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Selected Papers on the Practice of Educational
Communications and Technology Presented at the 2006
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Communications and Technology

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Dallas, TX

Co-Editors: Michael Simonson and Margaret Crawford

Nova Southeastern University, North Miami Beach, Florida

2006 Annual Proceedings - Dallas: Volume #2

Selected Papers
On the Practice of Educational Communications and Technology
Presented at
The National Convention of the Association for Educational Communications and Technology
Sponsored by the Research and Theory Division
Dallas, TX
2006

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Preface

For the twenty-ninth year, the Research and Theory Division of the Association for Educational Communications and Technology (AECT) is sponsoring the publication of these Proceedings. This is *Volume #2 of the 29th Annual Proceedings of Selected Papers On the Practice of Educational Communications and Technology.* This volume includes papers presented at the national convention of the Association for Educational Communications and Technology held in Dallas, TX. Copies were made available to Convention attendees and AECT members. Volumes 1 and 2 are available through the Educational Resources Clearinghouse (ERIC) system.

This volume contains papers primarily dealing with instruction and training issues. Papers dealing with research and development are contained in the companion volume (29th Annual, Volume #1).

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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Games for Learning, "FIDGE" for Instructional Design

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Abstract

Despite more than 30 years' existence of computer games and simulations in the instructional design movement, available comprehensive design paradigms are still lacking and well-designed research studies about the question of "how to" incorporate games into learning environments is still a question. In search for an answer, this study explicates the third generation of the "FIDGE model," which is an instructional design/development model (IDDM) that has come to life as a result of a formative research and with the inspiration from fuzzy logic. The model is designed for creating game-like learning environments, educational or commercial games, or briefly, video games in general.

Statement of the Problem

Traditional instructional design/development models (IDDMs) have been criticized on the grounds that they hardly represent a variety of structure, although they are abundant in number. The procedural stratifications and time-consuming practices have constituted the main rationale of these criticisms. On the other hand, although computer games and simulations have a history of more than three decades in the instructional design movement and computer games are considered as powerful tools to increase learning (Dempsey, Lucassen, et al., 1996; Dempsey, Rasmussen, et al., 1996); there are two major problems that are encountered. One is that there are no available comprehensive design paradigms and the other is the lack of well-designed research studies (Gredler, 1996). While the literature is growing as time passes, by the carbon copy researches that report perceived student reactions preceded by vague description of games and simulations or comparative studies of simulations versus regular classroom instruction (Gredler, 1996), the question of how to incorporate games into learning environments rather than, simply, to master the material, is much more frequently asked to the educational researchers (Dempsey, Lucassen, et al., 1996; Dede, 1996). In conclusion, there is the apparent and urgent need for the introduction of an IDDM that will help and guide instructional designers and/or game designers for the efficient use of games and simulations in educational environments, more precisely to create game-like learning environments.

Method and Data Sources

The study that originated the model was designed as a special methodology that is similar to that of a case study method of qualitative research (Yin, 1996), which is referred as "formative research" by Reigeluth and Frick (1999, p. 633). Formative research methodology fits best, while the researcher is interested in the design and development process rather than the product or outcomes, in contextual structure rather than specific variables and in discovery of the underlying elements rather than conformation (Merriam, 1998). Moreover, the reason that the case, which was selected by the researcher, was not especially and intentionally designed according to a specific model, but fulfills the same goals and provides the same context as researcher's intention, leads the design of the study towards naturalistic case of formative research.

Participants of the study consisted of 18 out of 56 senior undergraduate students of the Computer Education and Instructional Technologies (CEIT) Department of a university in a European country, with the age range of 20 to 24. Participants enrolled in an undergraduate course in their department, were invited to participate in a study that was designed to suggest a new instructional design/development model that might be used for creation of game-like learning environments, utilizing a 3D virtual world tool on the Internet. The researcher collected data during this design/development process, duration of which was three months.

As for the data collection and analysis techniques, observations, documents (such as weekly reports, peer evaluations, e-mail logs and reflective papers about the specific aspects of the selected case written by the participants), and semi-structured interviews with the participants (students), instructors (of the selected case); and content analysis were used. These data sources were the ones that formative research implies.

As for the first and the second iteration of the model, the same undergraduate course was selected, in which the participants used the first and the second generation of the FIDGE model, respectively. However, during these iterations, the selected case was designed to fulfill the requirements and the goals of the FIDGE

model and to provide the appropriate context as researcher's intention, leads the design of the study towards designed case of formative research. During the first iteration the researchers interviewed 16 out of 58 senior undergraduate students of the same department, with the age range of 20 to 23. The documents that are produced by the students were also collected throughout the course and analyzed afterwards. As for the second iteration, the researchers prepared different questionnaires for each phase in the model containing open-ended items and collected data from all 62 senior students enrolled in the course. In the light of the analyses of the collected data the model revised twice.

Results and Conclusions

Based on our findings, in our paper we put forth an appropriate and complete instructional design/development model for the creation of game-like learning environments. In accordance with many of the traditional models, our model also consists of four parts, which are analysis, design, development and evaluation. However, the components of these parts and the way they are structured are different from these traditional models. There are fuzzily bounded phases, which are progressing in a dynamic and an intertwined manner, as opposed to the linear structure and procedural stratifications that follow the other. For these reasons we inspired from fuzzy logic (Zadeh, 1996), which is an enhanced version of classical logic and rests on the same mathematical foundations. We especially interested in the set-theoretic facet of fuzzy logic, which is concerned with fuzzy sets, whose boundaries are not sharply defined. Moreover, by 'fuzzification' which is the process of replacing the concept of a set with that of a fuzzy set, it becomes possible to provide a way of constructing models or theories that are more general and more reflective of the imprecision of the real world than the models or theories in which the sets are assumed to be sharply bounded and definitely limited. This enlightened exactly what we want, i.e. the proposal of an alternatively structured IDDM against the traditional IDDMs that have been criticized for their linear structures, procedural stratifications and time-consuming practices.

During the first iteration the emerging issues was the usability problems related to 3D environments and the collaboration-related issues that was articulated by the participants as the lacking elements in the "design and development" phase of the model. Considering these comments, the model is revised and evolved into the second generation of the FIDGE model. As for the second iteration, the emerging theme was the emphasized need for an analysis of current games, by the participants, to be able to find out the game utilities and game genres appropriate for the subject matter that was the focus of the intended design (Akilli & Cagiltay, 2006). Throughout the course of the study, we also recognize that are some more motivational elements that should be taken into consideration while designing such environments other than the already present ones in the model which were a synthesis of various researchers' studies such as Malone (1980), Malone and Lepper (1987), Rieber (1996), Price (1990), Prensky (2001), Gredler (1996), Provenzo (1992). Thus, via the inspirational study that Tuzun (2004) conducted, we also add some more elements using his "Multiple Motivations Framework."

The FIDGE Model

General Overview of the FIDGE Model

In the current study, the researchers suggest an appropriate and complete IDDM for the creation of game-like learning environments based on the findings. In accordance with many of the traditional models, this model also consists of four parts, which are analysis, design, development and evaluation. Additionally, it possesses an additional phase; the "pre-analysis" phase. However, the components of these parts and the way they are structured are different from the traditional models. It consists of dynamic phases, which have fuzzy boundaries and through which the instructional designers progressed in a non-linear manner. Indeed, the reason of these characteristics is the basis of the model that is cultivated on the fuzzy logic concept, which also leads to a different visualization of the model rather than the traditional "boxes-and-arrows" approach (see Figure 1). Another reason is that the model is proposed depending directly on actual and concrete data collected from real-life practices. What is more, the researchers also coined the below presented model's name regarding these attributes, especially the non-linearity and fuzziness emerged from the findings. It is called as "FIDGE" model, which is the acronym that stands for "Fuzzified Instructional Design Development of Game-like Environments" for learning (Akilli, 2004). According to the Oxford English Dictionary (Oxford English Dictionary, 1989), "fidge" as a verb means "to be eager and restless; to express pleasurable eagerness by restless movements," which is also consistent with the impatience that anybody shows when playing a game is of concern.
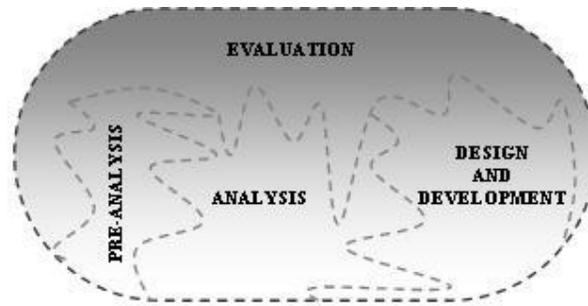
Figure 1. General structure of the FIDGE model.

Before scrutinizing the details of the proposed model, it would be better to emphasize the two general patterns that were dominant within the findings. First one is the contexts, in which IDD takes place, and, in which the product attained at the end of IDD process will be used. The second one is the attributes of this IDD process.

The first pattern is both a contributor and the by-product of the IDD process. It seriously affects the quality of the product and IDD process itself, and is in turn affected by the socio-organizational needs and cultural issues, which appeared during the IDD process, such as the need for a leader who will lead the rest of the team throughout the process, and the necessity to avoid acting with their emotions and feelings. As for the context, in which the product attained at the end of IDD process will be used, the findings revealed the importance of the appropriateness of the product regarding the socio-economic status and the abilities of the learner with consideration of the cultural issues.

For the second general pattern, the "must-be" non-linearity and dynamism throughout the IDD process; the fuzziness among each step of IDD process; and lastly, features originated and inherited from games and simulations were asserted by the participants. Throughout the entire process, all the participants had to make modifications and revisions in their plans and actions that they took to overcome the problems and obstacles, by means of continuous evaluation. Findings have indicated that it is impossible to omit or ignore any of the analysis, design, and development phases and instead of isolating these phases from each other strictly and conducting them in a linear sequence, it would be better to conduct them parallel to each other and in an intertwined manner.

Lastly, findings of study revealed that all of the participants used some features peculiar to games and simulations. For instance, findings of the study provided traces of unique features peculiar to simulations, such as non-linear event sequence, intertwined consequences of action-reaction chains, and dynamic set(s) of relationships changing with respect to the actions that the user took.

As for the games, findings of the study indicated the use of game characteristics, especially in the design phase of IDD process, such as challenge, fantasy, curiosity and control given to the learners that contribute specifically to motivation and thus eager learning. Moreover the findings also pointed out other features of games and simulations, such as engagement, interactivity and active participation. The use of popular culture elements with the above mentioned elements was another issue revealed by the findings of the study. There are two sets of principles that underlie the model, which are related to some socio-organizational issues for the design team and to the instructional design/development process itself. The first set of principles, which is related to peopleware (soft) and technical (hard) issues, is as follows:

1. Form a multidisciplinary and multi-skilled team including an experienced game-player
2. Provide common standards about the work done
3. Identify and develop awareness and need for an instructional system, and create mechanisms for motivation.
4. Meet the need for a leader and a guide.
5. Establish good communication strategies and create active involvement.
6. Manage, plan and schedule time.

The second set of principles, which is related to the whole instructional design/development process itself, is as follows:

1. Dynamic, non-linear and fuzzy phases.
2. Early decisions about the utilities and restraints of the technology, which will be used throughout the project.
3. Analogous, participatory design and prototypes.
4. Support from the literature.
5. Continuous and iterative evaluation and synthesis.
6. Focus on the modularity and flexibility of the product.
7. Creativity.

Lastly, before moving on the details of the model, it would be better to emphasize that the components of the model are intertwined through each other and sometimes conducted in parallel among the phases, despite their exhibition as a listing.

Pre-analysis Phase of the FIDGE Model

The reason for the existence of this phase is to provide a starting point for the instructional designers (see Figure 2). However, if there is no need for such a warm-up period, this phase could be skipped.
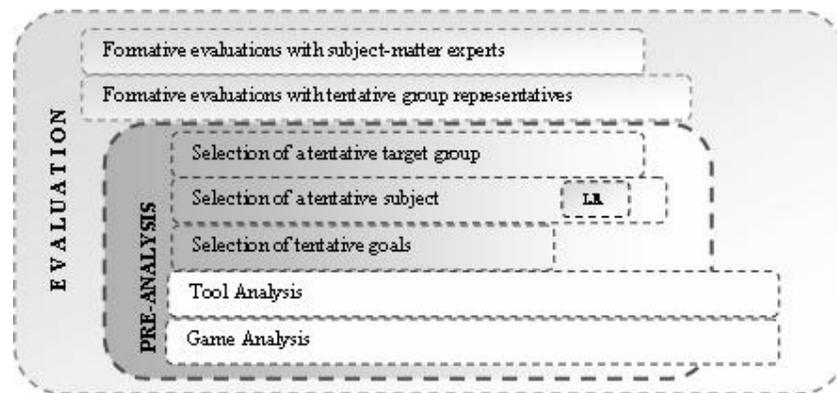
Figure 2. The visualization of pre-analysis phase of the FIDGE model.

All of the following issues are tentative and could be easily changed when the instructional designers begin to conduct analysis phase:

1. Determine and specify a tentative target group.
2. Select a tentative subject regarding your target group and depending on your previous experiences.
3. Conduct a small literature review (LR) to find evidence, whether your tentative subject fits or is likely to be fit for creation of game-like learning environment, or not.
4. Specify the tentative goals of your design according to the selected subject and regarding your target group.
5. Take the opinions and recommendations of the subject-matter experts, and a representative group of the tentative target group via interviews.
6. Begin to explore and analyze the development tool /software.
7. Begin to analyze different games to:
   a. Differentiate different game genres such as strategy, adventure, sports, etc.
   b. Find out game utilities such as multiplayer, collaboration, communities etc.
   c. Find out which game genre is appropriate for which subject matter e.g. strategy games are appropriate for social sciences.
   d. Find out game elements such as the use of pirates, magic, history, etc.
   e. Find out the appropriateness of the instructional approach in relation to game genre, game utilities, and game elements.

Analysis Phase of the FIDGE Model

In this phase, needs analysis, learner analysis, context analysis, content (or task) analysis, cost analysis (if needed), risk analysis, an analysis to adjust the duration and the frequency of the system for effective use, and a self-analysis should be conducted, while the tool and game analyses which began in the previous phase will continue (see Figure 3). Moreover, instructional approach and its implications should be specified and a time planning activity should be done.
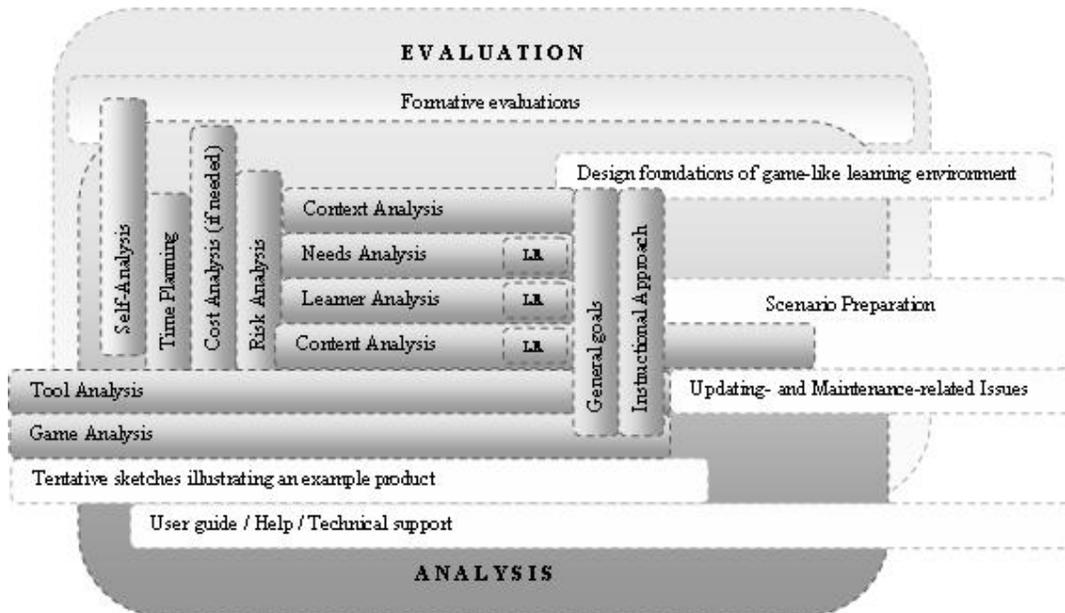
Figure 3. The visualization of analysis phase of the FIDGE model.

The components are as follows:
1. Needs analysis:
   a. potential stakeholders' (e.g. teachers', students', parents', etc.) attitudes toward computers
   b. potential stakeholders' opinions about computer use
   c. potential stakeholders' expectations from simulations and games
   d. why the target group should use simulations and games
   e. the insufficiencies and gaps in the topic/ subject stated by the target group (continued in content analysis)
   f. support from literature
   g. obtain or create sketches illustrating a completed product should to be shown to the target group or experts as an example, in order to be able to transform an abstract concept into a tangible one for them.
2. According to the conducted needs analysis, the general goals of the project will be constituted; more precisely, the needs will be transformed into the general goals of the project.
3. Learner analysis (conducted parallel to needs analysis and includes real observations, surveys, structured or semi-structured interviews with the actual target group and time schedule for all these):
   a. Actual target group's background information, i.e. characteristics, attributes, skills, prior knowledge, and specific entry competencies
   b.   Support and help from the literature
4. Context analysis (conducted parallel to needs and learner analyses):
   a. Actual learners' perspectives about the attributes of a game-like learning environment, in which they would learn the designated content.
   b. The role of the teacher or instructor.
   c. The amount of the learner control.

d. Examination of the computer infrastructure (fulfillment of the necessary and sufficient conditions, specification of minimum system requirements to work out the prepared program, identification of the hardware-related issues).

e. Specification of the socio-economic status of the learners (in relation with their computer literacy, in order to determine at which grade the program will be used).

f. Begin to lay design foundations.

5. Content (task) analysis (conducted parallel to needs, learner and context analyses; and affected by tool analysis):

   a. Efficiency assessment that stood for the optimum amount of content in a limited amount of time.

   b. Checking the accuracy of the content (formative evaluation with experts and learners).

   c. Verifying the topics included in the content through various resources (literature review).

   d. Taking students', subject matter experts' and experienced instructional designers' opinions (formative evaluation).

   e. Carrying out step-by-step reduction (regarding the limitations and boundaries of the tool and the structure (or nature) of the tool) (iterative cycles of formative evaluation).

   f. Setting the structure of the content (regarding the limitations and boundaries of the tool and the structure/nature of the tool).

   g. Creating the main elements of the scenario.

   h. Synthesis of the collected opinions of the students and the experts; the elements included in the content; and the instructional designers' own opinions (to provide intact objectivity).

6. Tool analysis (began in the pre-analysis and will be continued in analysis).

   a. The tool's structure/nature:

      a. What its uses are.

      b. How it is used.

      c. What its limitations and utilities are.

      d. Students' or learners' viewpoints and reactions to the tool.

      e. Investigation for alternatives to the selected tool/ technology.

   b. Thinking of suggestions about updating and maintenance of the system regarding tool analysis.

   c. Thinking of the issues concerning the guidance for and support to the user, such as 'help,' or 'technical support.'

7. Game analysis (began in the pre-analysis and will be continued in analysis. it is conducted parallel to tool analysis and in relation to learner, content, context analyses and instructional approach):

   a. Think of game utilities such as multiplayer options, collaboration, online virtual communities.

   b. Think of which game genre is appropriate for your instructional design/development.

   c. Think of the game elements for your instructional design/development.

   d. Specify the appropriateness of the instructional approach in relation to game genre, game utilities, and game elements of your instructional design/development.

8. Instructional approach (selected regarding the structure of the content, tool's nature/structure):

   a. Selection of instructional approach (e.g. discovery learning, scenario-based learning, problem-based learning or a hybrid approaches, which are offspring of two or more different approaches).

   b. The implications of the selected instructional approach to the design.

   c. Assurance of the selected instructional approach's capacity and aptitude for the application of game-elements.

   d. Adjustment of the instruction's duration and frequency for effective use.

   e. Formative evaluation to take the opinions of the learners and the experts.

9. Self-analysis for each instructional designer in the design team:

   a. Find out the needs, characteristics and skills that are lacking, but should be possessed by the members in the design team.

   b. Specify strategies to gain them.

10. Risk analysis:

    a. Envision of potential risks.

    b. Outline of a "panic room" plan against these foreseen risks.

    c. Cautions both to avoid and to solve possible problems.

11. Time schedule:

    a. Time arrangement for group meetings.

    b. Time arrangement for meetings with the designated experts.

    c. Time arrangement for meetings with learners from the target group.

12. Cost analysis (if needed):

    a. Preparation of an appropriate budgetary plan regarding the variables emerged throughout the above analyses.

13. Preparation for design:
    a. Specifying design foundations of game-like learning environment
    b. Writing down the tentative design decisions as the design team envisions them at the moment, i.e. a very general overview of design.
    c. Writing down the 'scenario bits,' such as the main theme of the scenario, the characters, etc.
    d. Drawing or providing tentative sketches illustrating an example product (The design team could find an example or create one to be used in formative evaluations mainly to give an idea to the interviewees about how the completed product would look like).

Design-Development Phase of the FIDGE Model

In this phase, scenario preparation; content clear-cuts; specification of motivation, attention, feedback, and learning assessment elements; preparation of user-help; creation of prototypes; preparation of rating scales, checklists and interview guides for formative evaluations; design of orientations; and insurance of usability issues, product's modularity and flexibility will be conducted (see Figure 4).
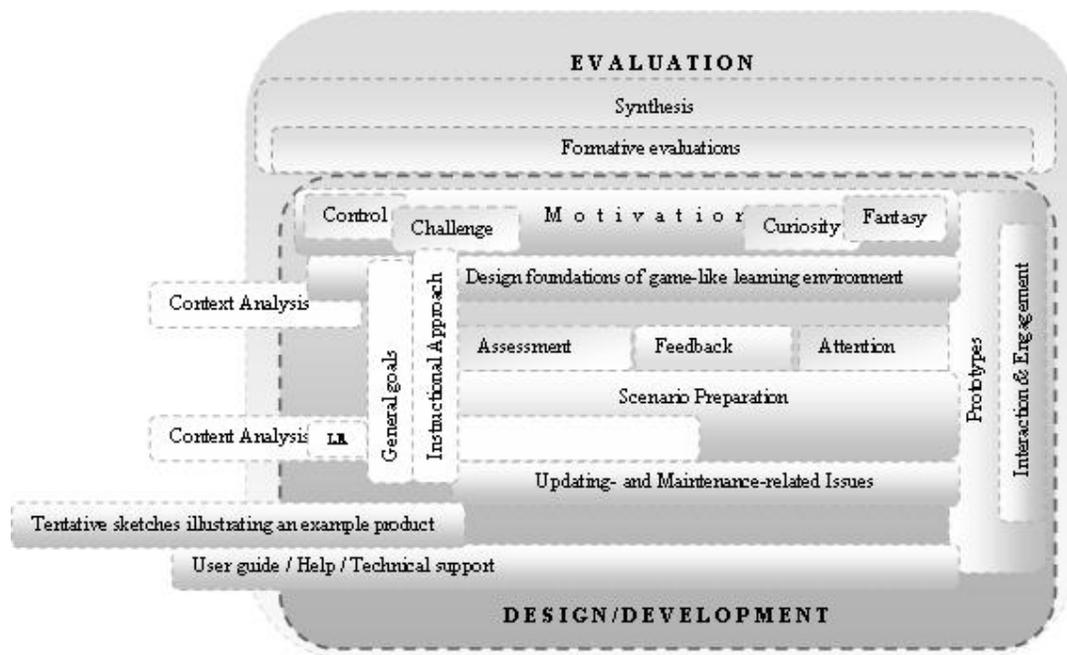
Figure 4. The visualization of design-development phase of the FIDGE model.

It would be better to emphasize that the implementation phase of the traditional models is contained in the intertwined design and development phase of the FIDGE model. This phase encompasses:
1. Preparation of more than one scenario, namely alternative scenarios for the game-like learning environment and selection of the most appropriate one:
   a. Regarding the content analysis.
   b. Regarding the selected instructional approach.
   c. Regarding the boundaries of the tool.
   d. Utilizing the team member's wide experiences as a game player.
   This gives an opportunity to switch to another scenario, in case the scenario prepared at the beginning failed to be implemented.
2. Preparation of the scenario-related components:
   a. Setting of the scenario (prototypes should be prepared, to be used to take feedback from the learners and ID experts continuously (formative evaluation)).
   b. Plot structure of the scenario (a typical use case should be written, which also provides guidance for the usage of the prepared program).

      c. A flowchart regarding the scenario (the flowchart should inherit the content's structure and should be framed by the tool's limitations).

