. Following are a few quotations from participants who were teaching different grade levels. A Pre-K ESE (exceptional student education) teacher participant used sound cards with visual and movement information for pre-reading skills instruction: "I am a pre-k ESE teacher and I do the letters and sing the day of the week with my students, everyday during circle time. What I found helpful in recognizing the letters are sound cards I use that show action of each letter sounds…The cards provides visual and movement to help remember a particular sound and letter". In the elementary and secondary levels, teacher participants focused more on the implementation of strategies for fostering fluency and reading comprehension among their students. A second grade reading/literacy teacher envisioned how she would implement the Column Notes for comprehension check: "I found the Column Notes strategy useful and easy to understand. I can see the benefits of using this tool at any grade level. For my second graders, I would use this as a before, during and after comprehension check for a story or textbook chapter read. We usually do a "picture walk" of a story to get an idea of what it will be about. After this, the students could write in the first column any questions they feel that they will have about the story or the highlighted vocabulary words. The second column would be where they would answer the questions that they had after reading and discussing the story as a class. The last column about "Me" would be great for them to apply what they learned from the text to their own lives. It is a wonderful way for them to write a real-life connection to the story, thus allowing for further comprehension. This would also be a good activity to do with a partner. I will probably try it as a group first, and then with partners, then individually, once I know that they understand the process behind the Column Notes". A middle school reading teacher used Exclusion Brainstorming for her remedial readers, grades 7-8, who were reading on the 3rd-6th grade level. "I have never tried this (Exclusion Brainstorming) before. So, this morning, before broaching our topic for the day which was "The History of Halloween," I put several words on the board around the topic. The students were less than successful in choosing the correct words which matched the historical significance of Halloween. This was a great idea!! I then knew exactly what I needed to cover today rather than spending (or wasting) time on concepts they already knew. We then

went on to read a collection of "scary" tales from the book, The People Could Fly and "The Tell-Tale Heart" We described the significance of Halloween and scary stuff in history and how these beliefs have influenced literature. (Funny…when I did this lesson, it didn't sound so confusing!)".

Conclusions & Recommendations

The investigation into FOR-PD participants' literacy log and participants' discussion board has shown that FOR-PD lessons were very effective. The pattern emerged from the data has matched the requirements of the RFP from FL DOE and the identified content features of UCF proposal for funding. Specifically, the participants have gained deeper understanding of reading and reading instruction from FOR-PD lessons. The participants learned or became more familiar with a large variety of reading and reading instruction strategies, e.g., SCAMPER, and FOR-PD referred online resources like SUNLINK. Moreover, participants appreciated the lessons, including its large on-line resources, challenging assignments, and research-based content. Particularly, participants, who were teaching content area, also valued the utility of FOR-PD strategies. The appreciation of the utility of strategies was a crucial element in strategy instruction because not only should teachers be able to communicate content area strategies, they must also assist their students in seeing the value of implementing such strategies in order to foster content literacy in their classrooms (Nichols, Rupley, & Mergen, 1998). Finally, the lessons were highly motivating, again, matching the requirements of both the RFP and the UCF proposal; participants planned to utilize or were already implementing more strategic instruction in their own classrooms. A large number of its lesson assignments required participants to describe how they implemented or would implement what they learned from FOR-PD lessons in their teaching. According to Reigeluth (1999), implementation was a good (utility) motivation in real life. FOR-PD teacher participants, as knowledge users, could provide their students with what they learned from their professional development in a timely fashion. On the other hand, for FOR-PD non-teacher participants, implementation as a major component of assignments would reinforce what they learned, when they envisioned what research/reading strategies might be relevant to which setting.