3. Content clear-cuts (as an extension of the content analysis in the analysis phase):
      a. Clarify the content in its brief, intertwined and clear-cut form using the continuing step-by-step reductions and modifications via iterations and feedbacks from the team members; subject matter experts, ID experts; and learners (formative evaluation).
      b. Make necessary changes in the goals, content analysis and the flowchart according to these modifications and reductions.

4. Specification of motivation, attention, feedback, learning assessment, interaction and engagement elements for creation of game-like learning environments:
      a. Utilize the essential elements of many commercial games possess, such as curiosity, challenge, fantasy and control given to the learner to give his/her own decisions.
            a. Employ multimedia features, such as animations for the introduction of your storyline in the scenario or throughout the course of your game (Tuzun, 2004).
            b. Use rewards, such as awards, points, badges, symbolic cups, etc. (Tuzun, 2004).
            c. Create opportunities for the user to be able to select or create his/her own fantastic/realistic identity, avatar, username, etc. (Tuzun, 2004).
            d. Specify the elements that will make your system unique in terms of learning, socialization, creativity, etc. (Tuzun, 2004).
      b. Utilize elements from popular culture.
      c. Pay attention to the relatedness of motivation elements with the feedback and attention components.
      d. Feel free to combine feedback and the learning assessment elements.
      e. Pay attention to interaction and engagement elements, which are also peculiar to games, related to the feedback, motivation and content.
      f. Include activities to provide learners' active engagement.
      g. Enrich the social aspect of the interaction provided via the program you are designing, to help your learners to establish a virtual community, or to give the feeling of togetherness via employing chat, e-mail, etc. features.
      h. Specify collaboration utility and climate of your game-like learning environment by describing how the users will collaborate, what utilities they will have when collaborating each other (e.g. will they share the tasks, complete only their own part of the task and merge each completed part at the end or each of them will complete the task on their own and use collaboration utility of your program to get help from each other?).
      The employment of formative evaluations to specify the details and components of the above is also important and helpful.

5. Preparation of user-help which should be conducted parallel to tool analysis including:
      a. The issues concerning guidance for user such as 'help.'
      b. The issues concerning support for user, such as 'technical support.'

6. Creation of prototypes (in relation to the above mentioned analyses and scenario)
      a. Paper-based prototypes preparation.
      b. Computer-based prototypes preparation.
      These prototypes are used to take feedback from the learners, experts and team members, about both the user-interface design and the overall design itself. They are also likely to reveal the above-given issues about the motivation, attention, feedback and the learning assessment elements of the design. All the way through these feedbacks, it is likely that the details of the 'user-help,' or 'technical support will also emerge.

7. Preparation of rating scales, checklists and interview guides for formative evaluations by:
      a. Including items about the arrangement, presentation, appropriateness, consistency of the content.
      b. Including items about the general appearance, appropriateness and consistency of the user-interface.
      c. Including items about the extent to which the program appeals to the user.

8. Design of orientations, such as:
      a. An orientation about your program to avoid misunderstandings.
      b. A more general orientation to acquire your target audience with the basic computer literacy and game-related skills (such as adjustment of an environment, in which the learners could play a simple game to acquire the game-logic and gain basic eye-hand coordination).

9. Insurance of usability issues throughout the whole phase by:
      a. Keeping in mind that everything should be user-centered and check your program's status accordingly, since they would be the ones who would use the product.
      b. Being aware of usability issues and employing them in the first place.

10. Assurance of product's modularity and flexibility by providing as much flexibility and modularity as possible for the final product, so that the need of a radical change, which might emerge following the formative evaluations, could easily be conducted.

Lastly, each of the above-mentioned elements should be supported by the literature. It should also be emphasized that final user interface could not even bear a resemblance to the initial one envisioned at the beginning. What is more, it is a possibility to be confronted with a very different version of the program, compared to the previously visualized design at the beginning.

Evaluation Phase of the FIDGE Model
Although the related elements of the evaluation phase were presented in the above phases, it would be better to give the general structure and main elements of the evaluation phase. Evaluation phase has three main elements, which are formative evaluation; summative evaluation and the synthesis (see Figure 5).

Instructional designers should never forget that evaluations and feedback taken from the learners should be continuous and should begin as soon as they started with the pre-analysis (or alternatively, analysis) phase.
Before conducting evaluations, the instructional designers should clarify the issues, such as, by whom the product would be evaluated, how they would be reached, where the evaluations would be conducted. For data collection, instructional designers should employ rating scales, checklists and the interview guides that would be already prepared in the design/development phase.

Instructional designers should conduct the formative evaluations frequently and with shorter intervals throughout the instructional design/development process and should employ them while determining the foundation stones of the instructional design/development process.

Instructional designers should conduct formative evaluations with the team members, their peers, learners in their target group and various experts of various professions; however, as stated in the previous parts, the learners representing the variance of the target group should be in the first place. This also puts forth the usability test that should be conducted within the evaluation phase.
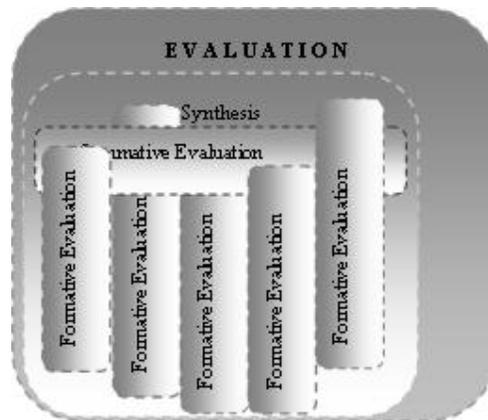
Figure 5. The visualization of evaluation phase of the FIDGE model.

In the synthesis part, as its name implies, instructional designers should make a synthesis and interpretation of all the data collected from the evaluations, related literature and their own comments, when making the final decisions about the project. For these purposes, after each evaluation, collected data should be analyzed; common points should be noted and discussed with the other instructional designers in the team.
As for the summative evaluation, it will be used to evaluate the instructional system as a whole. However, summative evaluation is not as critical as it was for the traditional model, since there will not be much left, due to the continual formative evaluations conducted throughout the design-development phase.

Summary of the FIDGE Model

To summarize, the FIDGE model is a real-life originated model that has a dynamic, non-linear and fuzzy structure and is enriched by unique features of games and simulation, which combines the context with peopleware throughout the instructional design-development process.

The proposed model might be used in creation of educational games as well as in creation of game-like learning environments. The researchers think that the proposed model might be appropriate to be used by both novice and expert users. The existence of the "pre-analysis" phase of the model is the most apparent evidence that this model addresses the novice instructional designers' needs. Another evidence is that they are the affiliates of the so called "game generation," who are different from many of us in various aspects and possess differentiating characteristics and skills resulting from different experiences and the "new media society" (Prensky, 2001, p.65; Calvert & Jordan, 2001). However, they also lack sufficient instructional design experience, which would have impact on their use of this model, both positively and negatively. The probable positive effects are their untouched creativity and ingenious design habits. The probable negative effects would be the difficulty in understanding the model or misinterpretations, which would result in void and ineffective design practices.

As for the expert instructional designers, the researchers believe that this model might widen their visions and help them catch up with the current trends and changes of the coming generation.

Lastly, among the limitations of the model, the probable inheritance from the selected case and the complex and complicated nature of the model could be asserted. The elements that constituted the model seemed to be affected by the IDD model used in the case. For instance, the use of prototypes was inherited from the "rapid prototyping" model. However, it would be meaningless to strive naming this concept in another way or to eliminate it, since it was found to be very useful. As for the complex and complicated nature of the model, it could be said that this is the first impression and it would be much easier to use this model due to its more flexible structure and fitting nature to human reasoning than other traditional models.

In conclusion, it should be kept in mind that all these issues are personal assumptions and visions of the researchers and should be verified by the follow-up studies. It would be hardly possible to clarify the uses, users and the limitations of the model, earlier than the conduction of such follow-up studies.

Table 1

Summary of the FIDGE Model

Issue	Its Property
Participants	All of actively participating learners and experts
Team	Multidisciplinary, multi-skilled, game-player experience
Environment	Socio-organizational, cultural
Process	Dynamic, non-linear, fuzzy, creative, enriched by games' and simulations' elements (fantasy, challenge, etc.)
Change	Continuous, evaluation-based
Evaluation	Continuous, iterative, formative and summative, fused into each phase
Management	Need for a leader and a well-planned and scheduled time management
Technology	Suitable, compatible
Use	By (novice /expert) instructional designers and educational game designers for game-like learning environments and educational games

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Web-based tests in Second/Foreign Language Self-assessment

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Abstract

This article focuses on the use of computers in Language Testing. The first part of the article gives a general introduction to three different kinds of tests administered with a computer: (1) computer-based tests (CBTs), (2) computer-adaptive tests (CATs), and finally (3) web-based tests (WBTs). On the other hand, the second part of the article focuses on self-assessment and web-based tests, presenting the DIALANG project (a new European work which has developed diagnostic language assessment tools in fourteen European languages, delivered over the Internet).

Introduction

Technology is increasingly being an important factor of change in education. As a matter of fact, instructors, administrators, students, parents and book editors and writers have experienced during the last two decades the greatest revolution that ever happened in the classroom. This advancement has been influenced basically by the introduction and use of the computer in the process of teaching and learning. Thus, learning became significantly richer as students started having access to new and different types of information, as they manipulated it on the computer through graphic displays or controlled experiments in ways never before possible, and as they could be able to communicate their results and conclusions in a variety of media to their teacher, students in the next classroom, or students around the world.

The rationale behind Foreign and Second Language instruction is based on the notion that maximum contact with the target language yields maximum learning, which is why this field has found a great advantage in the introduction of computers in the classroom (Council of Europe 1997). The new approach allowed addressing all four critical skills in language learning (speaking, listening, writing, and reading) by engaging the students' interest and providing a culturally and linguistically realistic context, at the same time that more materials were accessible.

Computer-based tests (CBTs)

Language Testers also found a new perspective for the assessment and evaluation of language acquisition. In fact, CBTs started being developed and used since the early 80s. These tests represented a new way of measurement for language competency, and were delivered on an individual computer or a closed network. CBTs can be offered at any time unlike mass paper-and-pencil administrations which are constrained by logistical considerations. In addition, CBTs consisting of dichotomously-scored items can provide feedback on the test results immediately upon completion of the test. They can also provide immediate feedback on each test taker's responses, a characteristic that is very useful for pedagogical purposes (Bennett 1999). Here we highlight some of the main advantages found in CBTs:

- Efficient Administration: CBTs can be administered to individuals or small groups of students in classrooms or computer labs, eliminating timing issues caused by the need to administer paper/pencil tests in large groups in single sittings. Different students can take different tests simultaneously in the same room.
- Immediate Results: One of the major drawbacks of testing on paper has been the long wait for results because of the need to distribute, collect, and then scan test booklets/answer forms and hand score open-response items and essays. On the other hand, the results of computer-based tests can be available immediately, providing schools with diagnostic tools to use for improved instruction, and states with information to guide policy. Even open-ended items can be scored automatically, greatly reducing cost and scoring time (Thompson 1999).
- Efficient Item Development: As computer-based testing becomes more developed, item development will be more efficient, higher quality, and less expensive (National Governors Association 2002). Bennett

(1998) believes that at some point items might be generated electronically, with items matched to particular specifications at the moment of administration.

- Increased Authenticity: Computers allow for increased use of "authentic assessments"—responses can be open-ended rather than just relying on multiple choice.

Computer-adaptive tests (CATs)

Adaptive testing is not new. In fact it has probably been around for centuries as a better way to test. And even since the beginning of the 20th century, when large-scale testing began, adaptive tests were some of the first tests ever constructed. Computers as a testing medium rapidly attracted the attention of psychometricians because they allow the application of Item Response Theory (IRT) for delivering CATs, which can often pinpoint a test taker's ability level faster and with greater precision than paper-and-pencil tests. The computer can make the necessary calculations needed to estimate a person's proficiency and to choose the questions to present. Based on the test taker's responses, the computer selects items of appropriate difficulty thereby avoiding delivering items that are too difficult or too easy for a test taker, but instead selects more items at the test taker's level of ability than a non-adaptive test could include (Alderson, Clapham & Wall 1995; McNamara 1996; Fernández Álvarez and Sanz Sainz 2004). CATs "offers a potentially more efficient way of collecting information on people's ability" (Hughes 2003: 23). Figure 1 shows in a clear and detailed manner the way CATs work:

ITEM BANK, ORDERED BY DIFFICULTY

EASIER   MORE DIFFICULT

The test starts with an intermediate item

CORRECT: A more difficult item is chosen

CORRECT: More difficult item

INCORRECT: An easier item is chosen

The level is established

(UCLES 2001:4)
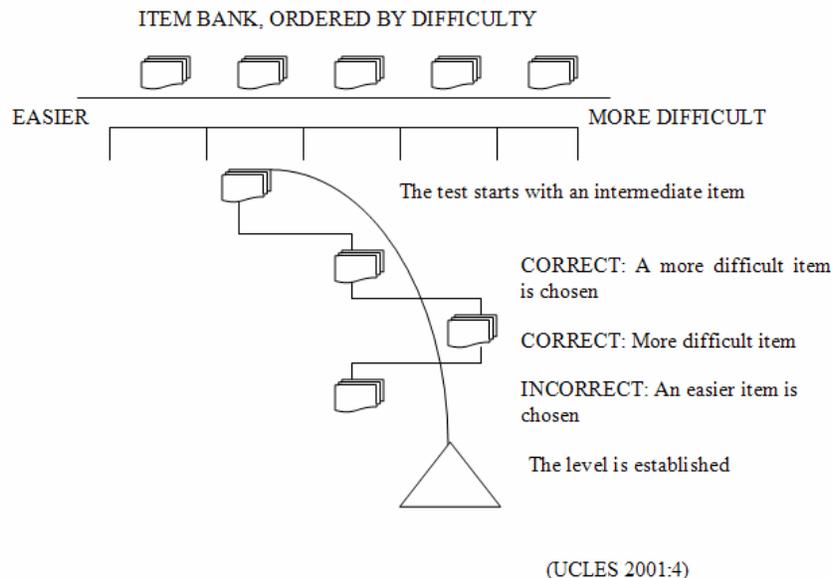
Figure 1. Selection of items in a CAT

According to Davies *et al.* (1999: 29), CATs "are claimed to facilitate greater accuracy of measurement as a result of presenting candidates with items which are at the maximum discretion level, i.e., are more or less at the candidate' level of ability, items of this type providing more information about the candidate than items which are too easy or too hard."

CATs, like CBTs, show some advantages. In fact, CATs were developed to eliminate the time-consuming and traditional test that presents easy questions to high-ability persons and excessively difficult questions to low-ability testees. Dunkel (1999) identifies some other advantages in their use:

- Self-Pacing: CATs allow test takers to work at their own pace. The speed of examinee responses could be used as additional information in assessing proficiency, if desired and warranted.
- Challenge: Test takers are challenged by test items at an appropriate level; they are not discouraged or annoyed by items that are far above or below their ability level.
- Immediate Feedback: The test can be scored immediately, providing instantaneous feedback for the examinees.

- Improved Test Security: The computer contains the entire item pool, rather than merely those specific items that will make up the examinee's test. As a result, it is more difficult to artificially boost one's scores by merely learning a few items or even types of items (Wainer 1990). However, in order to achieve improved security, the item pool must be sufficiently large to ensure that test items do not reappear with a frequency sufficient to allow examinees to memorize them.
- Multimedia Presentation: Tests can include text, graphics, photographs, and even full-motion video clips, although multimedia CAT development is still in its infancy.

Web-based tests (WBTs)

The last innovative testing technique is the so-called WBTs, which is a CBT delivered via the internet, written in the "language" of the internet (HTML), and possibly enhanced by scripts. The test is located as a website on the tester's server where it can be accessed by the test taker's computer, the client. The client's browser software (Netscape Navigator, MS Internet Explorer) displays the test, the test taker completes it and -if so desired- sends his/her answers back to the server, from which the tester can download and score them. If the test consists of dichotomous items (true/false or multiple choice) it can be made self-scoring by using scripts.

Even though we can still find several drawbacks in the use of WBTs (like security or technical problems such as server failure and browser incompatibilities), it is obvious that there are several advantages linked to them. Roever (2001) distinguishes three main advantages:

- Flexibility in time and space: This is probably the biggest advantage of a WBT. All that is required to take a WBT is a computer with a Web browser and an Internet connection (or the test on disk). Test takers can take the WBT whenever and wherever it is convenient, and test designers can share their test with colleagues all over the world and receive feedback.
  Even though security is a big issue in the use of WBTs, there are still advantages to delivering the test via the Web, that is, no specialized software necessary, existing facilities like computer labs can be used as testing centers.
- Easy to write: Whereas producing traditional CBTs requires a high degree of programming expertise and the use of specially-designed and non-portable delivery platforms, WBTs are comparatively easy to write and require only a free, standard browser for their display. In fact, anybody with a computer and an introductory HTML handbook can write a WBT without too much effort, and anybody with a computer and a browser can take the test; language testers do not have to be computer programmers to write a WBT. This is largely due to HTML's not being a true programming language but only a set of formatting commands, which instruct the client's Web browser how to display content. In addition, HTML contains elements that support the construction of common item types, such as radio buttons for multiple-choice items, input boxes for short response items, and text areas for extended response items (essays or dictations).
- Affordability: A WBT is very inexpensive for all parties concerned. Testers can write the test by hand or with a free editor program without incurring any production costs except the time it takes to write the test. Once a test is written, it can be uploaded to a server provided by the tester's institution or to one of many commercial servers that offer several megabytes of free web space. Since WBTs tend to be small files of no more than a few kilobytes, space on a free server is usually more than sufficient for a test. The use of images, sound, or video can enlarge the test considerably, however, and may require the simultaneous use of several servers or the purchase of more space.

CATs are possible on the Web and do not pose many technical problems beyond those encountered in linear tests but it cannot be emphasized enough that the design of a sophisticated WBT is a very complex undertaking that requires considerable expertise in IRT.

The DIALANG Project

In this section we will focus on the use of WBTs in Second/Foreign Language Self-assessment, based mainly on the DIALANG project. (www.dialang.org).

DIALANG is one of so many examples of WBTs. It is a new European project which has developed diagnostic language assessment tools in fourteen European languages, delivered over the Internet. The fourteen languages of the DIALANG project include all the official EU languages as well as Irish, Icelandic and Norwegian. The assessment materials cover all levels from beginners to advanced; there are separate assessments for reading,

writing, and listening as well as for structures and vocabulary. The project complements traditional approaches to language assessment by exploring the use of new technologies for assessing the use of language.

DIALANG offers validated tests of different language skills, together with a range of feedback and expert advice on how to improve the skills. It also offers scientifically validated self-assessment activities and allows users to determine their language level, strengths and weaknesses as well as to increase their awareness of current skills and of what it means to know a language. It has been developed by more than twenty major European institutions, with the backing of the European Commission and is based on the Council of Europe's Common European Framework (CEF) of Reference (2001), which has become established throughout Europe as the most widely recognized frame of reference in the field of language learning.

The purpose of the DIALANG assessment system is to provide language users and learners with diagnostic information about their language proficiency which will help them to become aware of their strengths and weaknesses and to find ways of improving their proficiency (Alderson 2005). The assessment system will also help learners locate themselves in relation to the levels of the CEF, for a variety of uses specified in the Framework and associated documents. Feedback from the system will also provide learners with information that can be used as a guide when setting new learning goals and planning their future language learning.

Like other WBTs, it offers many advantages such as the ones mentioned above: flexibility in time and space, easiness to write and affordability. As opposed to proficiency tests, the main advantage that it offers is its security: it would be useless to memorize lists of vocabulary, or to take the test several times in order to learn the specific items, because the basis of the test is self-assessment. The test does not provide a certificate to enter a university, or to obtain a better professional position. Trying to cheat the machine would result into cheating oneself.

Furthermore, DIALANG offers the test takers the possibility to choose the skill, skill level, sub-skill, topics, etc. that they whish to assess. All this learner oriented control means that the test is designed for a large variety of learners. Any candidates preparing for any kind of examinations, following any kind of teaching methodology, and aging 16 and over could benefit from the test assessment.

The main gain of the project is probably the way in which it provides assessment information:

- The feedback is immediate.
- Scores are objective.
- There is not a global grade but an identification of the test taker's current level.
- It suggests learners' further study.
- It enables the planning of curricula.
- It tries to cover learner's needs
- It allows the storage of the results for later comparison to check progress.

The procedure to follow in order to take the test does not require a lot of computer skills. The first thing to do is to choose the language in which instructions will be given. Instructions can be chosen in a different language from the language tested in order for the student to understand them whatever his/her level of proficiency in the target language is. After that, the skill and language to be tested are chosen. Then, test takers have the option to take a placement activity to measure their vocabulary knowledge in the target language and determine the items that should be present in the assessment. The next step is an optional battery of self-assessment questions that the learner has to answer in order to receive some feedback about what he/she thinks his/her level is. Next, learners take the test on the skill chosen previously. The items are frequently multiple choice questions, but sometimes a word or phrase has to be written. In these cases, only one answer is possible. Finally, DIALANG displays the results in terms of level, answer verification, score in the placement test, self-assessment feedback and advice.

Figure 2. Feedback Menu

The window under "your level" shows the level of the learner's proficiency according to the CEF. Under "advice", information about the current level is provided such as the capabilities of the learner, and recommendations for further development that would facilitate the step into the next level are granted.

In figure 3 it can be seen the information that DIALANG provides about the test takers' level of proficiency indicating the type of speech that they understand, what they generally understand and their conditions and limitations.

Figure 3. Information provided about the test taker's level of proficiency

A real challenge for CBTs, CATs and WBTs is to assess productive skills: speaking and writing. DIALANG lacks at the moment a system to assess listening and writing in terms of full sentences, paragraphs or essays. However, a project to include these deficiencies is currently taking place (Lancaster University n.d.). These are some of the items that are in the experimental phase:

- Indirect speaking with audio clips as alternatives. After listening to a recording, the test taker has four options which are also recordings intended to be the answer or reply to the first recording. This technique simulates speaking since the answer is not written, but oral. At the same time it is a multiple choice item, as we can see in figure 4.
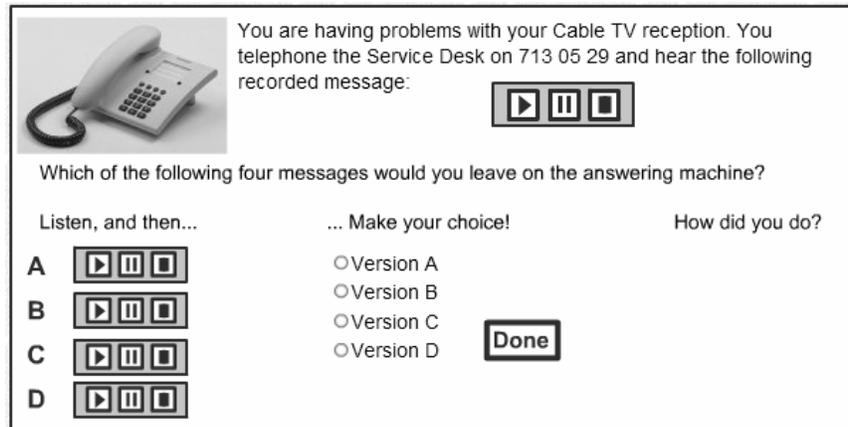
Figure 4. Indirect Speaking with Audio clips as Alternatives

- Interactive picture with sound. Oral instructions are given and the learner has to give an answer interacting with the computer. In figure 5, instructions are given to locate a room in a map. The answer is not the traditional written multiple choice item, but locating the room in the map.
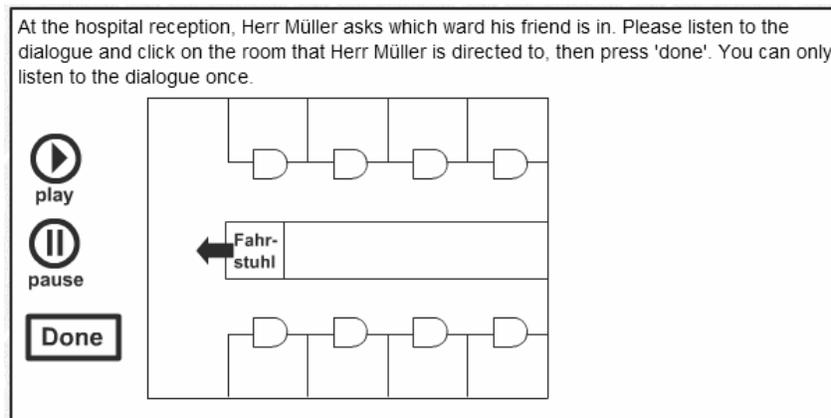
Figure 5. Interactive Picture with Sound

- Re-organization. In this activity some sentences have to be rearranged in order to make a coherent sentence (figure 6). Test takers have to drag and drop the sentences until they find the order they consider correct. This technique is taking us to a closer step towards the evaluation of coherence and cohesion through a computer.