Based on the findings from the analysis of both the log and participants' discussion board, following are a few recommendations. First, FOR-PD provided templates, links, and model postings for discussions for how to use strategies incorporated in the literacy log and other scaffolds to FOR-PD section facilitators and participants (see Appendix 1: literacy log template). It would be advisable for pre-service teacher participants or those who had no teaching experience to hold more on-line discussions with peers and gain more support from their section facilitator. Alternatively, section facilitators should provide more monitoring and support for these participants, particularly for a couple of more challenging strategy assignments in the literacy log and discussion board, like SCAMPER (well-suited for "thinking out of box" according to one participant, and useful in participants' own classroom for gifted-students). Second, the FOR-PD content with its large on-line resources and motivational assignments were very effective factors for the transfer of learning among participants. Participants used literacy logs successfully for the purpose of drafting and documenting their reading strategy assignments, which were further discussed, finalized, and eventually posted on the discussion board. Therefore, uses of both the literacy log and BBS should be continued, because they complemented each other as appropriate tools for ongoing assignments of this on-line reading professional development course. Third, there were frequent and timely responses on the participants' discussion board between the facilitator/instructor and participants in the two sections. In particular, Lesson 12 and a few other lessons had more interactions among participants in terms of breadth and depth of the postings; no matter participants were teachers or non-teachers, they were sharing stories, and exchanging views and tips for dealing with struggling readers in real life. Because peer interaction is a good motivation for adult learners and for on-line learning, it would be recommendable therefore that assignments involving more peer interactions be designed and added to the participants' discussion board.

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Appendix1: Template for the SCAMPER strategy

Name: _____

Topic: _____

SCAMPER Strategy

S Substitute	C Combine	A Adapt	M Modify	P Paraphrase	E Eliminate	R Rearrange

This page is designed for Lesson 9 of the FOR-PD Course. It may also be used or adapted for your classroom. See the FOR-PD lesson introductions for more information.

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A Case Study of Facilitators' Attitudes toward Effectiveness of Different Media Used in Online Degree Programs

Ulku Yilmaz
Cengiz Hakan Aydin
Anadolu University, Turkey

Abstract

This presentation consists of the results of a study in which facilitators' attitudes toward effectiveness of various media used in the Information Management Associate Degree Program of Anadolu University, Turkey. The study has shown that although facilitators indicated that textbooks should still be used in online courses, they found textbooks as being not efficient as multimedia programs and web environments. The participant facilitators also found multimedia programs distributed on CDs more efficient than web environment.

Introduction

Does not matter what form or model it is, every open and distance learning (ODL) initiative is based on one or more media. The major theorists, such as Moore (1973) and Holmberg (1990), also stressed on use of media as an absolute need in ODL. On the other hand, Clark (1983), argued that "...media [technology] do not influence learning under any conditions" and that "...media are mere vehicles that deliver instruction, but do not influence student achievement any more than a truck that delivers our groceries causes changes in our nutrition" (p. 445). He criticized the meta- analysis of James Kulik and his associates whose general conclusion was that computer-based technologies were as effective as, and in some cases more effective than, traditional in-class instruction in improving academic achievement (e.g. Kulik, Kulik & Cohen, 1980; Kulik, 1984). Clark has drawn attention on to the instructional design of the learning materials rather than the media itself. Opposing Clark's views, Kosma (1991) stated that media has symbolic and process attributes. He indicated that how the symbols were presented had a direct bearing on the perception and level of integration experienced by learners. Bates (1995) supported Kosma's points and emphasized the importance of technology decisions. Bates asserted that there are significant educational and operational differences between various technologies, and the appropriate choice and use of technologies mainly depend on the context in which they are used.

On the other hand, instructor presence in ODL is more critical, complex and challenging than traditional educational environments due to its technology-based nature (Rudestam & Schoenholtz-Read, 2002; Spector & de la Teja, 2001). Faculty has to overcome potential barriers caused by technology, time, and place that might be influential on their satisfaction, which, in turn, affects the success of the ODL initiative. Correspondingly, Moore (2002) from the Sloan Consortium (Sloan-C) considers faculty satisfaction as being one of the five pillars that support quality learning environments. Dziuban, Shea and Arbaugh (2005), however, points out the shortage of empirical studies on faculty satisfaction in ODL.