Reorganise the sentences in the paragraph to make a logical story.

Närmare 1600 gäster satt utanför monarkens träpalats och frossade.

Tack vare dieten hade kungen blivit av med en tredjedel, circa 70 kilo, av de 200 kilo som han tidigare vägde.

När kungen av Tonga för ett par år sedan firade sin 75-årsdag ordnades ett stort kalas.

Omkring 400 grisar slaktades och öns bagare hade gjort en enorm tårta till kalaset.

Kungen själv var dock försiktig, eftersom han höll diet sedan ett par år.

Clue | Done

Figure 6. Re-organization

- Benchmarking in direct writing is the opportunity to assess free writing. Learners are given a prompt, and they have to write freely about it. After they finish their text, they are given a range of sample texts to compare with their own. Figure 7 provides an example. The sample texts are answers that could be given by a learner in a determined CEF level. As a final assessment tool, advice is provided stating the features that characterize each kind of writing level and some tips to help improve writing skills.

Click the buttons below to see the different sample texts. These texts represent different levels of writing skills (A1-C2). Compare your text to these samples.

○ View answer A1
○ View answer A2
○ View answer B1
○ View answer B2
○ View answer C1
○ View answer C2

From the list below, choose the text which you feel was closest to your level.

answer A1 ▾ | Tips

Your Answer:

Kkdidk kdjdikjoidjn dkjdid

Sample answer A1 | ADVICE

Suomissa on epäkohta siksi ulkomallanen pakunut imereta kulttuurista suomia ja suomillainen erillainen kulttuurillainen maailamallainen

Figure 7. Benchmarking in direct writing

- Self-assessment in speaking. A question is posed for which several oral answers are given. The test taker has to decide whether he/she can do it better than the recordings. Based on the answer, a level is assigned to the reply and feedback information about the level is provided (figure 8).

Figure 8. Self-assessment in Speaking

Conclusion

The importance of assessment in Second/Foreign Language learning is unquestionable. The feedback received from assessment can be used to place a student in the correct classroom, to measure learners' progress, to revise and develop curricula, to create material, to propose teaching methods, etc. That is why it is not surprising that so much attention is focused on improving the assessment system. Technology plays a very important role in the development of testing methods. There are different kinds of computerized assessments such as CBTs, CATs and WBTs that offer great advantages to assessment research: They provide immediate feedback, ways to store test results for further analysis, improved security, storage of large amounts of items, grading objectivity, multimedia presentations, test takers' self pacing, etc.

However, there are certain areas that pose a real challenge to computer testing. Computers lack human intelligence to assess direct speaking ability or free written compositions. It is here where research is studying new pathways to improve assessment. DIALANG is a current project that aims these goals. DIALANG researchers are designing innovative test items to diagnose learners' levels of proficiency, and the improvements are having a considerable impact on the considerations of computer testing.

DIALANG focuses on self-assessment taking into account the learners' interest in grading him/herself fairly, but it could not be used as a certification system. No wonder that future research will take into account the progress achieved so far and will try to apply it to other kind of tests, such as placement tests, certification systems, etc. Furthermore, although we cannot expect computers to equal human intelligence, DIALANG is demonstrating that there are ways to improve computer testing. We will be expectant to hear new advances that will surprise us as much as DIALANG latest findings.

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E-Moderating Personas: Employing Interaction Design User Models to Construct and Interpret Online Instruction Archetypes

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Abstract

Phase 1 of this comparative study has focused on perceptions of emerging instructional roles and performance of teachers operating in blended (US) and online (Sweden) academic environments. The current study (Phase 2) has concentrated on the creation of e-moderating archetypes (*personas)* to provide better understanding of the roles, needs, and aspirations of online teachers. Two e-moderating personas have emerged sharing many similarities about their perceptions and manifestations of their online teaching styles, which however are explained by distinctively different reasons.

Introduction

Web-based distance education has become a "real" teaching alternative which has instigated more research (The Swedish Net University Agency, 2005) particularly in the past decade (Avgerinou, Griffin, & Pettersson, 2005; Andersson, Avgerinou, Griffin, Muffoletto, & Pettersson, 2004; Pettersson & Andersson van Limbeek, 2002; Pettersson, Svensson, & Wærn, 2002). This research has commonly focused on four major perspectives: information-technology, course management systems (including course communication tools), information design, and online learning.

Not surprisingly, there are many, significant differences between face-to-face (f2f), and web-based teaching. In a traditional teaching context, communication is implemented synchronously insofar as teacher and students are able to communicate instantly, and without delay. Besides the direct and instantaneous verbal exchanges, synchronous communication also transpires through visual signs and body language.

Conversely, if we accept that online teaching (e-moderating) occurs via the Internet and electronic multimedia, including the use of language (both oral and written), a common way of teaching in this context is through a dynamic interaction among participants, yet without the physical presence of the teacher or students. What happens then to the teacher's "identity" and role when s/he is no longer physically present as in a traditional classroom? How is it established? Perhaps most importantly, how is it perceived by both the students, and the teacher him/her-self?

Rourke, Anderson, Garrison, and Archer (2001) describe a model which concerns the teaching and learning transaction via computer conferencing. The model presents three core components of importance for learning in an online instructional community, namely, (1) cognitive presence, (2) teaching presence, and (3) social presence. *Teaching presence* refers to "designing and managing learning sequences, providing subject matter expertise, and facilitating active learning" (Rourke et al., 2001, ¶ 2).

Similarly, four major roles of the online instructor have been identified by Bonk, Kinley, Hara, and Paz-Dennen (2001) – *pedagogical, social, managerial, and technological*. The *pedagogical* aspect is manifested through the instructor's assuming the role of facilitator or moderator, e.g. ask questions, probe responses, encourage student knowledge building and linking, summarize or weave discussion, and support and direct interactive discussion, design a variety of educational experiences, provide feedback, referring to outside resources and experts in the field. The *social* aspect is manifested through the instructor's creating a friendly and nurturing environment or community feel, exhibiting a generally positive tone, fostering some humor, displaying empathy and interpersonal outreach (e.g. including welcoming statements, invitation, and apologies), and personalizing with discussion of one's own online experiences. The *managerial* aspect is manifested through the instructor's coordinating assignments (e.g. explain assignments, set plans for receipt of assignments, assign partners and groups, set due dates and extensions for assignments), managing online discussion forums (e.g. set pace, focus, agenda), and handle overall course structuring (e.g. organize meeting times and places, set office hours, clarify distributions). The *technological* aspect is manifested through the instructor's assisting with user technology and system issues, diagnosing and clarifying problems encountered, notifying when a server is down, and explaining limitations.

Research Focus and Questions

This two-phase, comparative research study was conducted by two university instructors whose research agenda concentrates on *teacher perceptions of own qualities, roles, and functions* in online instructional environments.

Phase 1 of our research compared and discussed the emerging instructional styles of participating online teachers (e-moderators), in Sweden, and the USA (Andersson & Avgerinou, 2006). Primary research questions concerned how teachers experience online teaching versus f2f teaching, as well as how the academic environment affects the teacher experience. The framework of this comparative research was defined by the fact that all US teachers were attached to a university just beginning to experiment with online and blended delivery; whereas online and blended curricula and delivery were already well established in the Swedish teachers' academic context.

Secondary questions included the differences and similarities of online vs. traditional teaching, and how participating teachers come to recognize and deal with them. What kind of teaching styles are used in web-based learning? What information design tools may a teacher deploy toward the creation of their "identity", and how does s/he establish their presence online? What are online teachers' professional development needs, and to what extent are they covered by their respective institutions? Finally, what are their goals and desires toward a pedagogically sound, and effective implementation of online learning?

If e-moderating is indeed a new type of instruction (Maor, 2003), then there is a pressing need to revisit the role of the online instructor. Therefore, in light of Phase 1 research results, the second phase (Phase 2) of this study has concentrated on using the identified perceptions, behaviors, motivations, and aspirations of the participating e-moderators with the view to creating composite, albeit fictional online instruction archetypes *(personas)*. In our attempt to do justice to the analysis and presentation of Phase 1 data, we set out to experiment with the transfer and applicability to our respective blended and online teaching contexts, of the persona research method typically deployed by usability and interaction design. Consequently, our questions have focused on whether and to what extent this methodological innovation would produce valid and reliable results from a research design perspective; as well as, whether we would gain a better, more comprehensive and more realistic insight into e-moderating, as a result of looking at our existing data through the novel lens of the persona method. An implication of the latter referred to whether our e-moderating personas could also be in some way meaningful to all those involved in the various aspects of online teaching.

Overview of Phase 1

Methodology

A predominantly qualitative design was adopted for this research, including surveys, semi-structured individual interviews conducted f2f, and focus groups interviews conducted online. Although we looked to address specific questions during the individual and focus group interviews, there was still opportunity for participants' personal input which could be diverting from the original set of questions. The respondents (N= 10) were teachers currently teaching or having recently taught through web-based environments in blended/hybrid (US) and completely online (Sweden) formats in our respective universities/countries. Analysis of the data employed the content analysis technique for all aforementioned instruments.

Results

Data analysis based on within and across group comparisons (Andersson & Avgerinou, 2006) have indicated some common threads which are completely aligned with the four major roles of the online instructor as identified by Bonk et al. (2001).

All participating teachers exhibit engagement with online teaching in all four identified roles. What is more impressive, regardless of their academic background and current instructional context, they not only view e-moderating as a new type of instruction; but they also perceive themselves as constructivist pedagogues whose purpose is to design and provide the type of nurturing and friendly learning environments that are mostly conducive to student creating their own interpretations of reality, and thus becoming responsible for their own lifelong learning. Some of our teachers share similar views on the Socratic philosophy and its online applications. These notions, combined with the online teacher training all of them received prior to their involvement in online teaching, may perhaps explain their self-perception of their online teaching performance from a multitude of perspectives- the

most significant one being those teachers' constant and fearless quest to serve their students' needs in the best possible way while updating and adapting their own practice to the rapidly changing demands of our times. As Good (2001) states, "the e-learning pedagogue is a hybrid creature with multiple skills and a passion for learning!" (p. 173).

<h2 style="text-align:center">The Current Study (Phase 2)</h2>

Research Focus and Purpose

From a qualitative research methodological standpoint, typically it has been challenging to present qualitative data so that it truly reflects meanings, behaviors, and intentions of research participants. In our case, it was speculated that qualitative data could be more realistically and comprehensively reflected via *personas*, a composite, albeit fictional archetype deployed by information architects and interaction designers (Kuniavsky, 2003). Therefore, in our attempt to do justice to the analysis but also the presentation of Phase 1 data, we set out to introduce the persona research method to a new territory, namely our respective blended and online learning contexts, and experiment with the mechanics of its transfer and overall applicability.

Taking into consideration Phase 1 results, Phase 2 of our research has focused on the development of e-moderating personas representing identified behaviors, motivations, and aspirations of real participants with the additional goal to better understand online teaching styles, thus assisting the professional development of aspiring and existing online teachers. An extension of this goal is to give aspiring e-moderators a realistic insight into the online instructor's role(s), but also to assist existing e-moderators better understand and further develop their online teaching style. Finally, the results of this study could benefit all those involved in supporting online teaching initiatives – such as instructional designers, course management system designers, technical staff, professional development units, administrators, etc. – trying to effectively match and align teaching and learning needs with corresponding services and resources.

Consequently, our questions have focused on whether and to what extent this methodological innovation would produce valid and reliable results from a research design perspective; as well as, whether we would gain a better, more comprehensive and more realistic insight into e-moderating, as a result of looking at our existing data through the novel lens of the persona method. An implication of the latter referred to whether our e-moderating personas could also be in some way meaningful to all those involved in the various aspects of online teaching.

Personas- What are they, where did they come from, and who's using them?

User representations are not new to product design, marketing and branding. Over the years, information architects, interaction and product identity designers have developed various models of user representation in order to base their product development on well informed decisions. Pruit and Adlin indicate (2006) that in marketing and branding models have been developed by Sissors (1966), Upshaw (1995), Weinstein (1998), Mello (2002), and Moore (2002).

In the area of usability and interaction design, *scenarios* have been deployed toward the organization, justification, and communication of ideas. More recently, the use of scenarios has been extended to assist in system design, product development, as well as research in human/computer interaction. Nonetheless, Carroll (1995) argues that scenarios instead of focusing on users and their actual opinions, they tend to provide assumptions about them. This is apparently the reason why user-focused models such as *user profiles* (Hackos & Redish, 1998), *user roles* (Constantine & Lockwood, 2001), as well as *user archetypes* (Mikkelson & Lee, 2000) have been adopted by most usability specialists.

In *The Inmates are Running the Asylum,* Alan Cooper (1999) asserts that a focus on technology is fostered in whatever we do, when we should instead be focusing on people. Therefore he offers a user model (*personas)* in order to address this problem, and re-focus product design and development on people and their needs. Originally surfacing in 1995, Cooper's personas were used in a collaborative fashion by design teams to communicate different user perspectives regarding complex design solutions for consulting projects.

According to Cooper (1999, p. 24), "personas are not real people … they are hypothetical archetypes of actual users … defined with significant rigor and precision". Personas can be conceptualized as imaginary people that we create as stand-ins for concrete target users of design products. When working with personas it is important to be aware of the distinction between *stereotypes* and *archetypes*. Each of these concepts stems from a specific theoretical context. Used mostly in social psychology, stereotypes can be defined as a simplified, often generalized form of idea (National Encyklopedin, 2006). It may be a preconceived idea of the characteristics typifying a person

or a situation. A stereotype may be considered as an attitude based on such a preconception (Oxford English Dictionary, 2006). The concept of archetype is based on Jung's theories. Archetypes represent uniformity and regularity in our apprehensions (Oxford English Dictionary, 2006). Personas are the official mask, the face we show. In other words, a persona conveys the connection between the ego and the environment (National Encyklopedin, 2006).

The term "hypothetical archetype" denotes Cooper's belief that there is no way to prove that the personas truly are representative of actual users until after the product is released and used. Thus, personas are better understood as representing real people throughout the design process. Cooper's point on defining personas "with significant rigor and precision" implies that the value of personas lies in their ability to provide specific details about users. A very important element in Cooper's personal model is that the representation emanates from distinct user goals, in addition to behaviors, tasks, demographic information. Personas are not "made-up". They are discovered as a by-product of the research process, and are defined by their goals. To make personas more realistic, names and personal details are constructed.

Personas are a sine-qua-non in product and interaction design, for various reasons. First, designers do not always design with the user in mind. Rather, they tend to focus more on themselves and their own perspectives. Second, users are complicated and varied. It takes an enormous amount of effort and time to understand their perspectives, behaviors, needs, and goals. Finally, those who perform the user and market research usually are not the designers. As a result, user profiles may not be as reflective of the actual user beliefs, needs, and goals.

Grudin (2006) provides psychological evidence as to the reason why personas work. He explains that when a designer tries to anticipate how others will behave in a new situation, in essence he exercises a very rudimentary skill that all of us apply daily in our attempt to anticipate how others may react to what we may say or do. Grudin's argument (2006, p. 643-644) is based on three assertions:

> (1) We find natural to create and use models of other people. If we did not, persona construction would not make sense. (2) Our ability to engage with models of real people transfers to models of fictional people (in this case, personas). (3) Our models of other people have a certain degree of complexity and detail. If people routinely use sophisticated models to anticipate behavior, sophisticated models of potential users could better help us anticipate their reactions to design. If the models we use are simple, expending resources on detailed or complex construction efforts might not be worthwhile.

Like other user representations, personas have been used in various disciplines to infuse user data into other processes. Pruit and Adlin (2006, pp. 36-37) assert

> Usually, these user representations are built and as static documents or other artifacts that provide a snapshot of interesting and relevant information about users. These artifacts have proven helpful, largely because they help make information about users highly accessible, engaging, and memorable to people making decisions. These representations are not alive, however. They are depicted as motionless portraits, usually contained within a single finite and static document. There is no room for growth or development. That is, unlike a character in a book or film, personas do not evolve. Moreover, the team using them is supposed to "get to know them" almost instantly. When we get to know a friend, neighbor, colleague, or even a character in a favorite book or TV show, we *build up* an understanding of them (i.e., we develop a relationship with them). Once we know people, we are able to understand why they do what they do, what they want, and what they need.
>
> Engendering this level of understanding is the next frontier for user representation. We believe you have to enable personas to "come to life," allowing them to develop in the minds of the people using them. To be very clear, we are *not* suggesting that personas change drastically over time, take on new characteristics, or develop new skills (they are not to be moving targets). Instead, we believe that *personas must live in the minds of your colleagues*.

Towards this end, Pruit and Adlin (2006, p. 37) propose that persona practitioners must (a) embrace the challenge of communicating information about users through narrative and storytelling; (b) maintain a lifecycle perspective when educating colleagues about personas; (c) allow the people using the personas to extrapolate from and extend them.

The Process of Persona Construction for Interaction Design

At first, a *persona hypothesis* is developed. Based on likely behavioral differences, while also taking into consideration identified target markets and demographics, the persona hypothesis attempts to address such questions as what different sorts of people might use a product; how might their behaviors vary; and, what ranges of behavior and types of environments need to be explored. Once potential roles, behavioral, demographic, and environmental variables have been identified for the persona hypothesis, qualitative data collection begins. This data is collected through ethnographic interviews, namely a combination of immersive observation and directed interview techniques (Cooper & Reimann, 2001). The researcher observes users in-situ and asks pertinent questions that primarily focus on what motivates user behaviors, and how they hope to accomplish their goals. Other sources of data collection may include: user interviews outside of their use contexts; information about users supplied by subject experts; focus groups and surveys; literature reviews of previous studies.

Once data collection and analysis are completed, the process of persona construction begins with a short, precise narrative description for each persona. The description includes specific details about workflow and daily behavioral patterns, professional and personal needs and goals, technical skills, as well as a few personal details in order to make each persona unique and memorable. To ensure development of a believable archetype a real name and a photo is also included. Depending on the quantity and quality of research data, usually one to two primary personas are developed; whereas secondary personas may also emerge.

Methodology

For our Phase 2 research design, we used the data already collected and analyzed during Phase 1. Each of us was responsible for the set of data that she had originally collected. Consequently, we were aiming at creating two primary personas, one for the US, and one for the Swedish participants respectively. We did not anticipate being able to construct secondary personas due to the limited number of research participants.

We followed the persona construction steps as described above with the exception of in-situ participant observation (study limitation). Taking into consideration emerging themes and patterns in participants responses as those related to various aspects of online teaching, our narrative description of each persona was based on the following categories: Name & Portrait (Photo); Personal Description; Technological Skills; Roles; Tasks; Current Problems; Professional Development Needs; Desires and Goals; Values.

Presentation and Discussion of Research Results

As anticipated, two primary e-moderating personas emerged on the basis of participant responses. "Linda Jeffries" represents the five US-based teachers operating in blended formats, while "Henrik Johansson" represents the five Sweden-based teachers responsible for totally online courses. Both personas are presented in Tables 1, and 2 below.

Due to the investigational nature of this study, the lack of previous studies in this area, the limited number of participants, as well as the lack of in-situ observations, it is best to consider these personas as *assumption*, or *tentative* personas. Let us also be reminded of Cooper's point (1999) that it is almost impossible to know how representative our personas are until we see them in action. As explained earlier in this document, a major concern of the current study referred to the transfer and applicability to a new context – namely, our respective blended and online teaching environments – of a research method (persona) typically deployed by usability and interaction design. Upon recognizing that analysis and presentation of qualitative data typically runs into the challenge of finding a manner that truly reflects meanings and intentions of research participants, we searched for methods employed by other disciplines to overcome this problem. Thus we opted for persona modeling in an attempt to present and organize our qualitative data in brief, yet succinct and comprehensive tables.

From a methodological perspective, and despite the aforementioned study limitations, we were particularly excited to gain insight into the potential of the persona method toward a more realistic understanding of the online teacher's roles and needs. In general, when designing personas for interactive web solutions one finds representative variables and/or categories, and constructs personas that are goal-directed, and defined by goals, tasks or skills levels (Cooper & Reimann, 2003). In this study, Linda and Henrik were developed as models that represent online teachers' perceptions, behaviors, needs and goals in relation to their teaching roles and perceived styles. Defining our categories was a rather uncomplicated task due to the fact that we had already identified emerging themes and patterns from our Phase 1 research. Another consideration related to selecting only those categories that while reducing our data they would still represent it effectively. This challenge was however counteracted by the very process of persona creation. We discovered that persona modeling truly allows for data presentation in a narrative

form so that the researcher is able to gain a holistic view of the data. A narrative form implies a beginning, middle, and end of a story. It presents characters and plots. We came to realize that presenting our qualitative data in narrative form has not only assisted us in distinguishing the most critical variables/categories, but also provided structure, depth, and meaning to the verbal information we had collected. We were able to see connections in our data that were not readily visible earlier. It is also noteworthy that while persona modeling was in progress, more than once we run the risk of treating the data in an over-simplified or generalized manner. However, returning to the theoretical premise that personas are archetypes and not stereotypes helped us avoid that risk. After all, generalizations are out of the question when working with qualitative data at such a high level of specificity as in the process of personal modeling. Finally, and perhaps most importantly, persona modeling forced us to stay consistently aware of, and thus concentrate more on our teachers' perspectives, and less on our own viewpoints.

Linda and Henrik represent in some sense all four e-moderating roles identified by Bonk et al. (2001). Although both are particularly concerned with the pedagogical aspect of their role, they assign different weight to the other three. For Henrik, the high importance ascribed to his managerial and technical roles, leaves the social role last in the group. Linda's second major focus is her technical role, followed by the managerial, and lastly by the social role. There is also variation in their manifestation of those roles. Both feel that to be effective online pedagogues they need to be able to set up well-considered online activities, provide quality resources, quick responses, frequent group and individualized feedback, guidance, support and motivation. Anticipating student needs, as well as prompting reflective practices though crucial for Linda, they do not feature in Henrik's list. The social aspect of their role is mostly manifested through the online tasks that they perform which are similar in that they both introduce problem-based activities, and a-synchronous discussions. However, for Henrik synchronous online conferences are important, when for Linda they are not even part of her report. Instead, she includes co-operative learning, reflective activities. The managerial aspect is more related to current problems that Linda experiences- those being lack of effective institutional support, time management, and her own lack of control over online group sizes. Time management is also a problem for Henrik, which is also connected to his desire for release time toward online course development. Henrik places the lack of effective institutional *and* technical support among his current problems, but in addition he includes the ambiguous issue of online security and its potentially negative implications for student assessment. The latter also signifies a concern associated with Henrik's technical role. He admits being only *fairly confident* in his online technical skills despite his extensive use of his university's course management system- concerning which, however, he warns that it may be risky for online teachers to be limited to just one of those systems as this may inhibit their pedagogical thinking about instructional design possibilities. Linda's technical role is manifested through her high level of confidence in using the majority of Blackboard's features, but also through her desire to be exposed to more Blackboard applications. She is concerned about the fact that some of her students do not have internet access which may affect not only their comfort level online, but also their perception of how seriously they should take online learning.

Though both of them appear confident in their online teaching skills, they still have specific professional development needs and desires. Linda needs more exposure to the technical, as well as pedagogical aspects of online teaching, while she would welcome mentoring if offered by colleagues with greater experience than her in the area of blended learning. Her wish list includes improvement of her online assessment skills, control of online group size, as well as professional development opportunities and better institutional support. Henrik's needs and relevant desires focus on receiving release time toward online course development, as well as support from multidisciplinary teams of his university that would provide technical, and pedagogical expertise.