Consequently, this paper summarizes the results of a study that focused on faculty satisfaction about the technology used in an online learning program. In the following sections, firstly, the setting of the study, or the Information Management Associate Degree Program (IMP) of Anadolu University, Turkey is introduced and later other details of the study were given.

The Information Management Program and Media Used in It

The Information Management Associated Degree Program (IMP) of Anadolu University is the first undergraduate level internet-based distance education initiative in Turkey. The purpose of the IM program is helping students (1) gain the necessary skills to use required business software effectively and efficiently, (2) acquire the concepts and experience of the Information Management in business, (3) attain the collaborative working experience and institutional communication on the Internet environment, and (4) get hold of necessary experience for the enterprise and management of the Internet environment.

This two-year long internet-based program has first started in the fall 2001 with 189 students from 42 different provinces of Turkey and from the Northern Cyprus Turkish Republic. The 86 of these students celebrated their graduation at the end of spring 2003. The program currently continues education with its

130 first year (freshmen) and 119 second year (sophomore) students. Of the students 54 percent are male and average age is 26. More than 50 percent of the students do not have jobs. They, additionally, have diverse computer experiences ranging from beginner to 15 years of professional work prior the program.

After registering the program either through the Internet or through the Open Education Faculty Offices that are spread out the country (in 83 provinces), the students receive instructions on learning processes as well as licensed software and instructional materials. The IM Program Guide consists of information on the curriculum, instructional activities, interaction possibilities, support systems, instructional materials, evaluation methods, software, and so forth. The Guide also includes sort of an orientation for self-study (distance learning) methods. The students can also walk-in the 83 offices and get help face-to-face. Additionally, web sites designed for supporting the students and online tools such as newsgroups, chat and e-mail provide instructions and information about different aspects of the program. Furthermore, a telephone line is available for the students 7 days in a week (16 hours each day). The students especially need help on setting up the software and on studying at a distance prior the instruction. So, the Guide, telephone line, the Offices, and online tools are mostly used to get help on these issues. Moreover, Microsoft as the requirement of an agreement with Anadolu University provides licensed software such as Windows, Office, FrontPage, Visio, Project, Publisher, and so forth to the students.

The students also receive instructional materials during the registration. The instructional materials are web sites and tools, original software, textbooks, and video CDs. The web sites and tools help students learn the content. The Computer-Based Instruction Center (CBIC) of Anadolu University has produced 25 modules of online learning environments that provide interactive presentation of information, examples and practices. The information is presented in different verbal and visual formats such as text, narration, and animation. The majority of the practices include multiple choice items with immediate feedback and links to the related content. These environments have designed in a way that enables self-paced learning and easy navigation.

The online tools serve for synchronous and asynchronous interactions among students, between students and facilitators, as well as between students and organizational and technological support staff. The students are able to interact synchronously (chat and forum) 4 hours in a day for each course with the facilitators. They can also use synchronous tools (email) to get help from the facilitators and other staff. There are 55 facilitators (academic advisors) employed primarily for providing the students academic (instructional) support. Each facilitator is an expert in one course content. For each course there are 5-10 facilitators. They do not only answer the students' questions but also evaluate the assignments. For every course additionally there is a coordinator whose main responsibility is to help and supervise the facilitators. The facilitators sometimes provide organizational and technical supports, too. However, there are staff that help to solve the students' technical and organizational problems online as well as via phone.

The students are also able to use video CDs produced by the CBIC. These CDs generally include around 40 hours of animated demonstrations about how to use the software. The videos on these CDs are also available online for the ones who have faster Internet connections.

In addition, a series of textbooks and e-books are provided to students as supplementary materials. Textbooks are the products of a private company and can be bought in any bookstore in Turkey. Anadolu University pays an amount of money to the publishing company for these textbooks. The e-books are the products of Anadolu University.

Purpose and Research Questions

This paper intends to reveal and discuss the results of an evaluation study in which facilitators' attitudes toward effectiveness of various media used in the Information Management Associate Degree Program of Anadolu University, Turkey. Answers of the following questions were sought in the study:

1. How effective, efficient and attractive the facilitators found the media used in IMP?
2. Does gender create a difference on the facilitators attitudes toward the media used in the program?

Methodology

This study was conducted as a part of a large evaluation project that aimed to get feedback from facilitators about the implementation of IMP. The project consisted of administration of a series of survey questionnaires and semi- and/or un- structured interviews. One of these questionnaires helped the researcher collect data for this study. Following section includes details about the participants, setting and the instrument.

Participants

Facilitators (55) employed in IMP of Anadolu University were asked to take part in this study. Only 2 of these facilitators did not participate due to personal reasons. As a result, the study was conducted with the participation of 53 online facilitators. All the participants were working as graduate assistants or as faculties in various colleges of Anadolu University besides working as facilitators in IMP. The majority of the participant facilitators were graduate assistants (31 participants - 56.4%) while others (22 participants) were experienced lecturers who have been teaching undergraduate level courses for a certain number of years in different fields. It might be beneficial to give some details about graduate assistantship in Turkey for the audience. To start with, the graduate assistantship is a profession in Turkey. In other words, graduate assistants are employed as fulltime assistant faculties, whose main responsibilities are to assist professors in their courses and research studies, as well as helping in the administration of departments. Although it is not encouraged, sometimes graduate assistants also take responsibilities of undergraduate level courses owing to shortage of professors. A big majority of the participant graduate assistants (28 out of 31 – 90%) have been assisting professors for several years, and sometimes, they stand as substitutes in lectures. Therefore, they can be considered as experienced in face-to-face teaching. Moreover, of the participants, 11 (20%) were females, and most (45.5%) were between 25-29 years old.

Instrumentation

The IMP administrators bring all the facilitators together at the end of each semester to learn their thought about the program and the support services provided them. It is noticed that just a few facilitators attend these meetings and those who attend hesitate to express their ideas and satisfaction from the support services. So, a survey questionnaire is selected as data collection method to seek input about support services of the IMP for online facilitators.

The questionnaire included a Likert type 5-point scale, ranging from strongly disagree to strongly agree (1-5), that were developed to measure facilitators' attitudes toward each medium used in IMP. The scale consisted of 7 self-report items concerning effectiveness, efficiency and attractiveness of each medium. Another item asked the participants to what extent they think these media should be used in future online programs and courses. For each medium a scale was provided. Therefore, the participants were expected to check the number (1-5) on each scale that best reflects their feelings about the item regarding that medium.

Procedure and Data Analysis

The study was conducted in May 2003. The participant online mentors were asked to complete and return the paper-pencil based questionnaire in a week. The researcher used descriptive statistics (means and standard deviation) in order to analyse the research question 1 because the nature of the question were to draw a picture of facilitators' perceptions, not to make comparisons. For the second question, t-tests analyses were employed.

Results

The reporting of results is organized into four sections. The first section discusses the reliability of the survey instrument. The second reports the results for research questions one while the third gives details of the results for research questions two.

Reliability of Analysis of the Survey Instrument

The following procedures were used to determine content and construct validity of the survey instrument: (1) review of the literature, (2) three experts who have been conducting research on online learning and teaching, as well as teaching online, and (3) the field test with the online facilitators of another program of Anadolu University.

According to Cronbach's Alpha analyses, the reliabilities for all sections of the survey were found to be quite high (0.89). The reliability of the participants' responses regarding the CDs that help to deliver instructional multimedia software (0.68) was lower than the reliability of the participants' perceptions about textbooks (0.88) and web based learning materials (0.85).

Facilitators' Perceptions of Media Used in the IMP

Results of the first research questions, "How effective, efficient and attractive the facilitators found the media used in IMP? are illustrated in Table 1.