Linda and Henrik's personal descriptions – mostly their demographic and contextual/environmental variables – in combination with their individual set of values can explain most of the similarities and differences regarding their aforementioned e-moderating profiles. The blended teaching context does not create major problems on the technical level for Linda as obviously her courses are not exclusively dependent on the course management system. However, Henrik's courses being completely online do bring the technical aspect on centre stage for more than one reasons (e.g. access, security, online testing, synchronous communication). Reflection and co-operation online is ranked high in Linda's teaching agenda due to their importance in teacher education aiming at the development of the reflective educator. However, this is not the case for Henrik whose subject area is health care. Linda's time management problem stems from her juggling her teaching responsibilities between the f2f and the online environment, and yet she is very supportive of the blended approach due to the f2f interaction it affords. In Henrik's case, the same problem can be explained by the fact that he tends to spend many hours online to not only teach, but also to get to know his students better and thus 'come closer at a distance' (his words). It is due to his perception of the stronger rapport between teacher and students also fostered by the fact that students cannot hide online as they

can in f2f teaching; as well as the flexibility and creativity of the online environment that he is so supportive of online teaching. It is interesting to note that though Linda's university (small, private) is only beginning to experiment with online courses, while Henrik's institution (large, public) is well established in the online teaching area, they both – each for their own reasons – request better institutional understanding which would translate in more efficient and effective support. Finally, the social aspect of their role may appear low in their agenda, but in reality it is not. Linda tries to help build online learning communities while knowing that at the same time she has the luxury and safety net of f2f interaction. For Henrik, building rapport online is also crucial although he definitely recognizes that for this to happen, absence or elimination of technical or managerial problems should occur first.

Their online training experiences, but over and above their constructivist teaching philosophies can account for perceiving e-moderating as a teaching paradigm in its own right, and themselves as student-focused online facilitators, that is, far from "expert teachers", just transmitting knowledge to students. This also explains why they strongly object to designing courses according to the notion of "one size fits all". Their teaching is based on Socratic questioning, encouraging the students to engage in personally meaningful projects, and find their own answers and solutions.

Table 1

Linda Jeffries (US group-based e-moderating persona)

1.	**Name & & Portrait** – # Linda Jeffries	*(Source: Getty Image Bank)*
2.	**Personal Description-** Linda is 47 years old. She lives is Chicago, US. She has been a teacher educator for over 10 years, having primarily taught student teachers in the traditional, face-to-face format. She teaches at a small, private university which is just beginning to incorporate more online teaching in its academic curricula. Linda has received training in Online and Distance Learning (ODL), which has greatly influenced her teaching practice, research agenda, and other professional activities. In fact she reports that her face-to-face and online teaching styles are in constant dialogue, continually influencing each other. Subsequent to her ODL training, she has taught most of her graduate courses in a blended format. She spends at least 7 hours a week teaching online, logging on little and often. She describes her online teaching style as warm, encouraging, reliable, and interactive. Discussion and the Socratic questioning are a big part of it too. On a personal level, Linda is married, has two college kids, and one dog. In her spare time, she relaxes by watching movies, and eating out with friends.	
3.	**Technological Skills-** She is a great deal confident in using her university's course management system (Blackboard). The specific Blackboard features she deploys in her teaching are the (1) Discussion Board; (2) Groups Area; (3) External Links; (4) Course Documents; (5) Course Information; (6) Faculty Information; (7) Assignments; (8) Digital Drop Box; (9) Announcements; and, (10) Online Tests and Surveys.	
4.	**Online Roles**- Reporting a good deal of confidence in her online teaching skills, she normally applies them through (1) providing feedback to the group of students on a regular basis; (2) providing personalized feedback to each student on an as-needed basis; (3) providing guidance, support, encouragement, and motivation; (4) providing quick responses; (5) setting up online activities; (6) providing quality resources; (7) stimulating student-guided reflections and discussions; and (8) anticipating potential student needs and reporting in advance.	
5.	**Online Tasks-** Typical online activities that Linda incorporates in her courses include (1) General tasks meant for everyone; (2) Specific tasks assigned to each group; (3) Co-operative learning activities; (4) Critical reflections; (5) Problem-based activities (including games & simulations); and, (6) A-synchronous conferences	
6.	**Current Problems-** Linda reports that currently she struggles with managing time online. She doesn't always work with the instructionally appropriate student group size. Her online assessment skills are not as effective. Her institution's support is ineffective and inefficient. She worries that not all her students have online access. Not all of her students are comfortable with online learning- some do not take it seriously.	
7.	**Professional Development Needs-** Linda needs more hands-on opportunities in order to experiment with different online teaching strategies, but also learn how to use additional Blackboard features. She also needs a knowledgeable and compassionate mentor to be available on an informal, as-needed basis.	
8.	**Desires and Goals-** Linda would like to (1) incorporate better assessment of student performance; (2) work with her preferred group size online (small); (3) receive more exposure online; (4) receive professional development opportunities; and, (5) receive more effective and efficient institutional support.	
9.	**Values-** Linda's pedagogical values and beliefs regarding online teaching and learning are summarized below ▪ She believes that student projects should have a meaning or value behind them. ▪ Although she believes that both theory and practice courses, both at the undergraduate and graduate levels lend themselves to ODL and Blended learning, she is more supportive of blended learning because it allows for face-to-face interaction with students. ▪ She feels that online teaching involves a set of skills in its own right.	

Table 2

Henrik Johansson (Swedish group-based e-moderating persona)

1. Name & Portrait- Henrik Johansson	*(courtesy of Lasse)*

2.	**Personal Description-** Henrik is 44 years old and lives in Västerås, one of the major cities in Sweden. He works at a public university, and travels with train to campus. Although before he begun teaching at the university – about 6-7 years ago - Henrik did not receive any teacher training, he has since participated in various professional development sessions on online teaching and learning provided in-house. He has a master's degree as well as considerable professional experience in his subject area (health care). Initially, he taught in the traditional f2f format. Today some of his classes are f2f and some are totally online. He has approximately four years of experience in online teaching. He puts in 4-10 online teaching hours per week, logging on little and often. Henrik does not want to be the so called *traditional teacher* transferring knowledge to students, and neither does he want to take the role of *the expert*. Instead, he strives to be a good pedagogue, who is more of a supervisor, giving guidance and advice. Henrik does not like spoon-feeding the "correct" answers to students; instead he inspires students to find their own solutions. Henrik is married and lives with his wife and two children. In their spare time, he and his family spend time at their summer house. Henrik has a passion for designs from the 1950's.
3.	**Technological Skills-** Henrik is fairly confident in using the university's online course management system. Most of the time, the specific features he deploys in his teaching are the (1) Discussion Board; (2) Course Documents; (3) Course Information; (4) Assignments; (5) Announcements; and, (6) Faculty Information.
4.	**Online Roles-** Reporting a good deal of confidence in his online teaching skills, he normally applies through (1) providing feedback to the group of students on a regular basis; (2) providing personalized feedback to each student; (3) providing guidance, support, encouragement, and motivation more than sufficient; (4) providing quality resources; (5) providing quick responses; (6) setting up online activities.
5.	**Online Tasks-** Typical online activities that Henrik incorporates in his courses include (1) General tasks meant for everyone; (2) Specific tasks assigned to each group; (3) Problem-based activities (including games & simulations); (4) A-synchronous conferences; and, (5) Synchronous chat seminars.
6.	**Current Problems**- Henrik reports that he has mixed feelings about the teaching habits he developed. Online teaching liberates him from certain time and location constraints associated with traditional teaching. On the other hand, he finds himself constantly working before a computer, both at the university and at home. He also admits that there may be a problem with the security level, since we can never be sure of who actually performed the tasks. Some students tend to perform their online studies "on the side" of other studies or work. Since we do not meet the students in real f2f classrooms, we do not know how they function socially. Henrik also reports a lack of understanding from his department and IT-personnel regarding the quality and quantity of support needed toward effective online teaching.
7.	**Professional Development Needs**- Henrik reports that he needs increased collaboration with IT-technicians and designers working in multidisciplinary teams. He desires more effective and efficient IT-support. He would also welcome additional course development time, since developing online courses requires a huge amount of time, probably more so than traditional courses.
8.	**Desires and Goals-** Henrik would like to (1) achieve an increased collaboration with IT-technicians and designers in multidisciplinary teams; (2) be given additional working hours to develop his courses both technically and pedagogically; (3) receive more effective and efficient IT-support.
9.	**Values-** Henrik's values and beliefs on online teaching are summarized below ▪ Feels that online teaching involves a set of skills in its own right. ▪ Feels "closer at a distance" compared to traditional classroom teaching as he gets to know the students more as individuals. ▪ Believes that students cannot "hide" as in the f2f format. ▪ Enjoys the flexibility and creativity the online environment affords. ▪ Thinks it is risky to only use one course management system (e.g. WebCT, First Class, Blackboard etc.) as this may limit creative pedagogical thinking.

Recommendations

Those interested in exploring further this methodological innovation using our study as their starting point, should appreciate the need for further validation of our *persona hypothesis* through surveys, interviews, as well as in-situ observation of a larger population of teachers operating in both blended and online environments.

Our underlying goals were to give aspiring e-moderators a realistic insight into the online instructor's role(s), but also to assist existing e-moderators better understand and further develop their online teaching style. We also envisaged that the results of this study would benefit all those involved in supporting online teaching initiatives – such as instructional designers, course management system designers, technical staff, professional development units, administrators, etc. – trying to effectively match and align teaching and learning needs with corresponding

services and resources. It is our sincere hope that the aforementioned groups will look carefully into the potential that persona modeling holds toward increasing the understanding of what is important to online teachers, how they implement their teaching online, as well as what particular concerns and needs they tend to have. In that case, as indeed was the case for our study, personas can be employed as a reference point and a discussion tool for design and administration teams, while at the same time assist those teams making better decisions and supporting online teaching initiatives having people, their stories and contexts – not technology – in mind.

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Video Podcasting: When, Where and How it's Currently used for Instruction

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Abstract

This paper addresses the questions: What is video podcasting?; When is video podcasting a helpful addition to a live or online course?; What educational institutions are currently making use of video podcasting for instruction?; and, How does one create and distribute video podcast content? An overview is presented of what video podcasting is, who is making use of video podcasting for instruction, and the technical aspects of creating video podcast content.

Podcasting

A new technology currently receiving a great deal of attention is "podcasting." A podcast is an audio or video file placed on the Web for individuals to subscribe and listen to primarily on MP3 players such as the Apple iPod. The term "podcast" like that of "radio" or "video" can refer to either the content or the method of delivery. A number of institutions have been experimenting with providing audio podcasts as supplemental instructional media (Descy, 2005). Winer (2004) observes that podcasting works similarly to how a desktop aggregator works. One subscribes to a set of feeds, and then can easily view the new items from all of the feeds together, or each feed separately. Podcasting works the same way, with one exception. Instead of reading the new content on a computer screen, one listens to or views the new content on an iPod or any device that can play MP3 and/or MPEG4 files.

iPod Devices on Campus

Although it is possible to listen to or view podcast content via a computer, it is the near-ubiquitous use of iPods and similar devices that have captured the public's attention and the imaginations of educators. Duke University, for example, currently issues incoming freshmen with an iPod (Armstrong Moore, 2005). In Armstrong Moore's article, Greg Joswiak, Apple's vice president of iPod product marketing is quoted as saying, "Institutions such as Duke, Georgia College & State University, and others are using the iPod as a portable learning tool for listening to recorded lectures, foreign language study, research notes, storing files and photos, and listening to audio books and podcasts." Modern iPods have large storage capacities. The popular video iPods, with either a 30 or a 60-gigabyte capacity, allow users to store and play digital video and still images as well as sound files. The authors note from personal experience that the video iPod's 2.5" screen is remarkably clear.

One of the appeals of the iPod is that users have access to digital media when they are not sitting at traditional desktop or laptop computers. Johnson (2005) points out that portable media players like Apple's iPod are "…not home computers but body computers, fashion accessories that now want to be cameras, TVs and radios. The iPod has become a sex symbol of self-expression, a hi-tech fetish that's helped us see the media as something to be individually programmed." There is certainly an important novelty aspect to these portable media players, but the longer term implications of ubiquitous media access suggests a profound shift in how educators might make use of instructional media. Professors, teachers, and instructional designers may now consider how to create or distribute course content that individuals can access almost any time or any place.

Video Podcasting or Vodcasting

Although audio podcasting is a relatively recent technology itself, even more recent is the phenomenon of video podcasting (that is, podcasts that contain visual information either in the form of still images, animation, or video). Video podcasting or "vodcasting" is seen by many as a potentially powerful instructional medium (Johnson, 2005; Mackey, 2005; Warlick, (?)). Mackey (2005) suggests that video podcasting's revolutionary potential is based on the fact that they can be made and distributed via the Web by a variety of producers, ranging from big-

budget to almost no-budget situations. Podcast video does not require special server distribution software the way Internet broadcasting does (SCVI.NET, 2006). This means video podcasting may be useful as both a means to communicate content (Descy, 2005; Ellis and Cohen, 2001; Touvinen, 2000) and as a means of student media production (Anderson, 2005).

Using Vodcasting to Enhance Instruction

Vodcasting is a potentially significant enhancement to instruction. It may allow students an opportunity to receive supplemental multimodal presentation, which is generally accepted as beneficial, particularly in the apprehension of complex concepts (Tuovinen, 2000). Ellis and Cohn (2001) caution that instructional multimedia supplements are intuitively attractive, but their use must be weighed against the cost of production. Vodcasting presents interesting opportunities for design and research in that vodcast productions may be accomplished with a minimal budget and moderate technological expertise.

Educational Institutions Currently Making Use of Podcasts

Various educational institutions are making use of podcasting. Major universities such as Duke, Michigan, Purdue, Stanford, and UC Berkeley are making podcasts of course lectures available for their students – especially undergraduates. Students enrolled in various courses use the Web (typically a password protected university server) to access the podcasts. Purdue University, with their Boilercast project, is at the forefront of using podcasting for educational purposes. The idea behind Boilercast is to provide students with audio recordings of lectures allowing students to review daily course materials for use on homework or as a review for examinations. A course that is part of the Boilercast project will have a podcast available to students the same day a class lecture is given. Students at Purdue University have access to podcasts for 70 different courses offered on campus. This number is expected to significantly grow (Purdue University, 2005).

Educational Vodcasts and Vodcast Design

Perusing the educational vodcasts available to the general public, using primarily the Education Podcast Network (http://epnweb.org/) and Apple's iTunes Music Store, it becomes readily apparent that educational video podcasting is in its infancy. The vast majority of video podcasts are essentially collections of clips produced originally for television viewing. This is unsurprising; historically new media begin by making what use they can of the content developed for older media (e.g. early television relied heavily on content "imported" from live theater and radio drama). There are few examples to date of vodcasting designed to make best use of this new medium. The significant differences between vodcasting and television viewing are the vodcast player's portability and the size of its view screen. As the medium matures, the design of the presentation will no doubt take into consideration its unique features. Just as television matured into half-hour and one-hour programming that makes use of multiple camera angles and close-up shots, and takes into consideration the fact that most viewers will be watching alone or in a small group, which is very different from a two or three-hour live play or musical experience which the viewer shares with a large group and sees from a single angle, vodcast producers must learn what works best for this new medium. Some of the more sophisticated vodcast producers add subtitles to the video and present the video in multiple, short clips to take better advantage of the medium. An example of which is PBS.org's NeRDTV vodcasts (PBS, 2005), the content of which is from PBS's broadcast television show of the same name (see Figure 1).
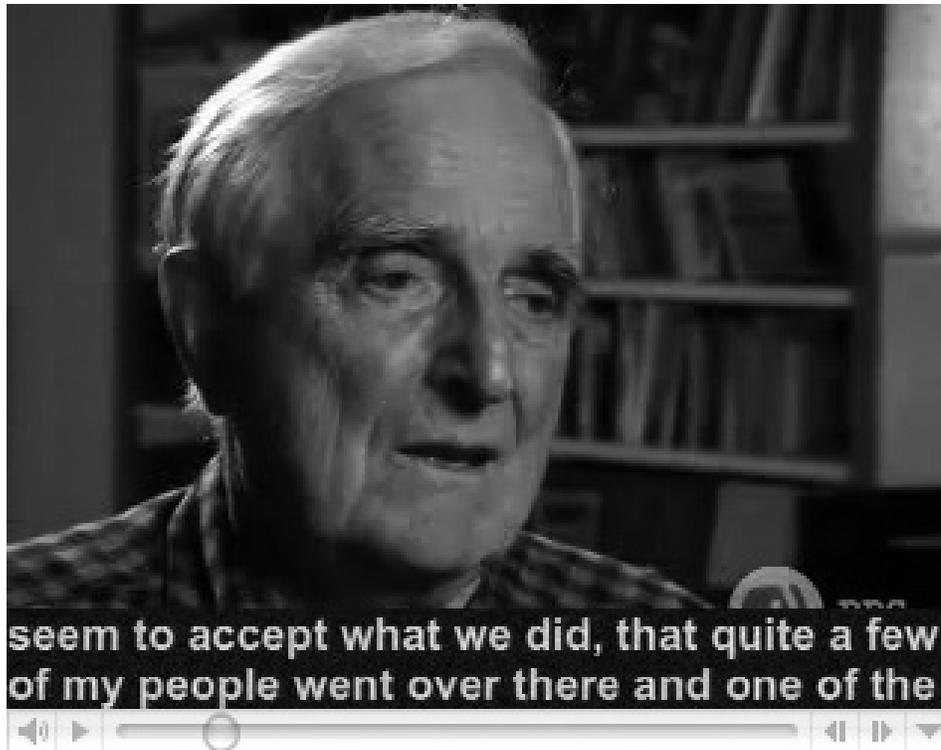
Figure 1. A still from the NeRDTV vodcast interview with Doug Englebart (2005)

Vodcasting Basics: Production Elements and Support Technology

From the perspective of accomplished media producers, video podcast production is reasonably simple using multi-platform software such as Flash, PowerPoint, and QuickTime. Video podcast production is particularly easy even for relatively unsophisticated media producers using Apple's multimedia production software such as GarageBand, iPhoto, and iMovie HD. Production is a matter of putting together a multimedia presentation saved in .m4a, .mov, .mp4, .m4v file format. In experimenting with the production and distribution of video podcasts, the authors found that in practice the only reliable method of creating an iPod-compatible video file was to use Apple's QuickTime software (using the "Export" function and selecting "movie to iPod") or to use Apple's GarageBand software, selecting "New Podcast Episode" when creating the file. The authors experimented with creating and exporting files from Flash and PowerPoint: both of these software programs allow one to export a digital video file, but these files ultimately had to be opened in and exported appropriately from either QuickTime or GarageBand to be viewable on a video iPod.

Figure 2 (below) is a screen capture of Apple's GarageBand software in "New Podcast Episode" mode. Note the tracks that are typical of most sound production software include a "Video Track" (the topmost track) which accommodates either video imported from iMovie or still images imported from iPhoto.

Figure 2. A screen capture of Apple's GarageBand in "New Podcast Episode" mode.

Once the video file is created, two more steps are necessary for the vodcast to be viewable to the public through Apple's iTunes software (presently the most popular method of collecting and viewing podcasts). The first is to upload the video file to a server. Write down the location of the video file because one will need this information as one completes the second step – creating an XML file. The XML file allows users to subscribe to the vodcasts through iTunes. This file needs to be uploaded to the same directory as the video file. Figure 3 (below) is a screen capture of XML code that the authors used.

```
1    <?xml version="1.0" encoding="UTF-8"?>
2    <rss xmlns:itunes="http://www.itunes.com/DTDs/Podcast-1.0.dtd" version="2.0">
3        <channel>
4            <title>AECT Presentation: Dallas 2006</title>
5            <itunes:author>Abbie Brown and Tim Green</itunes:author>
6            <link>http://www.geocities.com/bookwormsandgeeks/vodcastexample.xml</link>
7            <description>Examples of Vodcasts for Presentation</description>
8            <itunes:subtitle>Dig this! It works! </itunes:subtitle>
9            <itunes:summary>Two examples of vodcasts for the AECT presentation in Dallas 2006. Created by Abbie Brown
     and Tim Green. What wonderful product quality. I think these two guys are probably wonderful, funny, and great to
     hang out with.</itunes:summary>
10           <language>EN</language>
11           <copyright>(c) 2006 Abbie Brown and Tim Green</copyright>
12           <itunes:owner>
13               <itunes:name>Abbie Brown and Tim Green</itunes:name>
14               <itunes:email>bookwormsandgeeks@yahoo.com</itunes:email>
15           </itunes:owner>
16           <category>Technology</category>
17           <itunes:category text="Technology"></itunes:category>
18       <item>
19           <title>Episode 2</title>
20           <itunes:author>Abbie Brown and Tim Green</itunes:author>
21           <description>AECT Presentation</description>
22           <itunes:subtitle>Vodcasts</itunes:subtitle>
23           <itunes:summary>An example of a vodcast presentation</itunes:summary>
24           <enclosure url="http://www.geocities.com/bookwormsandgeeks/episode02.mov" length="0029" type="video/mov"
     />
25           <guid>http://www.geocities.com/bookwormsandgeeks/episode02.mov</guid>
26           <pubDate>Fri, 22 Sept 2006 2:00 PST</pubDate>
27           <itunes:explicit>no</itunes:explicit>
28           <itunes:duration>00:00:29</itunes:duration>
29           <itunes:keywords>weather, sattelites</itunes:keywords>
30       </item>
31
32       </channel>
33   </rss> |
```

Figure 3: A screen shot of XML code

There are several places in the XML code where information about the video file needs to be inserted. This information is unique to each vodcast. As other vodcasts are created, additional code needs to be added to the XML file. The code that is added is from the item tag to the /item tag. Figure 4 (below) shows an example of additional code included for a second vodcast.

```xml
1   <?xml version="1.0" encoding="UTF-8"?>
2   <rss xmlns:itunes="http://www.itunes.com/DTDs/Podcast-1.0.dtd" version="2.0">
3       <channel>
4           <title>AECT Presentation: Dallas 2006</title>
5           <itunes:author>Abbie Brown and Tim Green</itunes:author>
6           <link>http://www.geocities.com/bookwormsandgeeks/vodcastexample.xml</link>
7           <description>Examples of Vodcasts for Presentation</description>
8           <itunes:subtitle>Dig this! It works! </itunes:subtitle>
9           <itunes:summary>Two examples of vodcasts for the AECT presentation in Dallas 2006. Created by Abbie Brown
    and Tim Green. What wonderful product quality. I think these two guys are probably wonderful, funny, and great to
    hang out with.</itunes:summary>
10          <language>EN</language>
11          <copyright>(c) 2006 Abbie Brown and Tim Green</copyright>
12          <itunes:owner>
13              <itunes:name>Abbie Brown and Tim Green</itunes:name>
14              <itunes:email>bookwormsandgeeks@yahoo.com</itunes:email>
15          </itunes:owner>
16          <category>Technology</category>
17          <itunes:category text="Technology"></itunes:category>
18      <item>
19          <title>Episode 2</title>
20          <itunes:author>Abbie Brown and Tim Green</itunes:author>
21          <description>AECT Presentation</description>
22          <itunes:subtitle>Vodcasts</itunes:subtitle>
23          <itunes:summary>An example of a vodcast presentation</itunes:summary>
24          <enclosure url="http://www.geocities.com/bookwormsandgeeks/episode02.mov" length="0029" type="video/mov"
    />
25          <guid>http://www.geocities.com/bookwormsandgeeks/episode02.mov</guid>
26          <pubDate>Fri, 22 Sept 2006 2:00 PST</pubDate>
27          <itunes:explicit>no</itunes:explicit>
28          <itunes:duration>00:00:29</itunes:duration>
29          <itunes:keywords>weather, sattelites</itunes:keywords>
30              </item>
31      <item>
32          <title>Episode 1</title>
33          <itunes:author>Abbie Brown and Tim Green</itunes:author>
34          <description>AECT Presentation</description>
35          <itunes:subtitle>Vodcasts</itunes:subtitle> |
36          <itunes:summary>An example of a vodcast presentation</itunes:summary>
37          <enclosure url="http://www.geocities.com/bookwormsandgeeks/episode01.mov" length="0044" type="video/mov"
    />
38          <guid>http://www.geocities.com/bookwormsandgeeks/episode01.mov</guid>
39          <pubDate>Fri, 22 Sept 2006 2:05 PST</pubDate>
40          <itunes:explicit>no</itunes:explicit>
41          <itunes:duration>00:00:44</itunes:duration>
42          <itunes:keywords>weather, sattelites</itunes:keywords>
43      </item>
44
45      </channel>
46   </rss>
```

Figure 4: Screen shot of XML code that includes two vodcasts

Testing the vodcast is accomplished through iTunes. One opens iTunes and selects the Advance drop-down menu – selecting Subscribe to Podcast (this process is referred to as "subscribing"). In the dialogue box, the URL for the vodcast will be entered. As an example, the URL created in the XML code in figures 3 and 4 is http://www.geocities.com/bookwormsandgeeks/vodcastexample.xml . Completing this process will allow the vodcasts to be downloaded to a computer and viewable in iTunes. The iTunes software will then also check to see if new vodcasts are available at this location and offer the user an option to download the new vodcasts as they become available.