Table 1 Descriptive Statistics Regarding the Facilitators' Perceptions about media used in IMP

Functions of the medium		Media		
		Textbook	CD	Web
	CA	*0.88*	*0.68*	*0.85*
Helping learning	N	53	53	53
	M	3.92	4.47	4.38
	SD	0.96	0.57	0.74
Requiring less time	N	53	53	53
	M	3.49	4.51	4.45
	SD	0.99	0.67	0.57
Spending less effort	N	53	53	53
	M	3.28	4.60	4.30
	SD	0.93	0.57	0.75
Being entertaining and appealing	N	53	53	53
	M	2.79	4.49	4.13
	SD	1.03	0.61	0.83
Accessing and using easily	N	53	53	53
	M	4.15	4.33	4.11
	SD	0.93	0.81	0.75
Transferring the content accurately	N	53	53	53
	M	4.17	4.00	4.06
	SD	0.97	0.71	0.74
Presenting the content attractively	N	53	53	53
	M	3.11	4.38	3.96
	SD	1.05	0.66	0.92
Future implementations	N	53	53	53
	M	3.98	4.47	4.39
	SD	1.18	0.97	1.06

As can be drawn from the Table 1, the participant facilitators think that a textbook is a medium than can be accessed and be used easily, that transfer the content accurately and that help learners learn the subject matter. In other words the facilitators believed that textbooks were effective and efficient media. However, they found their attractiveness or appealing as sort of problematic. On the other hand, they asserted that textbooks should still be used in online courses. Among all three media, multimedia programs delivered on CD-ROMs got the highest scores at every item. Likewise, web materials were also found quite effective, efficient and appealing. It was interesting to notice that the facilitators have shown a better attitude toward CDs when comparing with web materials. This result may be related to the access problem. Nowadays all the computers have CD-ROM drivers but it is hard to find fast Internet connections.

Gender and Attitudes toward Different Media
The second question of the study examined the *differences* occur in the facilitators' scores for the media used in IMP due to *their gender*. An independent sample t-test analysis has been conducted to see of *gender* makes any difference in the participant facilitators' attitudes. According to the results, no significant difference between the female and the male facilitators' perceptions was observed. This result is consistent with other studies conducted with the same group of facilitators.

<p style="text-align:center">**Conclusion**</p>
This descriptive study using survey data revealed that the facilitators in the IMP of Anadolu University were satisfied with the effectiveness, efficiency and appeal of the multimedia programs distributed on CDs and web materials. They also found textbooks effective and efficient although not as much as other media. However, the study has shown that the facilitators did not think that textbooks were appealing. Ironically, they indicated the necessity of textbooks in future online learning implementations.

So, it seems that textbooks are still adorable media for us and will be around for a while. In order to get maximum benefit out of this medium the designers should find ways to make them more appealing and interesting.

As it has mentioned before this study was conducted as a part of a large evaluation project that aimed to get feedback from facilitators about the implementation of IMP. There were a series of questionnaires, each of which included quite a number of items on different aspects of the program. This situation could be effected on the participant facilitators during the administration of the program. So, a separate study supported with qualitative methods might help getting better insight about how facilitators think about the media used in an online program. These sorts of studies can help administrators of the IMP and similar ones to improve their practices.

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An Examination of Classroom Community Scale: Reliability and Factor Structure

Huang-Chih Yu
Fengfeng Ke
Pennsylvania State University

Abstract

This study was intended to extend current work on the Classroom Community Scale (CCS) by examining its internal reliability and factorial structure. Data were collected from 280 students at both online and face-to-face classes. The results of the factor analysis indicated a satisfying internal reliability (Cronbach's alpha is .78) of the total scale and a three-factor structure of important attributes for classroom community: interdependence in learning, emotional support, and sense of membership.

Introduction

Learning communities are a growing feature in the education landscape. The power of community to support learning has been well theorized or explored by many researchers (e.g. Brown & Duguid, 2000; Palloff & Pratt, 1999; Lave & Wenger, 1991). Various descriptive studies on the development of learning communities in formal schooling have also been conducted.

However, most of these studies report only community development efforts rather than results. Without a workable evaluation tool, educators have difficulty indicating whether a phenomenon of community has really emerged within their classrooms, or how this community phenomenon has developed to support learning.

As an effort to tackle this difficult position, Rovai (2002) has developed the Classroom Community Scale, which is an instrument to assess students' sense of community and the extent of community development. Rovai defines "sense of community" as consisting of two components: feelings of connectedness among community members and commonality of learning expectations and goals (2002). The CCS contains 20 five-point Likert-scaled items, ten items each for the subscales of connectedness and learning. Rovai (2002) has field-tested the CCS with university graduate students enrolled in e-learning courses, reported a high internal consistency of the total scale, and described how two subscale factors were extracted from factor analysis. Since its publication the CCS has been cited or applied in quite a few learning community studies (e.g. Anderson, 2004; Blignaut & Trollip, 2003; Brook & Oliver, 2003).

However, it should be noted that the CCS has been developed and applied only in online learning environments. In addition, students involved in the CSS field-tests are only education-majored graduate students. Rovai (2002) admits that caution should be exercised when generalizing the CCS to different course environments or different student groups. Therefore, it remains questionable whether the existing scale has psychometric credentials that are sound under different learning environments, or whether the scale contains items that reflect the characteristics of different learner groups.

Method

The present study intends to extend current work on the CCS by examining its internal reliability and factorial structure. Data sets from both online and face-to-face learning environment, from a mix of graduate and undergraduate university students of different academic majors will be used in this article. By doing a reliability and factor analysis of collected data, we are able to assess the CCS in the contexts of multiple course environments, hence suggest directions for its future development.

Participant

In this study, participant population consists of a total of 280 university students who are enrolled in five undergraduate and graduate courses in education, engineering, and business school at the spring semester of 2005. Among them 135 are enrolled in two face-to-face courses while 145 are enrolled in three Angel-based online courses. Situated in different learning environments and having different educational backgrounds, the participants vary in age (from 20 years to 50 years), gender, and ethnicity.

Setting

The treatments used in this study comprise five education, engineering, and business graduate and undergraduate courses offered by a major state university located in Midwest America. All courses are regular credit courses, with three of them delivered via the Angel e-learning system. Instructor student rations range from a low of 1:10 to a high of 1:300. Full-time experienced faculty members teach the courses. It is observed that instructional designs and presentation styles of the five courses are different. Among these five courses, two graduate e-learning courses from education school are teamwork and dialogue oriented; one undergraduate e-learning course from engineering school is highly structured and lecture-based; then the remained two undergraduate face-to-face courses from business school are more balanced between lecture and teamwork interactions.

Measures and Procedures

Data were collected during the final three weeks of the semester for each of the five courses sampled in this study so that "students will have substantial exposure to the course about which they are responding" (Rovai, 2002). Rovai's Classroom Community Scale along with demographic questions regarding gender, age, educational background, and ethnicity were made available to students via both online and paper-and-pencil surveys.

The scores were computed by adding points that are assigned to each of the five-point items. Items were reverse-scored where appropriate to ensure that the most favorable choice is always assigned a value of four and the lease favorable choice is assigned a value of 0. Higher score reflects stronger sense of community.

Analysis and Results

Data analysis was conducted in two parts. First, the internal consistencies of the total score and of each of the two subscales were examined. The reliability analysis (N = 277) indicated a satisfying Cronbach's coefficient a of the total CCS scale, .78. But the coefficients of two subscales – Connectedness and Learning – were .69 and .63 respectively, lower than the lower acceptable bound of .70 (Nunnally & Bernstein, 1994).

Second, factor analysis was conducted to examine the factor structure of various indices of classroom community. We seek to determine if the data replicated the two factors implicated in the Rovai's model. The data were factor analyzed using principal component factoring with a varimax rotation. The criteria established in advance of the selection of factor items were: a factor loading of .35 or higher; at least a .10 difference between the item's loading with its factor and each of the other factors, and interpretability.