Discussion and Conclusion

Like film and television at their inceptions, video podcasting is an exciting technology that has captured the imaginations of instructors, students, and the news media. There seem to be a number of possibilities for its use in instruction and many individuals, institutions, and organizations are currently experimenting with producing and distributing video podcasts. However, like film and television, these instructional possibilities may only be realized by those educators who put significant time and effort into experimenting with design and production.

The authors found video podcast production software relatively easy to use. However, the entire process of production and distribution requires a good deal of arcane technical knowledge. The authors spent well over two days' time creating and making available two 30-second vodcast episodes. Most of that time was spent learning the processes necessary to create and distribute the files; the initial vodcast episode took far longer to create than the

second episode. The authors are relatively sophisticated in the creation of digital multimedia and in the application of HTML and XML, but at times they had to turn to even more expert producers to understand how to make the process of video podcasting work correctly. The effort involved was a far cry from Apple's claim, "Podcasts can easily be created on your Macintosh," (apple.com, 2006). It should be noted that both authors used Macintosh computers to accomplish the video podcasting experiment. It should be further noted that the experiment was aimed only at accomplishing the technical task of creating and distributing video podcast episodes; the episodes themselves are "content free." There was no time spent creating actual instructional content, which would have added a number of extra hours to the entire process.

Similar to the production of film, traditional video, or Web sites, most educators are going to need the support of knowledgeable media producers and programmers to make video podcasting work for them and their students. Educators and sophisticated media producers and programmers are also going to have to be able to communicate effectively among themselves in order to create something that is both of genuine educational value and is technologically viable. The communication between such disparate groups presents a unique challenge in and of itself.

Of course, in terms of content selection and presentation design, the old computer programmers' term, GIGO ("Garbage In: Garbage Out") applies to video podcasting as much as it does to any instructional media production endeavor. The use of a new technology may briefly imbue content with a certain temporary glamour, but ultimately that content and its delivery must be of some genuine help to the learner or it will ultimately be discarded. While it is an exciting, promising new technology, it remains to be seen what significant effect on instruction video podcasting will have on the design of instruction in the long run.

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http://www.ipodder.org/whatIsPodcasting

Use of Primary Source Documents for Teaching
21st Century Information Literacy Skills

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Introduction

Information rich, information overload, and information explosion are popular terms in our culture today. Classroom teachers, media, and technology specialists recognize that skilled consumption of information requires careful selection and evaluation of resources before information can be used for students' research projects (Lamb 2004). Often it is an overwhelming task sifting through the electronic sources to locate appropriate and usable information. In working with elementary and secondary school students, one of the most common roadblocks to the use of digital sources is the indiscriminant copying and pasting of information to a student's research paper. Teachers are distressed when students copy and paste directly from the Internet to "write" their final paper. The media or technology specialist is equally frustrated when students wander aimlessly browsing the web, looking for "interesting" facts about their topic. More often than not, ample time is devoted to searching for facts but students lack a focused research question (McKenzie, online). In a typical classroom activity, the teacher provides a list of topics for research and the media specialist a list of possible resources in the form of a pathfinder (Bush, 2003). The final paper is a compilation of information, reporting interesting facts and figures related to the topic. However, even with careful planning, many teachers experience less than satisfactory results from their students. Research papers requiring library and Internet resources for research projects are often superficial in content and lacking valid conclusions statements. The solution to these problems may be in the use of a new curriculum that focuses on "21st Century Literacy" for K12 classrooms.

Review of the Literature.

In 21st century classrooms, the current trend for teaching information literacy is in conjunction with technology-based tools using Internet and other digital information resources (National Higher Education Consortium, 2005; Lamb, 2001; 2004). Information Communication and Technology (ICT) is one of several components in the 21st Century Skills Model recommended by a leading advocacy organization for infusing 21st century skills into education (See www.21stcenturyskills.org). Using ICT, students learn not only how to query a database but also layout the design of an electronic slide presentation. In an article in *Change* magazine it was reported that technology-savvy students of the 21st century use fewer critical thinking skills than their parents (Breivik, 2005). Even with the use of Internet, cell phones, DVD's, and a multitude of electronic devices, information comes cheap and often is not used for critical analysis and evaluation. Quick-fix research using search engines may yield copy and paste solutions, but extended thinking is often lacking in the research process. Even though Information Communication and Technology skills are being strongly promoted as a critical need for 21st century classrooms, many students enter the workplace with inadequate skills for use of information to solve typical work-related tasks (Educational Testing Service, 2005). Defining the information need and articulating a concise and logical report is in high demand for most positions in business and industry (NCREL, 2003).

The 21st Century Partnership was established by the U.S. Department of Education and several member organizations including the Educational Testing Service (ETS), American Association of School Librarians (AASL), and the International Society for Technology in Education (ISTE). In addition, there is an extensive list of members from the technology industry (See http://www.21stcenturyskills.org) The 21st Century Learning Model has six components – Life Skills, 21st Century Content, Core Subjects, Learning & Thinking Skills, 21s Century Assessments, and ICT Literacy. Based on a report published by the Educational Testing Service (2005), components for ICT Literacy include several processes in which the student must engage in order to perform at the level recommended by the 21st century literacy consortium. Students must define the information need; collect and manage information from digital environments; interpret information using ICT tools for comparison, analysis, and synthesis; evaluate information for authority, bias, and timeliness; and communicate their findings through the creative use of ICT environments. If students are to engage in classroom activities that will transfer to future work environments, there must be a 21st century approach to the use of information to solve problems and report solutions.

In elementary, secondary, and college classrooms, skills for formulating a clear and concise research question are directly related to Information Skills curriculum recommended by the American Library Association and the Association for Educational Communications & Technology (ALA & AECT, 1998, p.11). If you combine this with the ICT Literacy model recommended by ETS, the first step would be to "identify and appropriately represent an information need" (p. 18 ETS, 2005). This involves behaviors related to formulating a research statement and retrieving information from a variety of sources. But, this is just the first step. Using the information to efficiently generate a summary report or solutions to a problem should be the culminating step for a real-world research assignment. This demands a level of thinking and content analysis that is often missing in K12 research projects. One reason might be an over reliance on simplistic research projects using general information sources (Loertscher, 2005). Students may benefit from more problem solving and higher level learning activities within their research projects. Early in 2004 I was invited to participate in a formative evaluation project for a primary sources website. As a professor of media and technology the idea of using digital primary source documents became an intriguing possibility. I decided to investigate the effects of ICT environments for teaching the use of primary source documents for high school research projects.

In 2004, the academic library at East Carolina University received a large grant from the North Carolina State Library (North Carolina State Library, online). Previously, Joyner Library had worked with local museums to archive images of artifacts from the *Country Doctor Museum,* and the *Tobacco Farm Life Museum.* The purpose of the project was to digitize approximately 200 texts pertaining to the history of 29 eastern North Carolina counties. Currently the *Digital Library of Eastern North Carolina* is a product of these early efforts to preserve old and rare books, documents, and images through the grant-funded digitization project *(available online* http://digital.lib.ecu.edu/historyfiction/). The *Digital Library of Eastern North Carolina* follows the example of other online resources providing digital primary source documents. *The American Memory Project,* sponsored by the Library of Congress is "a digital record of American history and creativity" (http://memory.loc.gov/ammem/about/index.html). It was first begun in the early 1990's and currently stores more than 9 million items related to American history and culture.

In addition to the websites sponsored by East Carolina and the Library of Congress, there are numerous Internet resources providing access to primary source documents. Formats for the primary sources include letters, diaries, legal documents, maps, broadsides, and many other resources scanned and archived as digital primary sources (Brown, 2005; Veccia, 2004). Because these documents are primarily written as first person accounts by individuals, and are not "textbook facts", students soon learn that careful evaluation of all sources is an important step in the research process. Biases and opinions are deeply rooted within most letters and diaries (Friedman, 2005; Library of Congress, online). Even official documents and legal reports can be biased, depending on geographic region and time period. Extensive reading in any of the primary sources leads to the possibility of writing your own version of history. Much depends on how well the author presents various viewpoints and perspectives in the reporting a singular event. Based on earlier work by Friedman, I proposed a partnership project with a rural high school in eastern North Carolina to investigate students' proficiencies with ICT literacy using electronic resources and primary source documents. Using three Internet based resources for primary source documents, the question was asked, "are digital primary source documents useful tools for teaching Information and Communication Technology (ICT) literacy skills in K12 schools?"

Method.

In case studies reported by Barton (2005), high school students participated in perspective-taking activities to write alternate points of view for events in history. Using old diaries, letters, and journals, students soon learned that history could change based on such things as geographic location and social position of the person relating their story. Replicating many of Barton's activities, a case study investigation was used to report the strategies students used to analyze primary source documents for "writing their own history". In addition, surveys and focus group interviews were used to gather feedback from students and their response to use of primary source documents as reference materials for doing research.

A rubric was used to identify proficiencies in the seven areas recommended by Educational Testing Service for ICT Literacy. These are- *define, access, manage, integrate, evaluate, create* and *communicate.* My observations were focused on these proficiencies and how often students demonstrate skills for defining a question, accessing and managing information, integrating resources into useful summaries, evaluating their sources, and creating a valid conclusion statement presented electronically to their peers (ETS, 2003). Upon recommendation by the school media specialist and a classroom teacher, the 12th grade English Literature students were given instruction in how to use (1) skills in generating a research question, (2) use specific search strategies to locate primary source documents,

(3) evaluate information for bias and engage in perspective-taking thinking processes, and (4) apply technology literacy skills for use of PowerPoint software for the purpose of reporting conclusions to a peer-audience. The researcher, media specialist, and classroom teacher provided additional remediation and support as students learned new skills in use of Boolean methods for entering keywords in a variety of search engines and educational databases. They also received instruction in how to present their final report to their peers in the classroom setting.

In an earlier publication, the Educational Testing Service (2003) reported testing the seven ICT proficiencies for college level students, however, in a recent report by MSNBC (available online), the college level skills have been translated for use in testing high school students:

> Students will receive an individual score on a point scale of 400 to 700, and schools will get reports showing how students fare in seven core skills: defining, accessing, managing, integrating, evaluating, creating and communicating information.

Using the ICT proficiencies as a framework, a rubric was designed to identify the seven core proficiencies within students' research behaviors and in the content of their final products (See Appendix).

The first proficiency is identifying need and generating the research question (*Define*). Students should be able to "frame" (McKenzie, online) a research question using problem-based learning techniques for brainstorming, perspective-taking, and critical thinking skills. Second, students should use ICT tools to gather information and, based on information need for the defined research question, organize the information into a useful format (*Access and Manage*). Next, students engage in higher order thinking skills to compare and contrast, synthesize, and summarize information (*Integrate*). Following integration, students should be able to make judgments on whether the information satisfied needs for the task in the ICT environment, including authority of the source, bias and timeliness of the materials (*Evaluate*). Last, using ICT tools students must be able to report their findings, conclusions, and solutions within appropriate context for the audience (*Create/Communicate*). The observation instrument included the following behaviors: (1) students ability to frame their research questions related to the time period and circumstances for the research project; (2) students ability to generate a focused research question that is useful to meet an authentic information need; (3) students persistence in use of search engines to find useful information; (4) students persistence to work with software for developing their electronic slide presentations; (5) students problem solving ability within the ICT environment.

Discussion

Framing an Authentic Research Question.

Students needed guidance and instruction in how to frame and generate a research question. Even when provided a list of motivational topics, the researcher, teacher, and media specialist devoted several class periods modeling the cognitive process for "framing the question" and bringing the topic to a focused research question rather than a fact-gathering-and-report methodology. When generating their research questions, typical responses by the students might be - "research on battles of the Civil War", or "research on life on a southern plantation". Students were not able to frame their topics within the boundary of a focused research question. Nor were they able to generate an original query that would require critical analysis on information related to a topic. Instead, students wrote superficial questions that only required searching for basic facts. In Illustration 1 you will see two examples of focused questions generated by one male and one female from the class. The students gathered pertinent information and critically analyzed the content for perspectives based on culture, geography, and personal bias. By framing the research questions, students were able to *define* the information needs, *access* appropriate sources of information, and *evaluate* the content of information for usefulness in answering their research questions. Note, all three proficiencies, *define, access,* and *evaluate* are components for the ICT skills curriculum.

See Illustration 1. PowerPoint® slides displaying students' "framed" research question.

Framing Questions	*The Purpose*
What was prison life like at different prisons during the Civil War?	*We often forget how difficult it was for women to win the battle for the vote.*
What was the difference between the treatment at Union Prisons and Confederate Prisons?	*What did they sacrifice? Why would someone oppose women's suffrage?*

Many students needed additional instruction in how to *evaluate* the contents and validity of certain websites. In particular, credentials of the author, was an important information skill learned by students in this case study. Proficiencies for ICT Literacy include the ability to "judge the degree to which information satisfied the needs of the task in ICT environments, including determining authority, bias and timeliness of materials." In Illustrations 2 and 3, are examples of how students gathered information from several sources for critical analysis. The students' final conclusions are based on various perspectives. Considerable judgment and evaluation of content was needed for students to report on final conclusions related to their original research questions.

Illustration 2. An example of student's ability to use ICT tools to *Access, Integrate, Create*, and *Communicate* information needed to answer a framed research question.

NARRATIVE OF PRISON LIFE

AT BALTIMORE AND JOHNSON'S ISLAND, OHIO:

By: Shepherd Henry E. Elli

- Building was uncleansed and not ceiled. It was simply weather boarded.
- Rations: One half loaf of hard bread and a piece of salted pork.
- Clothing and blankets were not suitable for weather conditions.

http://docsouth.unc.edu/shehperd/shepherd.html

Similarities and Differences

Union Prisons	Confederate Prisons
• Small portions of food	• Smaller portions of food than received than in the Union Prisons
• Clothing was not suited for the weather	• Clothing was not suited for weather
• Received cruel and harsh punishment	• Received cruel and unusual punishment
• More medicine available.	• No medicine available

Illustration 2 is an example of how students gathered information from several sources with first hand reports on prison conditions in the North compared with conditions as reported in the South during the American Civil War. The student's conclusions are based on analysis of facts as these were reported by persons incarcerated in both northern and southern military prison campus.

In Illustration 3, the student reported the comments from the opposition as a strategy to report how bias is evident in the media. She compares this with media reports from broadsides that were in support of women voters. The student's conclusion contained some personal bias but was still well articulated in her admiration for early leaders in the suffrage movement.

Illustration 3. An example of student's ability to use ICT tools to *synthesize, summarize, compare* and *contrast* information.

The Women's Reasons

" Women must obey the laws…pay taxes… suffer from bad government… just as men do.

Women are citizens of a government of the people, by the people and for the people, and women are people.

They should vote equally with men."

The Opposition

DO WOMEN WANT THE VOTE?
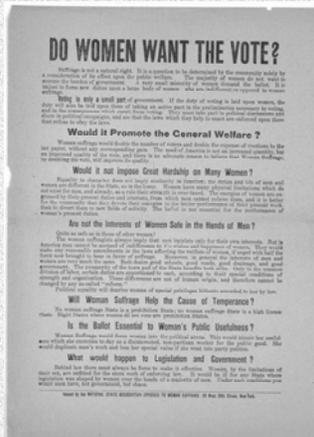
•The majority of women were believed to not want the vote.

•Another argument was that the responsibilities of voting would interfere with their duties as a housewife.

•Women were also expected to trust men with their interests.

Persistence in Use of Search Strategies.

Early in the project, students wasted too much time with aimless wandering of the Internet to locate "facts about my research". This relates to the typical practice of locating basic facts without using higher-level thinking for comparing and contrasting, summarizing, and critical analysis of what was reported in the documents. Students also struggled with fact versus opinion with many of the documents. Legal documents, government websites, and other historical documents presented in textbook style were always interpreted and reported as entirely accurate. Students soon learned that documents *were not* always entirely accurate. They were prompted to compare several different viewpoints for one historical event and soon recognized the differences in geographic region, time period, and economic status can affect the accuracy of content within primary documents. Cognitive processes for this activity clearly support the ICT skill for *integrate* in which the student must "interpret and represent information" thinking skills to "synthesize, summarize, compare and contrast information from multiple sources" (ETS 2003).

Persistence in Use of Software for Problem Solving and Presentation of Research Results.

Students were motivated to report their findings using electronic slide presentations however many students were frustrated in learning basic computer skills and trouble-shooting for glitches in the software. There was also a need for prompting in the use of search engines and Boolean methods for entering keywords. The earlier pilot project was successful in that students were highly motivated to research their topic and because of the opportunity for additional time in the library using the Internet. However, the teacher reported less than satisfactory results for the final product. Student papers did not include valid conclusion statements. When interviewed during focus groups, students reported lack of time to write the final paper. With additional probing and questioning, the researcher concluded that students spent too much time with Internet searching for the primary sources. During the follow-up projects, (through collaborative efforts of the teacher and media specialist) an extended timeline was planned to provide adequate time for gathering data, processing the information, and writing final conclusions. In addition, students were provided a list of sources in a pathfinder and were instructed to search extensively within the websites and web portal provided by the media specialist. This helped alleviated the problems with too much time searching irrelevant websites.

Conclusions

Students gained new understanding in how to interpret historical documents as they read primary sources to "write their own history". They also learned that all history is a biased report of events and are the viewpoint of the author. Comparison of viewpoints by age, race, gender, socio-economic status, and geographic region were used to

teach information literacy for the selection and evaluation of information to answer their self-generated research questions. Students began with simple fact-gathering but soon graduated to more in-depth analyses in order to identify biased and opinioned reports for an historical event. In addition, students exercised skills in evaluation of several different sources for the same event. Their evaluations were self-directional and required a high level of evaluative judgment for drawing final conclusions. This was an obstacle for many of the students early in the project until they recognized the importance for comparing stories from different perspectives. The American Civil War, Women's Rights, and sensitive topics such as slavery of African Americans were useful topics leading to a successful experience with information and communication technology skills. Using the seven proficiencies recommended by the Educational Testing Service (ETS, 2003, 2005), I was able to devise an observation instrument with criteria for students' ability to locate and access information. Using recommendation by ETS, a researcher-designed rubric was used for assessing skills in determining usefulness of information. In addition, criteria within the rubric were used to evaluate conclusions presented in students' electronic PowerPoint® slides. In the beginning frustration was high, but mastery of basic technology skills led to a more relaxed learning environment. Just as with adult learners, high school students are pressured to work under time constraints when facing technology glitches and slowdowns. The teacher and the media specialist were highly motivated to achieve a successful completion for the projects, thus persevered even with technology delays. The effective use of Information and Communication Technology skills as described for 21st Century classrooms are evident from this study.

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Appendix

Rubric for Evaluating Contents of Research Projects *
*adapted from Educational Testing Service *Components of ICT Literacy.*

Define-Using ICT tools: Select appropriate topic - teacher input Frame research question within focused boundaries Identify appropriate resources to answer the research question	**Access**-Using ICT tools: Locate, retrieve digital primary sources useful for answering the research question
Manage- Using ICT tools: Organize information to be able to efficiently analyze content Summarize content Report portions of content to answer the research question	**Integrate**- Using ICT tools: Read and interpret information using synthesis, summarization, and critical thinking skills for compare, contrast and perspective taking. Read and interpret information from multiple sources
Evaluate- Within ICT environments: Make judgments on the usability of the information to answer the research question Make judgments on authority of the source Make judgments on bias Make judgments on timeliness of the materials as this relates to the research question	**Create**- Using ICT tools: Adapt, apply, and design a report with conclusions to the original research question **Communicate**- Using ICT tools: Design a report that is appropriate for the audience Design a report with content that is clearly communicated and understood by the audience.

Developing Learning Content Markup Language (LCML) for Personalized Instruction in the Adaptive Learning System

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Abstract

This paper designs a Learning Content Markup Language (LCML) based on XML structure. LCML focuses on developing effective structure of learning objects called learning content for the adaptive learning system, Matching Learning Objects to Individual Differences (MLOID) proposed at the AECT conference in 2005. Learning content includes descriptive metadata, which is pedagogical information and properties related to individual differences, and links to material source. The learning content written by LCML will be a basis of complete learning units in the adaptive learning system.

Introduction

Adaptive learning systems aim to help learners gain their own knowledge structure by personalizing instruction based on individual differences (Baek, Wang & Lee, 2002; Cheon & Grant, 2005). The key function of an adaptive learning system is determining how to modify the learning content according to learners' differences. To deliver appropriate personalized instruction, an instructional unit should be subdivided into learning objects (Cheon & Grant, 2005). The concept of learning objects has been given immense attention from scholars, and standardization efforts have been conducted by IEEE Learning Technology Standard Committee (LTSC) and Instructional Management System (IMS) Global Learning Consortium. However, most standardization with e-learning is concerned with issues of interoperability and reusability for learning objects and content packaging (Hummel, Manderveld, Tattersall & Koper, 2004). Reusing learning objects without considering instructional principles may lead e-learning to create "page-turners," which do little to advance interactions and apply appropriate instructional models.

In order to implement effective adaptive learning system, new concept of learning objects is needed. Separating structure and contents from layout could make it possible to create and update contents for different purposes (Fiala, Hinz, Meissner & Wehner, 2003; Mohan & Greer, 2003). Extensible Markup Language (XML) is suitable for implementing the separation. Because XML is independent from a specific platform and emphasizes document structure, it allows multi-format output. The focus of this paper is to design Learning Content Markup Language (LCML) based in XML in order to implement Matching Learning Objects to Individual Differences (MLOID) proposed at AECT conference 2005.

Review of relevant literature

In order for learning objects to be reusable and searchable in a consistent way across different platforms, they can be simplified by providing standardized information called metadata (Mohan & Greer, 2003). There have been a number of efforts worldwide to develop standard for learning objects. For example, IEEE Standard for Learning Object Metadata (LOM) is the first accredited standard. The LOM standard uses nine categories of XML data elements to describe learning objects. It is intended that LOM metadata will simplify the discovery, management, and exchange for learning objects over the Web (Mohan & Brooks, 2003). The other standard model is IMS Metadata Specification (IMS, 2003). It has specifications for the design of learning. IMS content package specification is the structure of a learning object and physical resources, and IMS learning design specification consists of contents plus learning activities and achievement of learning objectives (Mohan, 2004).

However, there have been arguments about the specifications (e.g., Hummel et al.., 2004; Mohan, 2004; Mohan & Brooks, 2003). Hummel et al. insisted that technical standards are important but not enough to promote learning without attention to the process of instruction. On the other hand, Mohan (2004) stated that even if LOM standard contains elements such as Semantic Density (i.e., rated effectiveness) and interactivity level, it is not enough to facilitate sophisticated instructional design. In addition, pedagogical information should be included in

metadata for personalization. Pedagogical information would specify cognitive activities plus teaching and learning strategies (Mohan & Brooks, 2003).

Most studies about learning objects have used or suggested new XML-based document formats for adaptive learning. One of the studies proposed Domain Structure Markup Language (DMML) which aimed to describe the knowledge general structure (Baek et al., 2002), where elements such as title, concept, relationships, explanations and examples are used to create pages dynamically. TeachML uses didactical units and didactical structures to create different presentations and routes through the course (Wehner & Lorz, 2001). In a component-based document, components are described by attaching metadata specifying properties and adaptive behavior, constructing a Web site by aggregating and linking components to complex document structures (Fiala et al., 2003).

Prototype of Learning Content Markup Language (LCML)

The proposed prototype of Learning Content Markup Language (LCML) focuses on developing effective structure of learning objects for the adaptive learning system called MLOID. Regarding previous studies, there are limitations for implementing an effective adaptive learning system by only using metadata and learning objects alone. In order to fully realize adaptive learning units for each individual, content should be separated from presentation. In addition, pedagogical strategies should be considered when constructing the learning unit.