Four factors had eigenvalues of greater than 1.0 and the scree test suggested that either a three or four factor solution would be most appropriate since the scree test had obvious breaks at these points. Three and four factor solutions were assessed and the three factor solution was selected since it offered the simplest and most interpretable structure. The factor loadings for the three dimensions of important attributes for classroom community were presented in Table 1. The item that did not account for salient factor loadings on interpretable factors during factor analysis of the 20 items were pinned out.

TABLE 1.

Items	Factors		
	Interdependence in Learning	Emotional Support	Sense of Membership
19. I feel confident that others will support me	.87	.10	-.15
18. I feel that my educational needs are not being met	.83	-..56	.04
10. I feel reluctant to speak openly	.83	-.15	.05
20. I feel that this course does not promote a desire to learn	.83	-.16	.01
13. I feel that I can rely on others in this course	.81	.11	-.22
16. I feel that I am given ample opportunities to learn	.81	.06	-.25
14. I feel that other students do not help me learn	.71	.07	.23
11. I trust others in this course	.66	.28	-.16

7. I feel that this course is like a family	.59	.33	-.08
12. I feel that this course results in only modest learning	.53	-.37	-.20
3. I feel connected to others in this course	.09	.82	.23
1. I feel that students in this course care about each other	.02	.80	.20
2. I feel that I am encouraged to ask questions	.00	.62	.28
5. I do not feel a spirit of community	.03	.53	.50
15. I feel that members of this course depend on me	.09	.47	.01
6. I feel that I receive timely feedback *	.20	.22	0
17. I feel uncertain about others in this course	.09	.01	.71
9. I feel isolated in this course	.02	.18	.70
8. I feel uneasy exposing gaps in my understanding	-.34	.15	.69
4. I feel that it is hard to get help when I have a question	.06	.30	.62
Eigenvalue	6.15	3.71	1.35
% of Variance Explained	30.75	18.57	6.75
Cronbach's Alpha	.90	.77	.70

Note: Item 6 did not account for salient factor loadings on interpretable factors.

Discussions

The study results indicated that CCS has a satisfying internal consistency for the whole scale, but not for the two subscales (connecedness and learning). Then, the factor analysis demonstrated a three-factor structure rather than the two-factor one suggested by Rovai (2002). Rovai's field studies suggested that connectedness and learning can be identified as two independent factors. But the result of this study showed that these two attributes could be integrated into one dimension.

As Table 1 displayed, item 19, 10, 18, 20, 16, 13, 14, 11, 7, and, 12 account for a salient factor that is defined as *interdependence in learning*, which refers to the combination of trust, shared needs (in this case, learning), and exchange of influence. McMillan and Chavis (1986) defines that psychological sense of community includes four main elements: membership, influence, integration and fulfillment of needs, and shared emotional connection. In this study, the factor of *interdependence in learning* can be interpreted as the dynamics between two senses of community elements – influence and needs. Item 3, 1, 2, 5, and 15 account for another factor called *emotional support*. In this study, emotional support means not only emotional connection as described by McMillan and Chavis (1986), but also a mental support between peers (i.e. peer encourage, caring, etc.). Finally, item 17, 9, 8, and 4 represent the third factor – *sense of membership*, which means students in a classroom community, should first have "emotional safety," willingness to reveal how one really feels, and then develop a "sense of belonging." In McMillan and Chavis's theory, both emotional safety and sense of belonging are indices of sense of membership.

In conclusion, we believe that the Classroom Community Scale can be used as a useful evaluation tool for educational practitioners in future learning community development at both online and offline learning settings. The whole scale has a satisfying internal consistency and its factor structure concurs with the constructs defined by previous community theory. However, it should be noted that one item (item 6) did not account for any salient factor, hence need to be dropped. Additionally, we suggest more items accounting for emotional support and sense of membership should be added for the future development of the CCS.

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