The concept of learning objects in the system is not the smallest media file but contains necessary information such as structure or level of difficulty as well as the link of the learning objects, such as a text file or an image file. Accordingly, learning contents include descriptive metadata and material sources as a basis for complete learning units in the adaptive learning system. However, metadata outside of learning content will exist in order to be searchable and reusable. The basic architecture of adaptive learning contents is depicted in Figure 1.
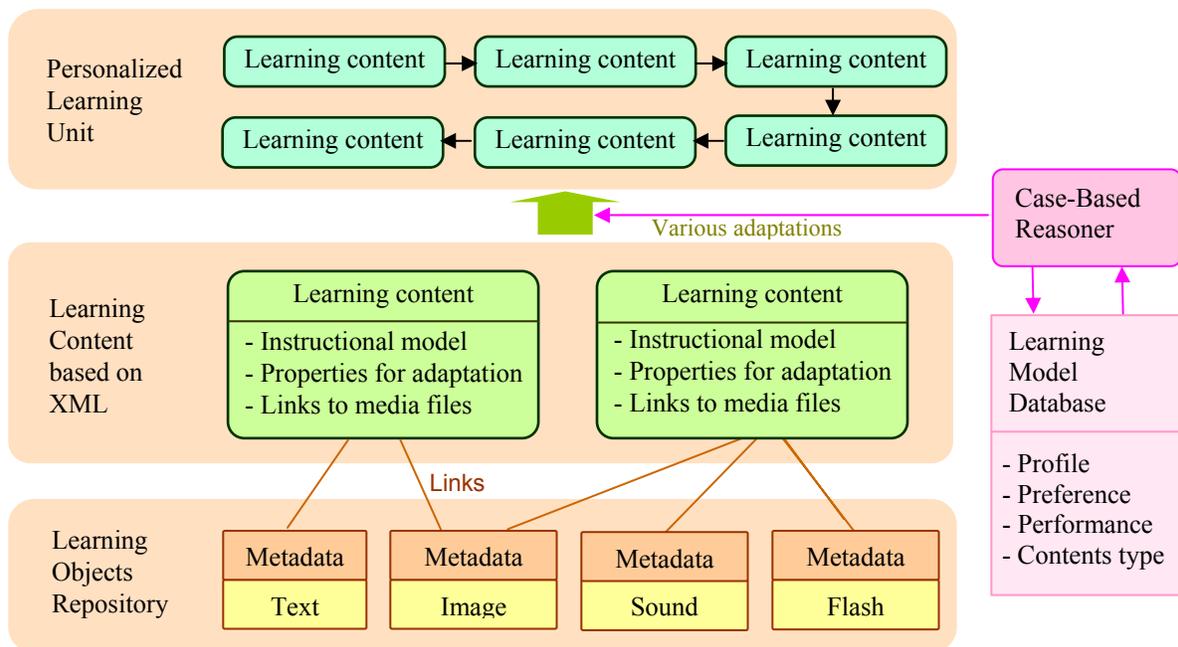
[Figure 1] The learning content adaptation model

Learning content is expressed by XML grammar, because XML is independent from presentation and easily extended by alternative elements. Therefore, learning content written by LCML is system independent, reusable and extensible. Elements in XML documents describe properties for adaptation. The structure and example of XML tags in LCML are described in Table 1.

[Table 1] LCML structure example

Elements	Attribute examples	Use for adaptation
Topic	Title	Title of a page
Section	Type – pretest, instruction, assessment Title	Navigation, menu bar
Instructional model	Name – Gagne's nine events of instruction Type – linear, nonlinear Step name – present stimulus materials Step number – 2	Instruction route
Content	Type – pretest, presentation, activity	
Prior knowledge	Type - general, high, low	Different contents
Learning style	Type – visual, auditory, reading	Different presentation
Media	Type - text, image, sound, movie, PPT, activity,	Learning materials

Using appropriate attributes of each element in learning contents, appropriate adaptive learning unit can be reproduced. For example, the <topic> and <section> tags can be used to make titles or navigation menus in different interface styles. Furthermore, the <instructional model> element consists of four attributes that indicate pedagogical information. Especially the step number will be used to construct sequences of the learning contents. In the <content type> element, a learning content may not have any learning material but have guidance of a learning activity. <Prior knowledge> and <learning style> are basic indicators for personalization in this system. Depending on the types of those elements, an adaptation model will make personalized instruction. Because of the flexibility of XML, additional individual differences elements can be added.

Future work

In this paper, LCML is proposed as the first step to implement the proposed adaptive learning system MLOID. Learning content written by LCML can fully realize effective adaptive learning system. Separating contents, including properties of instructional information and individual differences, allows reproducing a unit of learning in order to meet various adaptive purposes. However, there are considerations in implementing learning contents using LCML. First, additional XML elements for other individual differences components could be considerable. Second, an XML authoring tool needs to be developed in order for instructional designers to easily make learning contents and assign the XML elements. The adaptive system can make various personalized learning only based on the essential learning contents. Third, a student profile XML schema needs to be designed to accumulate a student's learning outcomes and preferences. Last, a server-side adaptation algorithm based on learning contents model is needed.

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Teacher Created, Computer Based Virtual Field Trips

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Abstract: This paper will discuss Computer Based Virtual Field Trips that use technologies commonly found in any public school classroom in the United States. The discussion will focus on the advantages of both using and creating these field trips for an instructional situation. If the decision is made by an instructor to create a virtual field trip, the technologies used can be as simple as using digital pictures and text in Microsoft PowerPoint or Hyperstudio or as complex as using digital video and panoramas in Macromedia Director. The level of complexity will depend on the technology available and skills of the developers.

Virtual field trips are a hot buzzword for integrating technology into the curriculum. If one does a web search using "Virtual Field Trip" as a key phase, hundreds of sites will be identified. These sites are overwhelmingly web based and provide an abundance of pictures with limited information about locations that are deemed to have educational value. Krupnick, states that, "The Web is now crowded with sites that are considered 'Virtual Field Trips' and they vary a great deal in content and usefulness." She further states that, "For teachers who already have a curricular unit assembled and are looking for online enhancements, these are adequate. But for teachers who are looking for a source of new and exciting curriculum such sites are only a starting point. In order to make them useful, an instructor would need to develop curriculum." (2000, p. 43)

The approach taken in this paper is that a virtual field trip is much more than a web-based presentation of a location. Our focus is to show how to design a field trip based on curriculum content that allows the student to "learn" from the field trip in a way that is similar to actually taking the field trip. Coulter states, "The key is for (instruction) to drive the technology implementation and not vice versa, despite pressures to integrate technology into the classroom.... virtual field trips ... enable students to refine and extend their growing understanding as they explore other parts of the world." (2000, p. 49)

In educational situations actual field trips need to be more than "just a day away from school," with limited tangential educational purpose. They should be as real a connection to the "real world" as possible. A normal day field trip does not offer sufficient time to take full advantage of all a site has to offer. Bellan and Sheurman (1998) discuss ideas about actual and virtual field trips and state pitfalls of both. Their article outlines the teacher involvement necessary to alleviate some of the pitfalls. Among these are a teacher visiting both the actual and virtual sites, the teacher's plan for student use of a virtual site, student use of the virtual site before visiting actual sites, and follow up instruction using both the virtual and actual trip experiences. Taking the field trip on the computer does not eliminate all the concerns about how field trips are used. The virtual field trip is usually not sufficient by itself. Pre-planning the trip and the follow-up experiences should be addressed as part of the teacher's curriculum. In addition we suggest a virtual field trip should be developed by the teacher to be used in connection with an actual field trip to the site.

Definition of a Virtual Field Trip

Virtual field trips as referred to in this paper, are computer-based simulations of an actual field trip, which allows the user to vicariously experience the environment of the intended location. They provide the teacher and learner the opportunity to explore aspects of an actual trip without leaving the classroom. They should include all elements of a well-designed field trip and provide the student with experiences that are beyond those that could be obtained from a pamphlet about or a photo display of the location. Stainfield, Fisher, et. al. (2000) feel that virtual refers to "digital alternative representations of reality" and that a virtual field trip is not an attempt to create a virtual reality.

The Power of Instructor Designed Virtual Field Trips

Instructors can create their own virtual field trip with their students by using a digital camera. By planning what they would like to include, the field trip can be designed to meet the objectives of the specific instructional situation. The site used for the virtual trip can be one that is within the student's local community. Choosing a site that can be visited by the class or a student's family will vastly increase the educational value of the experience. This

requires that teachers must have control in creating the trip to meet their curricular needs. Student involvement in the creation of the virtual field trip can give power to the experience. This can take the form of; collecting information at school, using aspects of the technology in the construction of the product, taking the actual field trip and gathering the images and information that is presented in the virtual field trip. This type of involvement focuses student's attention and learning on the intricate aspects of the content presented. In addition it provides ownership by the students of the project and focuses their learning of the curricular content. Last, but not least, it provides opportunities for students to use the technology in a real world situation, which addresses the NETS standards by preparing them to function in a technology rich information society.

Advantages of Creating a Virtual Field Trip

The main advantage of a virtual field trip is that it can be used to meet the objectives of the curriculum and the needs and ability levels of the students. Other advantages include:
  • providing opportunities for repeated visitations to the site for continued study.
  • allowing the teacher to focus on one specific aspect of the trip at a time.
  • providing for the presentation of a wider variety of experiences than may be possible on one trip.
  • illustrating time sensitive issues that could not be viewed on a single actual trip.
  • allowing classes in a different geological location to visit and compare with resources in their own area.
  • providing integration of the multiple aspects of the field trip into a number of different curriculum areas.
  • allowing for commonality of experiences by all participants.
  • allowing students to take a closer look at areas that could not be fully explored during an actual field trip.
  • using for assessment purposes.
  • sharing with colleagues and parents.
  • using repeatedly by the teacher year after year.
When teachers use a virtual field trip in conjunction with an actual field trip to the same site, a virtual trip can serve as a motivator for the trip, or as an advanced organizer for the day's activities. It also encourages learners to plan and prepare for activities to be carried out on the trip or can provide a simulation for students who may not have been able to attend the actual field trip.

Limitations of a Virtual Field Trip

There are two major limitations to using a virtual field trip. The first is the availability of a field trip that meets the objectives of the curriculum. Commercially available and Web based field trips are designed for a large audience and may need to be adapted to meet an individual instructors curriculum needs. The second limitation focuses on the designer's expertise in the content area and appropriate pedagogy for the field trip.

Barriers, and the Paths over Them

The main limitation in creating a virtual field trip is the time needed to create the experience. The teacher who wants to create a virtual field trip needs to find ways of involving others such as; colleagues, community members, students and parents. If the teacher views the design of the field trip as dynamic, constantly evolving, construction of both the actual and virtual field trips will grow over time.

Because curriculum design requires content expertise, another limitation is the creator's knowledge of the content area of the field trip and the curricular objectives. As teachers become involved with the design they often need to extend their content knowledge, thus increasing the time necessary to design the experience. On the positive side, they can get so involved that their personal knowledge increases and it becomes a professional development experience.

A third limitation is the availability of the technology. However with the increasing availability of technology in the schools, homes and work places this is becoming less of a barrier. Coupled with the availability of the technology is the teacher's ability to use the technology effectively. Again this can become a learning situation and thus increases the time to create the product. This limitation can be minimized by the involvement of colleagues, community members, students and parents.

When evaluating the effectiveness of a virtual field trip one should consider both the appropriateness and the effectiveness of the technology used in the presentation of the content. Children frequently experience learning situations indirectly thought technology by the use of pictures, time-lapse photography and interactive non-linear experiences that allow the learner to follow their interest and to revisit locations in the program as their interest

grows. Technology should not be seen as a replacement for experiences but as an enhancement of these experiences. Technology can be used to enhance the senses, build interest and excitement or to review and analyze experiences. Digital cameras provide the technology necessary to; record experiences for later analysis without damaging the environment, document cause and effect relationships, record changes over time, document unique events, record images that give historical perspectives, open vistas of limited access to all learners, and reviewing and analyzing experiences.

Conclusion

A virtual field trip that resides on a storage medium and not on the WWW has advantages in its effectiveness. The program is not dependent on access to or the vagaries of the Web, it runs faster, it is always accessible, and it focuses the student's attention on the task at hand.

This paper uses the terms teacher created, creator, and assembler in an apparently interchangeable manner. This is due to the principle that while the teacher is the driving force in the design and creation of the virtual field trip; the tasks can be done in conjunction with students, parents, interested community members and colleagues. The technologies used to develop and create virtual field trips are commonly found in public schools today. This process of creating virtual field trips can be as simple as using digital pictures and text in Microsoft Power Point or HyperStudio or as complex as using digital video and panoramas in Macro Media Director. The technology skills necessary in the creation of the field trip all are within the scope of the National Educational Technology Standards (NETS) for Teachers, and many are within the scope of the NETS for students.

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Successful Marketing Lessons Learned from Action Research: How a University Blended Program Survived and Thrived

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Abstract: This study looks at team collaboration in marketing a University blended-delivery program successfully. This presentation reports action research which investigated the development and implementation of a marketing program that successfully boosted enrollments over 49% in a blended University blended university program. From its inception through the second year of operation, program enrollment increased due to the marketing program based on an effective approach grounded in simple marketing principles. Lessons learned along the way can shed new light on how to improve future marketing of new programs and successful adoption.
KEYWORDS: Action Research; Blended Courses; Marketing Strategies; Distance Learning

Introduction

This study looks at team collaboration in successfully marketing a University blended-delivery program. The researchers discuss lessons learned in marketing education programs from a large public university in the southwestern United States. The study focuses on marketing, action research and collaboration as a means to accomplish innovation diffusion, and as a model for change integration of new university programs (Bourner, Katz & Watson, 2000; Isgar, 1995, Larson & LaFasto, 1989).

The research team observed a marketing plan implemented by their university to gain a larger market share in a fertile potential academic market. From the inception of the plan through the second year of operation, program enrollment doubled due to the implementation of the marketing program which was simple and direct. Throughout the process the project was monitored through an instructional design and action-research perspective, to facilitate field-based research for future marketing university initiatives. The results were successful, largely, the researchers found, because the university delivered what it promised.

The study utilizes change theory to assess how successful innovation can quietly assimilate into the culture of the academic environment without mandates from management (Fullan, 1991, 1994; Gannon-Cook, Crawford & Varagoor, 1999; Robinson, 1995). Once the innovation is adopted, it becomes less threatening. Templates, training, and instructional tools can help the electronic innovations become adopted, ultimately turning the adopters into assimilators. Once the assimilating or "morphing" of the innovation takes root, it may still take some time for the "old guard" resistors to adopt, but the wave of change can carry latecomers along with the critical mass of adopters. As it increases usage, a "tipping point" (Gladwell, 2002) occurs, and the innovation becomes part of the fiber of the evolving culture of the community. Rapid prototyping can then be used to continue the marketing program and the collaborative efforts can be promulgated and nurtured, both electronically and face-to-face.

The importance of the action research, of painstaking observation, and noting each team member's style of implementation, provides crucial data throughout each step of the study. The results of this study are supported by the university data reported one year after the study: 49% increases in the blended university degree programs introduced into the targeted market geographic areas as a direct result of the marketing campaign. Researching and journaling the effects of team collaboration in the marketing of programs proved beneficial to both the university administration and to the targeted communities in need of new educational programs.

One finding in this study was that "word of mouth" can turn out to be a critical ingredient to the success of a marketing program. In addition, combined delivery methods and support by the sponsoring institution are crucial to the embedding of the innovation into the target (educational) market. What is beneficial for the sponsoring institution is the body of research from the target program that can provide important data to lead to the development of both marketing and online and blended learning templates for future marketing and educational product campaigns. The results of this study could have residual effects on both the sponsoring institution and the targeted educational community that affect the cultures of both the institution and organization, as well as contribute to the body of literature on the marketing of educational products and services.

Literature Review

Marshall McLuhan (1964) predicted a "global village", over fifty years ago, and today, we are living in it. In this global community, it is crucial to develop personal and professional electronic development frameworks. Recent research has posited that there may be a relationship between an organization's level of capability in delivery of training and the barriers set up to detain it. One of the biggest obstacles is the entrenched culture of the organization itself (Berge & Muilenburg, 2001, Shaik, 2005). Often the challenges to the implementation of innovation, such as electronic instruction, come from the very establishment committed to its adoption. Organizations can be at different stages of maturity regarding their capabilities to conduct electronic education, but too often the organization is hurdling forward at such a brisk pace that training is developed and delivered without an audit trail of testing (2001). In many instances, little formative test-marketing is conducted when new programs are initiated, so action research can offer a "failsafe" opportunity for test-marketing that can also provide valuable insights into the needs of a community without the university administration losing too much valuable effort or money.

Many academic administrators seem to think that, when it comes to creating and marketing distance education programs, "if you build it, they will come" (Robinson, P. 1984). However, in the light of recent investigations into ineffective corporate university online programs, it may be more important than ever for administrators to evaluate the reasons why they want to increase their online programs and learn the lessons taught by successful marketers. Research on marketing new products conducted at Harvard has revealed interesting data on what kinds of marketing influences people to purchase products and these findings could shed new light on the importance of "the people factor" on the successful marketing of new products (Zaltman, 1997). The Zaltman study pointed to "word of mouth", most notably in the form of testimonials, were more successful in marketing a new product than media advertisements. The good news is that people will talk about something they are excited and feel good about, but the

bad news is that they will also talk about bad experiences too. So it is important to make sure that the product can be delivered consistently in order to get and keep positive testimonials from satisfied customers, and these findings can also apply to the field of education as well as business, as posited by results of this study.

Adoption of an innovation seems to occur more effectively when the innovation becomes assimilated into the culture of the environment (Fullan, 1991; Fullan, 1994; Robinson, 1995; Rogers, 1995; National Council for Educational Technology, 1995). Once the innovation becomes less threatening, employees, in this case teachers, become more comfortable and less threatened. As more employees (teachers) begin to use the innovation, they adapt their workstyles to use it and also begin encouraging their peers to try it. Adoption then comes next, so it is important to reinforce participants and encourage their progress throughout this step and the entire process in order to integrate the innovation (Robinson, 1995). But most important is the need to deliver what was promised to the target market and to be sure the key supporters and early adopters know that they are receiving what was promised. This is perhaps the most crucial lesson learned throughout the study: it is not as important to have a new and innovative "product" (and it is somewhat important to have some new "product") than it is to deliver what was promised. In other words, the potential supporters do not want to be promised "blue sky" then delivered something that bears no resemblance to what was promised, or worse yet, to not have the "product" delivered at all. (In this instance the "product" was an entire Master's Program that could be delivered in both face-to-face and blended environments to a school district 50 miles away from the university "pitching" the new program).

One study on change related to new technologies, standards and assessments (Bourner, Katz & Watson, 2000), looked at what new directions universities could take with respect to technology and education in a global community and eLearning development frameworks. The research did not analyze technology, best practice, or which factors could influence participation, but focused on internal development frameworks, particularly with respect to collegiality, professional training of faculty, personal collaborations and professional collaborations (Bourner, Katz & Watson, 2000). The study seemed to reinforce what the researchers' of this study found, and that is, there needs to be consistency in promising specific deliverables and being sure those deliverables are consistently provided. In the instance of this study, the marketing representatives worked well with school district administration and prospective students, and did so consistently, so a bond of trust was formed that proved invaluable to the support and delivery of the innovation.

A interesting piece of literature from New Yorker staff writer Malcolm Gladwell (2002) supports the collaboration concept, or at the least, a contagion of communication, and points to the "word of mouth" factor as being one of the most important to the ongoing success of an innovation. Gladwell purports that there are three identifying characteristics to successful products or marketing efforts. These are:

      one, contagiousness; two, the fact that little causes can have big
      effects; and three, that change happens not gradually but at one
      dramatic moment-(these) are the same three principles that define
      how measles moves through a grade-school classroom…
      of the three (identifying characteristics), the third trait-
      the idea that epidemics can rise or fall in one dramatic moment-

is the most important, because it is the principle that makes sense
of the first two and permits the greatest insight into why modern
change happens the way it does. The name given to that one
dramatic moment in an epidemic when everything
everything can change all at once is (called) the "Tipping Point." (p.9)

But the tipping point can be a pendulum; swinging both for and against, the innovation, so it is important to assure consistency in the ongoing delivery of a new product over a longer period than an initial trial "honeymoon" period of time. Short-sighted timelines for implementation of new programs can have exactly the opposite of the desired effect, but once the innovation gets a "bad" or "negative" reputation, it is much more difficult, and sometimes impossible, to regain lost territory. A number of other studies also support the importance of collaboration and the keeping of promises (Clark, Moss, Goering, Herter, & Wascha, 1996; Faber & Green, 2001; Giarratano & Gannon-Cook, 1999; Havernik, Messerschmitt, & Vandrick, 1997; Haverschmidt, Smith1998; John-Steiner, Weber, & Minnis, 1998; Larson & LaFasto, 1989; Robinson, 1995; Shaik, 2005; Stribiak & Paul, 1998).

Another study that addressed adoption of an innovation reviewed obstacles to distance education (eLearning) implementation in higher education. This study posed that business and academic organizations can be at different stages of maturity regarding their capabilities to integrate an innovation, in this case, eLearning (Berge & Muilenburg, 2001). The survey posited there may be a relationship between an organization's (or community's) level of capability in adoption and the barriers to adoption. The greatest obstacles in the study were reported to be:

(1) Employee (faculty) compensation and time taken to do innovation;

(2) organizational change of the culture of an organization. In the early stages of integration, the struggle mainly focused upon changing the culture of the institution;

(3) the lack of technical expertise and support;

(4) evaluation/effectiveness issues increase as innovation, in this case educational programs, is increasingly used; and,

(5) user support services necessary for innovation.

The researchers in the southwestern university marketing study found these five items to be challenges in the implementation of their marketing program because their target group was a school district. Teachers are usually time-challenged, entrenched in a culture resistant to change, without tools and support to enforce and integrate the innovation (Berge & Muilenburg, 2001; Bonk, 2001; Bonk, Kirkley, Hara, & Dennen, 2001; Clark, Moss, Goering, Herter, & Wascha, 1996). This knowledge helped the researchers to amend their marketing plan to include more face-to-face support to nurture new candidates to join the Master's and certificate programs, and

to continue maintaining that support by initiating reasons to visit sites, follow-up with requests, and provide technical expertise to program participants.

Research on team management and of other types of innovations, including eLearning projects, pointed to the importance of the innovation's adaptation and reinforcement in both

environmental and cultural contexts (Kaufman, 2000; Larson & LaFasto, 1989). This can be accomplished by reinforcement of collaborations, by delivering the product promised, and by providing service and encouragement to the customers (in this case the teachers and school district administrators who use and support the innovation) (Faber & Green, 2001). In this instance, this meant the southwestern university needed to reinforce its commitment to its collaborators that it would deliver and maintain these blended graduate and certificate courses. If these things are done, the delivery of the product promised, the provision of consistent and reliable service, and the encouragement and support to the adopters, then the innovation becomes further integrated into the fiber of both the provider's (the southwestern university) and the customer's (the school district) culture (Kaufman, 2000; Robinson, 1995; Rogers, 1995; Rogers & Shoemaker, 1971; Stribiak & Paul, 1998; Varagoor, 1998; Wolcott, 2002).

Adoptive Behaviors, self-determinism, competence, tendency for success and tendency to avoid failure, all contribute to successful participation in an innovation, in this case, the marketing of the Master's Degree and certificate programs. The five attributes of innovation, developed by Rogers and Shoemaker (1971), are:

- relative advantage;

- compatibility;

- complexity;

- trialability;

- observability and assess for the potential adoption capability of the innovation within the culture of the population sampled.

These attributes also serve well for action research. Findings of this study suggest that one primary requisite to adoption of an innovation is that it must be perceived as simple to use and maintain if it is to be successfully implemented (Allan & Wolf, 1978; Gannon Cook & Crawford, 2001; Robinson, 1995). Another requisite is that the innovation must be supported and maintained by the sponsoring provider. Again, the delivery of the product promised and the ongoing accommodation of that product are paramount to the innovation's ongoing success.

Methodology

This study utilized a qualitative research methodology, action research, to apply the observations used in educational research to a higher education marketing program. One of the researchers acted as action researcher as well as marketer and was embedded in the marketing team. The marketing team consisted of the department chairperson, one marketing specialist, several volunteer professors who actively marketed the program, and a remote-site campus director who agreed to offer the Master's and certificate programs in blended online and face-to-face classes.

Action Research

Action research is "the practical application of the scientific method or other forms of disciplined inquiry to the process of dealing with everyday problems" (Vockell & Asher, 1995, p. 445). The term action research evolved from actual research conducted informally in

Kindergarten through twelfth grade (K-12) classrooms by teachers who needed to find expeditious solutions to classroom problems (Gay, 1987, p. 8). Data collection was observed by the teacher as researcher who would journal the process of discovery and provide a chronicle that would describe the steps taken as well as the solution that solved the problem.

In earlier action research studies, the teacher often began the study with a new classroom initiative that needed documentation, then the teacher organized and analyzed the qualitative data from the study throughout the initiative's implementation and reported the findings upon completion of the initiative's implementation. Through the last fifteen years, action research has come to be a reliable source of data and has provided valuable insights to teachers in the field and has been acknowledged as an excellent source for important archival data. It is now used not only in both K-12 settings, but in both higher educational and training and human performance settings. "In action research the emphasis is more on what practitioners do than what they say they do" (Avison, Lau, Meyers, & Nielsen, 1999, p. 93). The action research approach is "value-driven, attuned to power issues, committed to stakeholder participation, and action-oriented" (Nelson, 2004, p.389).

The origin of action research has been attributed to organizational trainers such as Kurt Lewin (1951) as a collection of problem-solving cycles for improving organizations. "The term 'action' captured the notion of a disciplined inquiry in the context of focusing efforts to improve the quality of an organization and its performance" (National Literacy Secretariat, n. d.). The research process involved identification of the project; analysis; planning; observing; evaluating; amending; and beginning the cycle again.

The integration of theory and practice is the key to action research. (National Literacy Secretariat, n. d.).

> The value of action research is that it represents a scientific
> approach to problem solving that is considerably better than
> change based on the alleged effectiveness of untried procedures,
> and infinitely better than no change at all. It is a means by which
> concerned school personnel can attempt to improve the educational
> process, at least within their environment…True progress
> requires the development of sound theories having implications
> for many…not just one or two. One sound theory that includes 10
> principles of learning may eliminate the need for hundreds of
> would-be action research studies. Given the current status of
> educational theory, however, action research provides immediate
> answers to problems that cannot wait for theoretical solutions.
> (Gay, 1987, p. 9)

The Marketing Study

In this study, the initial marketing program was designed to appeal to a limited geographic radius so that the marketing program effectiveness could be tracked to a specific marketing code and also to a physical campus location. The program campaign targeted a very

large school district within fifty miles of the university and the initial campaign was to market a Masters degree in Instructional Design and a certificate program to the school district.

The marketing campaign took place over a one year-period, and the implementation of the marketing campaign was rolled out over the second six months and following year. The faculty from the southwestern university who elected to participate in the marketing team were given six months initially to design the basic marketing campaign, test and implement it. The team was provided with a very small marketing budget, enough to make copies of flyers and to sponsor some in-person presentations to the school district that included cookies and soft drinks. They were also provided with some travel reimbursements for mileage to the school district to which the marketing campaign would be targeted. Rapid marketing campaign prototypes were developed and several onsite promotional presentations were held to encourage school district participation in the marketing program. The action researcher provided the reports and journals to the team at the end of the initial trial period, then the university monitored and reported the results of the program at the end of the first and second year (of the program).

Analysis of the Action Research Conducted in this Study

Since the plan took longer than originally scheduled, adjustments in the rollout cycle of the program implementation were made to accommodate the extended timeframe program execution.

The first discovery by the lead marketing faculty team member was also the first project setback; it was the uncovering of a problem that could have been a "deal breaker", a prior university marketing program that had devastating effects on the same community targeted for this study. That first marketing program had begun very successfully and had continued for two years, but was then adjudged by the university to be too expensive to maintain, so it was summarily dropped with little notice to the community. So when that program was pulled, the students were forced to take online courses from their university when they were available, or travel 50 miles to the university to complete their degrees. This had caused the school district both emotional and financial pain for the teachers in the program. Many ended up being forced to discontinue the program. This also caused considerable chagrin and the embarrassment to the school district: the administrators felt they had been "baited and switched."

Ironically, despite the huge potential for problems presented by this prior disastrous experience, the school district was willing to enter an agreement with the southwestern university once again to help their students attain the Masters degree and certificates. The district administrators expressed hope that the new university staff involved in the marketing campaign would deliver what the university promised this time. The researchers documented every meeting and the results, then provided a chronicle of the rapid prototypes of the program.

The action researcher reported the following observations and findings:

- The marketing plan was projected to be offered to an educational market in need of the Master's Degree in Instructional Technology and Instructional Design (ID) Certificate Program;

- The data on the educational market covered basic information and the marketing plan was created in response to requests from individuals in that area, so there was reasonable belief that the implementation of this marketing plan could yield enough students to people the Master's Degree and very possibly the ID Certificate Program;

- Obstacles were greater than anticipated, but with rapid prototyping of the marketing plan, objections were addressed and the plan was implemented successfully;

- The recorded dialogs depicted an evolving fiduciary relationship between the university and school district that forged a stronger bond than in years past.

The final reports of the university at the end of the first and second year of implementation showed a 49% increase in the enrollments: an increase of 24% over the last five months of the first year (January through May 2003); and an increase of 25% over the second year (May 2003 through May 2004).

What Succeeded in the Study

The initial project took six months longer than originally anticipated, largely due to the hesitancy by the school district to initially participate in the marketing program based on their prior experience with the southwestern university. However, after trust was cultivated, the initial rollout of both the Master's and certificate programs were completed by the end of the first year and revisions were done on an ongoing basis by the marketing team. The researchers attributed the success of the Master's and certificate programs to the university's delivery of exactly what was promised to the school district administrators.

Discussion

Lifelong learning is going to become more prominent for most 21st century citizens as more people compete for fewer jobs in a global job marketplace (United States Distance Learning Association, 2001). So incentives that offer educational opportunities, including degree or advanced-degree seeking opportunities, and skill-specific training certificates, will continue to increase with this need. It will be important to find innovative and cost-effective ways to market new programs and reach as many candidates as possible for these programs. While research on marketing should include "how to" avoid failure, its primary purpose should be to study how to anchor positive and sustained outcomes for new educational innovations (Robinson, 1995; Schott & GannonCook, 2001).

The Institute for Higher Educational Policy (2000) established several bookmarks for successful technology diffusion, and these bookmarks can also apply to most innovations:

- technical assistance throughout the process of implementation;

- (personal and ongoing) assistance in transition to DE (the innovation);

- continued assistance and DE (innovation) training (Bower, 2000; Institute for Higher Educational Policy, 2000).

Rogers (1995) found that certain attributes predict adoption of technology: relative advantage, compatibility, complexity, trialability, and observability (Wolcott, 1997). When the innovation is perceived to be better, and consistent with the adopter's needs and values, the faculty member will be more likely to try the innovation. Once tried, if the result is successful, then it will be adopted. These principles certainly held true for this study; the action research collected from the marketing team supported the findings of the research cited herein, that positive expectancy led to adoption, delivery of the promised product was met with expectancy, and consistent delivery of the product led to outcomes of user-satisfaction and adoption (Berge & Muilenburg, 2001; Bourner, Katz & Watson, 2000; Jacob & Hellstrom, 2001; John-Steiner, Weber, & Minnis, 1998).

Summary

The first step towards successful acceptance and integration of an innovation introduced through a marketing campaign is to obtain feedback and deliver the product that was promised. While this is the most obvious of conclusions, it seems to be one that often escapes implementers of innovations. And failure to consistently deliver the product promised may result in loss of confidence and even prevent future opportunities. So, while this is a simple lesson in marketing, the moral of the story is exactly that…there is a moral: consistently deliver what is promised, and if possible, perform even better than expected. The researcher and participants in this study would also recommend including action research in any marketing studies. Action research, if included in the initial marketing campaign, can expand upon the body of knowledge in the research areas of innovation, and diffusion of technology. The learning environments in the next millennium could greatly benefit from these studies.

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IP-Based Conference Management Systems: The (R)Evolution of Synchronous Communication in Distance Education

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Abstract

This paper delineates our current practices by sharing experiences of using synchronous communication tools for instructional purposes. We argue that both synchronous and asynchronous interactions in distance education are able to contribute a synergetic effect to student learning achievement. While this technological symbiosis is correlated with administrative support and resources, instructors are advised to look into freeware programs on the market and to meditate on the instructional use of these real-time communication tools. Recommendations for practitioners are outlined.

Introduction & Background

With the level of synchronicity now available to virtually anyone with access to a telephone and a computer, one would expect that the technology that revolutionized the way businesses communicate, would also find its way into distance education programs. Nevertheless, asynchronous communication continues to dominate the distance education scene. From interesting experiment to exciting frontier, desktop videoconferencing is quietly moving from revolution to evolution, and it is time we gave it a second look.

When desktop videoconferencing made its debut in the mid 1990s, it appeared that Web-based distance education was on the verge of a major communications revolution. However, after a brief period of experimentation, desktop videoconferencing was abandoned by most distance education providers before it had a chance to fully evolve. Initial tests were plagued by setbacks including expensive hardware and software, poor frame rates and audio reception, jerky or frozen images, limited bandwidth, limited capabilities, and incompatibility issues. As asynchronous Web-based distance education programs flourished, synchronous programs faded. However, within the past five years, several key technological issues have been resolved, making synchronous communication less expensive, more powerful, and available to more people. This renewed viability suggests that distance educators give synchronous communication tools a second look to determine how they can contribute to distance education, establish how they should be integrated into a coherent online pedagogy, and justify the rationale for supporting them in distance education courses.

Review of Literature

From Revolution to Evolution

A revolution is a drastic and far-reaching change in ways of thinking and behaving. If the change is slow, gradual, or progressive it is called evolution. Despite their slow start, IP-based audio and video conferencing tools have the potential of revolutionizing the way distance education courses are delivered. However, due to convenience as well as other factors, asynchronous communication has been institutionalized into the vast majority of Web-based distance education programs. Yet, according to Haefner (2000), synchronous and asynchronous communication can work symbiotically in online classes. In an opinion paper titled *The Importance of Being Synchronous*, Haefner wrote:

> It is hard to imagine teaching without both these modes of interacting with our students, and I can't believe many teachers would want to handicap their teaching by relying on just one of them. But anecdotal evidence suggests many online teachers do exactly this, and rely almost exclusively on asynchronous communication….Computer-aided instruction that is solely asynchronous cannot possibly convey any kind of immediacy. If it takes days, or even hours, for students to get a response to a question, many students will lose the intellectual thread – and the urge to follow it. (¶ 5)

The Right Tool at the Right Time

As with most instructional tools, there are many advantages, and potentially disadvantages, to synchronous and asynchronous communication. The key to successful implementation is to know when to use the right tool at the right time for the right purpose. Collis (1996) identified four significant advantages of synchronous over asynchronous systems:

- Motivation - synchronous systems focus the energy of the group
- Telepresence - real time interaction builds a sense of social presence and involvement
- Feedback - synchronous systems provide quick feedback and support consensus and decision making
- Pacing - synchronous events encourage people to keep up-to-date and which helps people to prioritize their studies

Two additional advantages can be added to this list:

- Spontaneity - synchronous events make it easy to add new ideas to the conversation.
- Familiarity - synchronous systems can simulate a more traditional environment.

Student Perceptions of Synchronous Communication

In an informal survey of graduate students enrolled in an online class, two questions were asked: (1) what form of Web-based communication do you feel is more efficient for facilitating group discussions? (2) what form of Web-based communication do you prefer in your online courses? 39 students participated in the survey. For the first question, only 12 students (30.8%) responded that asynchronous communication was more efficient than synchronous communication while 27 students (69.2%) believed the opposite was true. Yet, in response to the second question, only 3 students (7.7%) responded that they preferred synchronous communication in their online courses. Despite the perceived efficiency of synchronous communication, a clear majority (69.2%) responded that they preferred to communicate asynchronously in their distance education courses.

Along with the prior literature, this internal survey illustrates a trend in distance education programs of emphasizing convenience over efficiency. This dichotomy is understandable when one considers the needs of adult learners. On the one hand, they need and desire feedback and interaction between and among their peers and instructors. On the other hand, they also need flexibility and convenience to balance busy schedules to work around professional, family, and learning responsibilities. The results of this survey underscore the need to find a balance between synchronous and asynchronous communication in distance education programs, exploiting the benefits of both while minimizing their shortcomings.

Practices

At the University of Texas at Brownsville (UTB), our fully Web-based Educational Technology Program is fortunate enough to receive resources from both the UTB and the University of Texas TeleCampus (UTTC), where most of our graduate courses are facilitated through. We have been able to adopt the following synchronous communication tools:

1. Audiobridge – an audio conferencing service provided by the UTTC, where students call in to participate
2. BlackBoard – a course management system available through both UTB and UTTC, where students type to communicate
3. Skype + Festoon – a voice-over-IP Internet phone, where students take part in a voice (or text) chat and share files at no cost
4. Macromedia Flash Communication Server – the "engine" of Macromedia Breeze, where learners enjoy video/audio/text conferencing
5. Horizon Wimba LiveClassroom – an advanced virtual classroom that has more communication features than the first four products

An audiobridge uses a traditional telephone land line to host a multiluser conversation. Currently, this service is offered by the UTTC to its constituencies almost 24/7. A conference call initiator, who is usually the instructor, schedules a conference at least 48 hours ago by simply submitting an email or telephone request to the UTTC (see Step 1 in Figure 1). As soon as the request is fully processed, a phone number is then generated and emailed to the instructor. The instructor then forwards the email to the class along with the instructions. From the instructor's perspective, there is one major drawback -- such service does incur some long distance call fees to students.
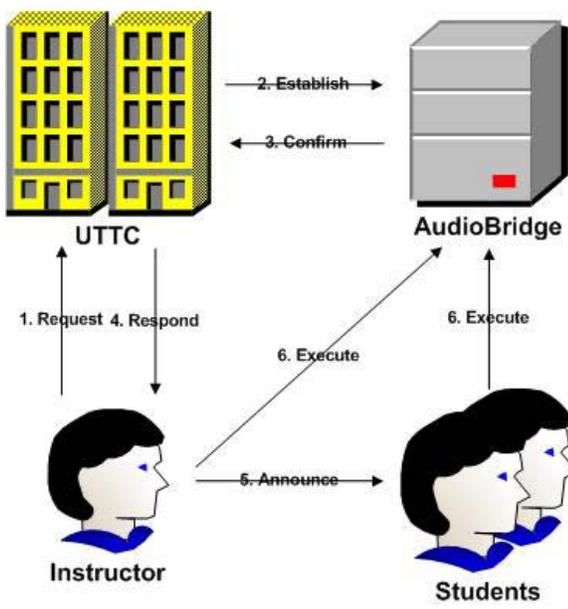
Figure 1. The procedural map of Audiobridge.

Blackboard is a popular vendor's product that features text conferencing (see Figure 2). Instructors can create as many chat rooms as needed to facilitate the text chat sessions on the class and group levels. The archive feature allows for future references and clarifications. Blackboard's licensing fee is increasingly becoming a concern to many university administrations as hosting costs continue to rise unabated.
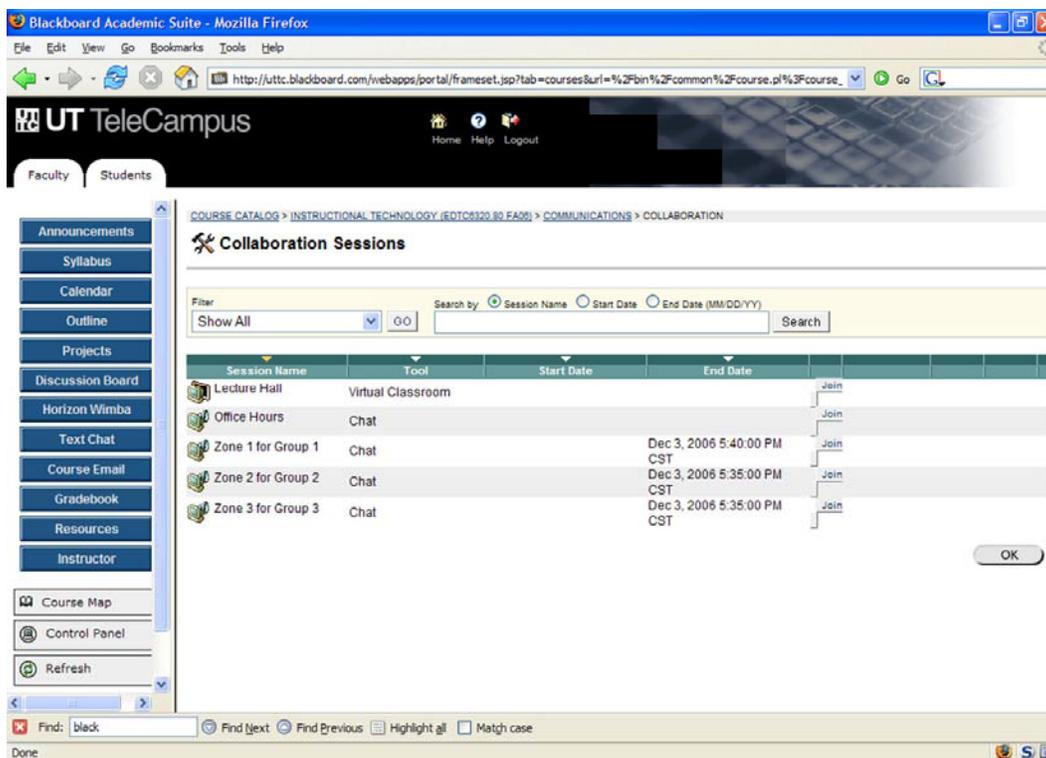
Figure 2. A screen shot of Blackboard Collaboration (a.k.a. Chat).

Recently bought by eBay, Skype is a voice-over-IP voice messaging system, and it uses the peer-to-peer (P2P) technology. P2P technology can potentially provide vulnerability to network security, and is arguably the main reason why P2P and related applications are not so popular among most campuses from their administrators' viewpoint. Skype offers free PC to PC calls for up to five people (including the conference call initiator/host). Festoon works as a video plug-in program of Skype and claims that it can serve up to 200 users in one video call (see http://www.santacruznetworks.com/products_Festoon.html). Once Festoon is installed, it shows on the top right corner of the Skype window (see Figure 3).

Figure 3. A screen shot of Skype with Festoon activated.

Macromedia Flash Communication Server, recently renamed Macromedia Flash Media Server, is a software product that is the "engine" of its famous sister product, Macromedia Breeze (now Acrobat Connect Professional), a Web communication (management) system. For under-funded institutions, Macromedia Flash Media Server may be a cost-friendly option. There are websites, such as http://echo.ryerson.ca/index.html, which share scripts for Macromedia Flash Media Server users. At any rate, potential users must be knowledgeable about ActionScript, a programming language specifically for Flash. Figure 4 below presents an interface that includes areas for (from the top) log in, PowerPoint slides, text chat, and video (on the right), as well as an audio platform.
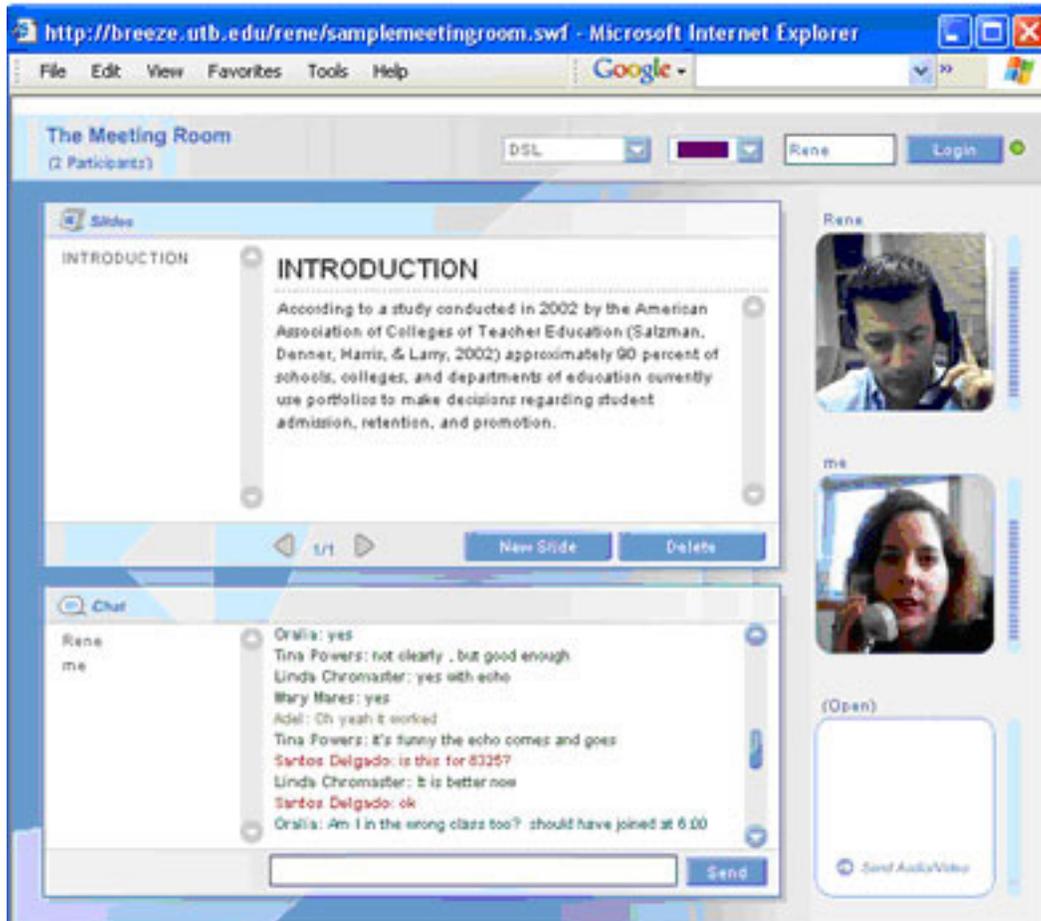
Figure 4. A screen shot of Macromedia Flash Communication (Media) Server.

Horizon Wimba Live Classroom, another vendor's product, can provide nearly all kinds of the aforementioned interactions. Yet, this "Rolls-Royce" type of conference/communication management system does not come with a cheap price tag (e.g., licensing fee). Just like Macromedia Flash Communication Server and Skype, Horizon Wimba Live Classroom's end-users (i.e., the instructor/presenter and the students/participants) are advised to adopt a headset with a microphone on it and to subscribe to a wired (as opposed to wireless) high bandwidth Internet service for video/audio quality purposes. These requirements add expenses on the end user side. An up side is Wimba's user-friendly interface and the fact that Wimba fits seamlessly into Blackboard. Figure 5 below shows a screen shot of the Horizon Wimba Live Classroom integrated into Blackboard.
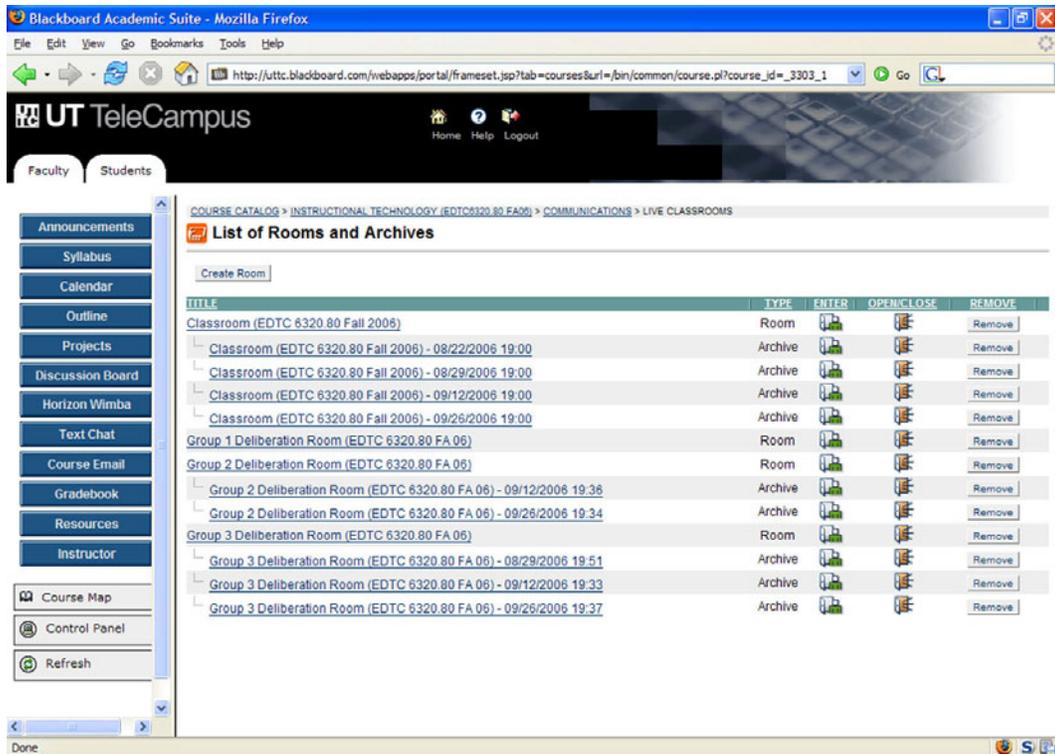
Figure 5. A screen shot of Horizon Wimba Live Classroom, embedded in Blackboard.

Recommendations for the Practitioners

Effectively integrating synchronous communication into an asynchronous online environment requires structure and effective conference moderation of the discussions. The following tips are recommended:

- Decide what your objectives are for using synchronous communication.
- Outline the rules for participation in your syllabus.
- Be organized. Successful sessions need to be planned carefully. Prepare a focused topic in advance for each session.
- Hold an orientation at the beginning of the semester, where protocols and features are demonstrated and disseminated.
- Have a "Plan B," in the event of technical problems.
- Allow time for questions.
- Inform learners of your expectations.
- Schedule formal or informal practice sessions, of which "a feature of the day" is re-introduced.
- Separate group deliberation rooms (e.g., Group 1"Chowhounds") from the class discussion room (e.g., Town Hall).
- Use audiovisuals when appropriate in the synchronous sessions.
- Be flexible. Any live conversation can potentially metamorphose into the "teachable moment." Be ready to move in whatever direction the discussion may lead, but be prepared to redirect the conversation if it goes off-topic.
- Be aware of students who do not to participate. Determine if their nonparticipation is due to a technical or skill problem, or a certain reluctance to engage in classroom dialogue.

Summary

Clearly, in the evolving world of distance education, synchronous communication has a significant role to play. While asynchronous delivery of instruction continues to play an important part in providing instruction that is

free of time, place and scheduling, the synchronous approach adds immediacy, live interaction and personal contact. This type of interaction is endorsed by Wang and Newlin (as cited in Pan & Sullivan, 2005, p. 27) who argue, "…asynchronous tools are viewed as the backbone and muscle for the subject content, whereas synchronous media…are the heart and hustle of online courses." Both forms of instructional strategies can peacefully co-exist if care is taken to appreciate their relative strengths and weaknesses. As with all technology and the technological symbiosis, care should be taken to match the technology to the learning objectives, the instructional activity design, and attributes of the students.

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The Effectiveness of different podcast formats, usage patterns and styles of podcasting in delivery of curriculum materials Comparative Survey/Test Snapshot of a Trend or Opportunity: Podcasting Mobile Media Delivery to the NetGen

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Description

The School of Communication at the University of Houston is studying the benefits of podcasting in the distribution of specific curricular content. Various entities within study group are investigating podcasting and its potential place in Academia, usage and impact in higher education. This paper will attempt to analyze student use of podcasting as a delivery medium for supplemental materials, preferred type of podcast, and student perceptions in benefit and learning.

Abstract

We are already reading about and experiencing the use of podcasting as a tool in the classroom. However, are the students benefiting? Is it just a fad? Is this really some form of flash learning? The uses of the iPod or other mobile media device are some of tools by what has been termed the "NetGen" or iGeneration (Wikipedia) group of students today use. Since its introduction in 2004 the iPod has seen its usage rise to the top of the list of all other mobile media delivery devices. It has also taken a foothold and rise in the academic field as a possible media delivery portal or path to the students who belong to the iGeneration or that group of students who consume and use the Internet and mobile media and their devices on a daily basis. Podcasting delivers an electronic message that can be downloaded and playbacked on a personal, mobile media device or MMD. More and more, educators are experimenting with podcasting; and it is a means to an end for educational content delivery.

As part of an investigation team, we plan to see if we can take a snapshot of how students enrolled in the large lecture classes might benefit from supplemental materials delivered via podcasting. We would also like to examine the types of podcasts used, where and how the podcasts are viewed, and if these podcasts beneficial. There is also a mobility issue: Might the students use the material via a computer connected to the Internet using an aggregator like iTunes, a portable MP3 player iPod?

The designs of the investigation are to gather data based on surveys and test scores, and compare that data to a control group. At the School of Communication the course Introduction to Media Production will be used. The textbooks and lecture materials such as PowerPoint presentations will be the same. Each class will be taught in the face-to-face lecture style. The use of in-class technology will consist of a projection system utilizing PowerPoint presentations as support to the in class lectures. These PowerPoint presentations will be posted in WebCT so students may retrieve them from this web-based tool. The same multiple-choice tests and exam dates will be assigned. One class will have the opportunity to download the podcasts and use them, the other will not. It has been accepted and even expected that the class where the podcasts will not be made available could find access to them.

Each format will also be different in its design. The audio version will be the actual lecture delivered that week. The podcast can be downloaded to most mobile media devices. The Enhanced Podcast will include photographs of items on the PowerPoint presentations. They are not the lectures but talking points, which have limited distribution base on mobile devices. The video cast will be short; it will be between 1 to 5 minute vignettes from topics in the textbook. These topics will be included on the tests, and students are expected to understand in order to lay a solid foundation for their education at the School of Communication. These video podcasts will also serve a training opportunity for the School of

Communication Media Production Curriculum. The instructor using the podcasts will be the designer of the content, voice narrations and part of the videos too.

Podcasts can be delivered in three formats, audio only, still images with audio the enhanced podcast or full motion video with audio in near DVD quality. The class will be presented all three formats. Data will be on:

- Which format do students prefer, audio only, enhanced (stills with audio), video, or all?
- Which platform do they prefer to access Podcasting, iPod, computer, or other media device?
- Where, when, how often do students access podcasting?
- What is the students' feedback on the usefulness of Podcasting.

Since not all students will have iPods or media players that can playback these podcasts, the students have an opportunity to still use them as long as they have access to computer with internet connection. These students will be able to use iTunes on their computer, the aggregator, to access the podcasts or save then to harddrives or burn to CD. Survey data will be gathered on this usage as well.

The data will be gathered in simple surveys distributed to students through out the semester. The test scores will also be reviewed as possible indicators to what the podcast may if any. The data will be compared to another class, which will be taught similar curriculum, and the lectures will use WebCT as supplement but without the access to the podcasts.

The class, which is not instructed to the podcast, is believed to most likely gain access to the podcasts and use them. An anonyms survey will be given to this class as an attempt to seek the data on usage and possible effects.

This investigation is just the beginning of trying to track patterns of usage in what some view as a trend in the educational field. Podcasting could be another tool to further education, and reach a generation of students who can learn in a mobile environment. It is whether content delivered is retained and used by these students along with the how when and where that can better facilitate the message delivered by the educator.

Survey Instrument

The University of Houston Podcasting Survey was conducted in the Spring semester of 2006. One hundred sixty one (161) students participated from 4 classes in 2 courses, which the data was gathered from. Students were enrolled in Communications 3353 Web Technologies where one class was conducted on line and the other was taught face to face. The second course was Communications 2320 Introduction to Media Production with both classes taught face to face and both larger lecture formats. One section of 2320 had access to the podcasting material form the beginning of ht semester, while the other section introduced podcasting at midterm

Students where given same Survey Instrument at the end of the Spring Semester 2006. The Survey consists of 7 Sections that gathered data on Demographic information, What type of iPod used, What type of MP3 player used, Use while involved in other activities, Podcasting course material, Podcasting and learning styles and study habits, and lastly Podcasting and learning effectiveness.

Demographic Information.

The study's sample population was predominately in the 20-25 year-old are range, which places them in the iGeneration group. This generational group tends to be raised using the Internet, MySpace, and iPod (Wikipidia). Over 80% of the sample population had high-speed Internet connections with only 11% on slower dial up lines. This group is much more adapted to quicker access to Internet materials as the survey supports. They have been using the Internet for much longer as well, with over 60% of the respondents

having over 8 years of usage. Format of the course was important as well, traditional face-to-face, no online usage, traditional face-to-face, some online usage, hybrid/blended class (50% or more online) and fully on line.

What kind of internet connection(s) do you have?
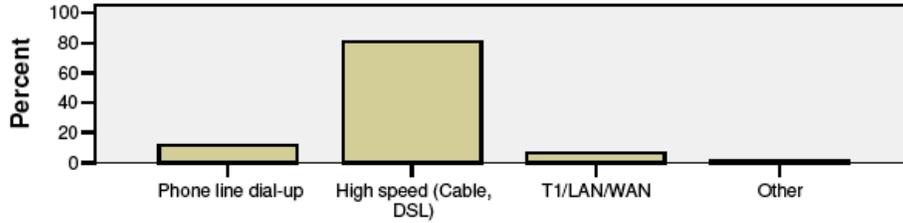
How long have you been using computers?
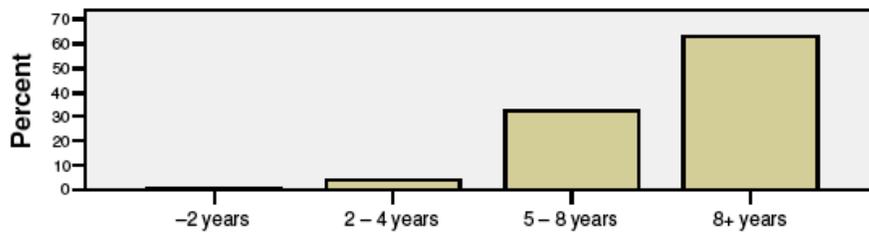
What is the format of the course you are currently taking?
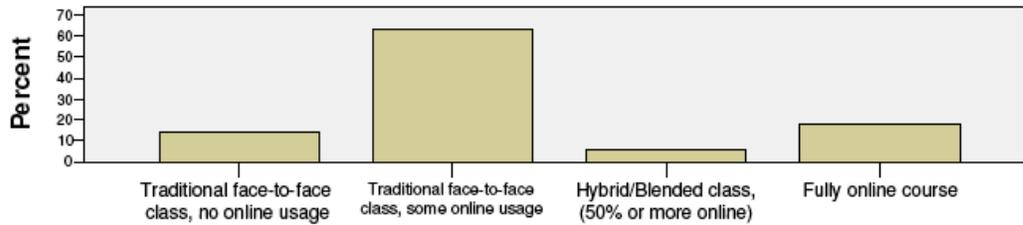
Mobile Media Device (MMD) Ownership

Ownership of mobile media devices (MMD) like iPod models and other MP3 devices along with the knowledge of podcasting was gathered. In one of the Web Technologies courses the video iPod was distributed to the students, all other surveyed courses the student had to have their own. Student could still access the Podcasts using their computers if they did not have an MMD or if they choose too. Further questions involved usage of the devices, and preferred use by the Student.

Did you know what a podcast was before you took this course?

Yes
No

42.52%
57.48%
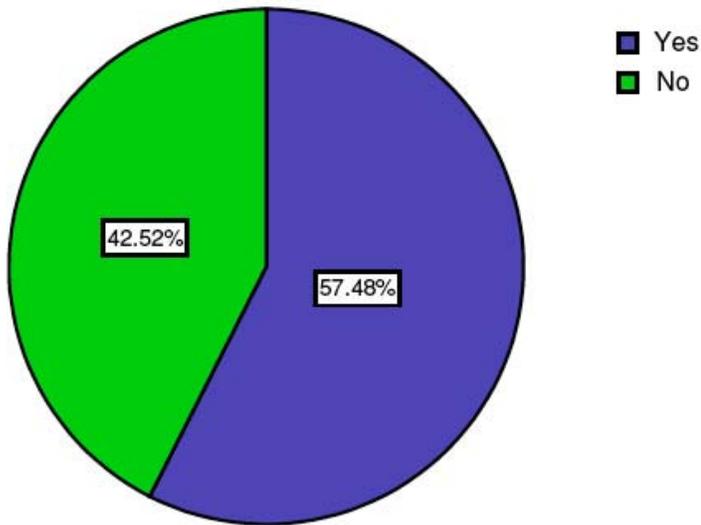
Did you ever listen to a podcast before you took this course?

Yes
No

31.5%
68.5%
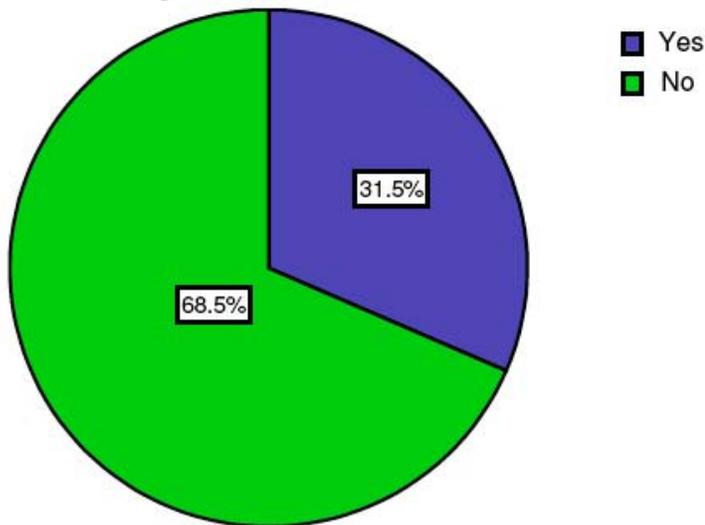
As seen the majority of the student population, over 57% knew what a Podcast was before the survey semester, but only a little over 31% had actually listened to a Podcast. This would give the indication that the students where aware of the technology, but it was still under utilized.

The term Podcasting can seem to be exclusionary, being so closely associated with various iPods models and the Apple computer product line. Podcasts can be view on PC computers as well and Podcasts can be downloaded to other non-iPod MP3 players. Students were allowed to use the MMD of their choice.

Indicate which model(s) of iPod(s) you currently own
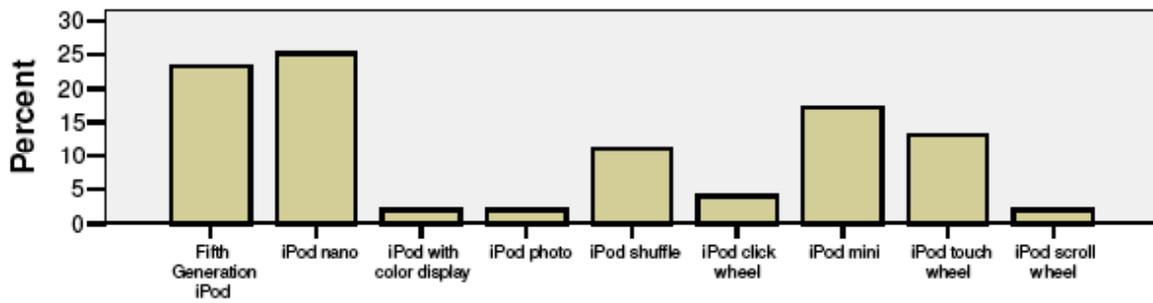
How many hours do you use your iPod a week?
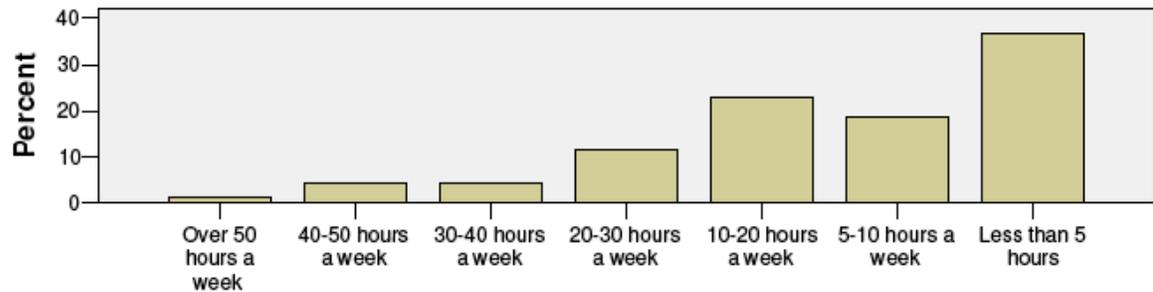
When do you prefer to use your iPod?
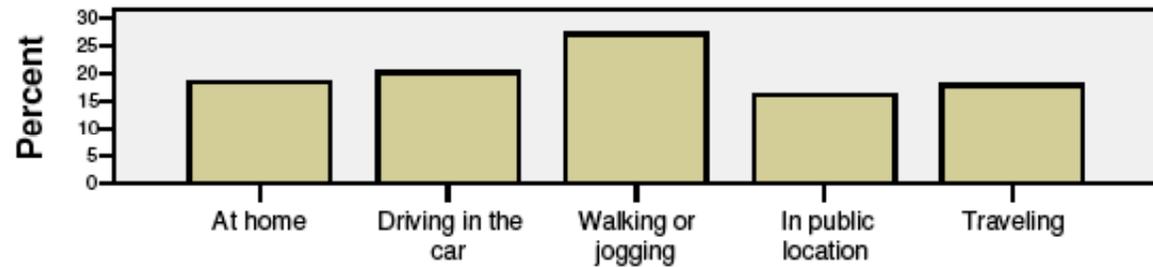
What activities do you do most with your iPod?
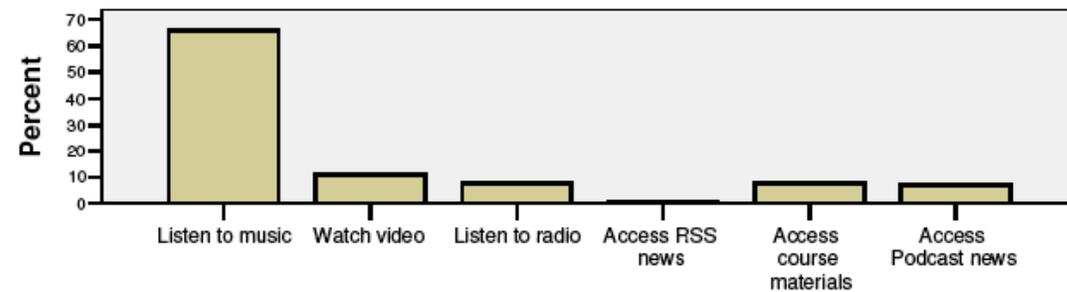
How many hours do you use your MP3 player a week?
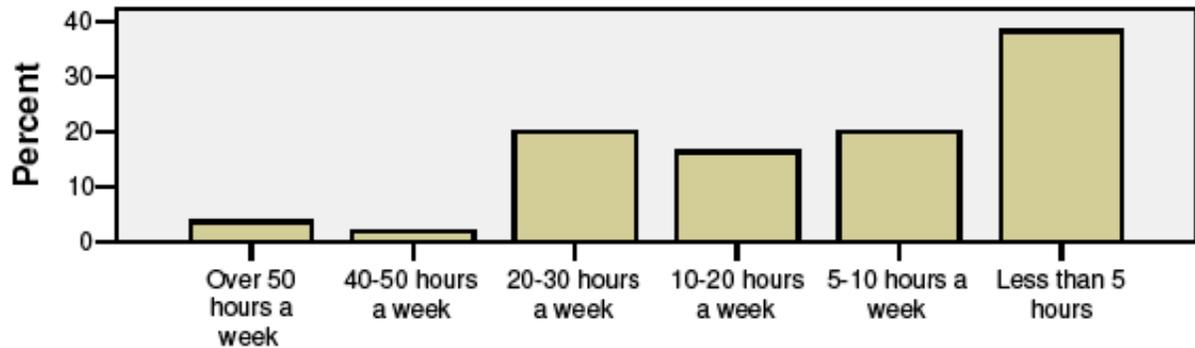
When do you prefer to use your MP3 player?
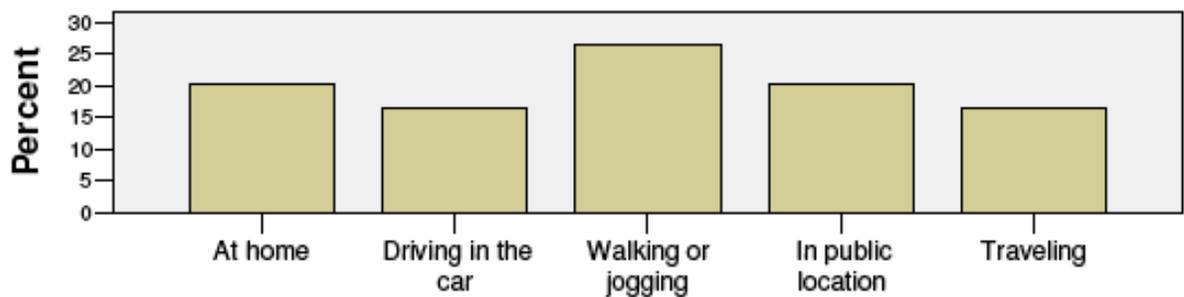
What activities do you do most with your MP3 player?
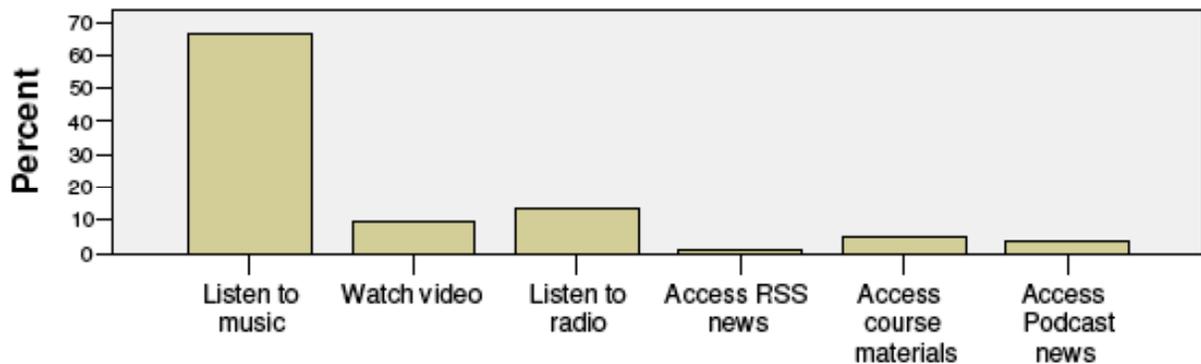
Here the data gathered supports whether the student has an iPod or other MP3 device. The usage patterns are similar in hours used, when used, and with music being the most reported activity. This is not surprising as these devices are targeted as personal music players, yet one can see that if offered the student would also access course materials if made available.

Student Usage and Formats

The survey found a wide range of reasons students chose to access course material via the podcast. There was no favorite delivery style; audio cast, enhanced cast or video cast. Yet when further questioned, over 56% of the students stated a preference for video casts as it most suited their learning style.

Majority of the student's surveyed are using their mobile media devices less than 5 hours to access course materials, this data could help shape, how the podcast formats should be in content and duration. Possibly short duration messages, or burst messaging, would benefit in the restrictive technological confines of the mobile media devices. The survey supported this concept as shorter messages were constructed for the enhanced or still image format and the video format as well. Audio casts where usually longer as they where full lectures by nature, but these to can be packaged in chapter format allowing the student to skip through the lecture to better benefit their learning.

As a new and developing method of course delivery, the responsibility well be placed on the educator to present different possible applications of the technology to the student population. Presenting course materials through a different channel will not be enough. Integrating this technology in to the daily learning experience will be vital. Our survey supports this.

The length of the podcasts were:

Legend:
- Too long
- Just right
- Too short

1.64%
17.21%
81.15%
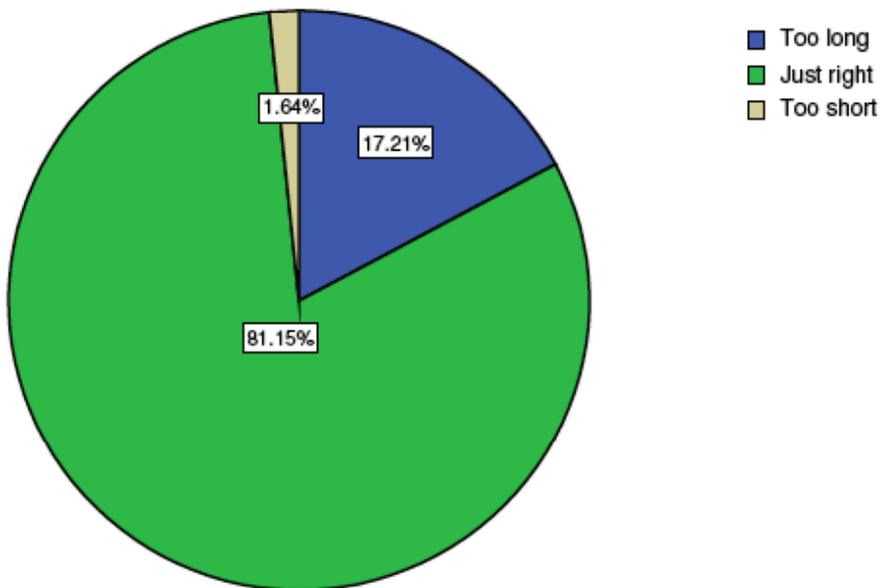
Please rate the following delivery quality of podcast course materials. (Still Images)
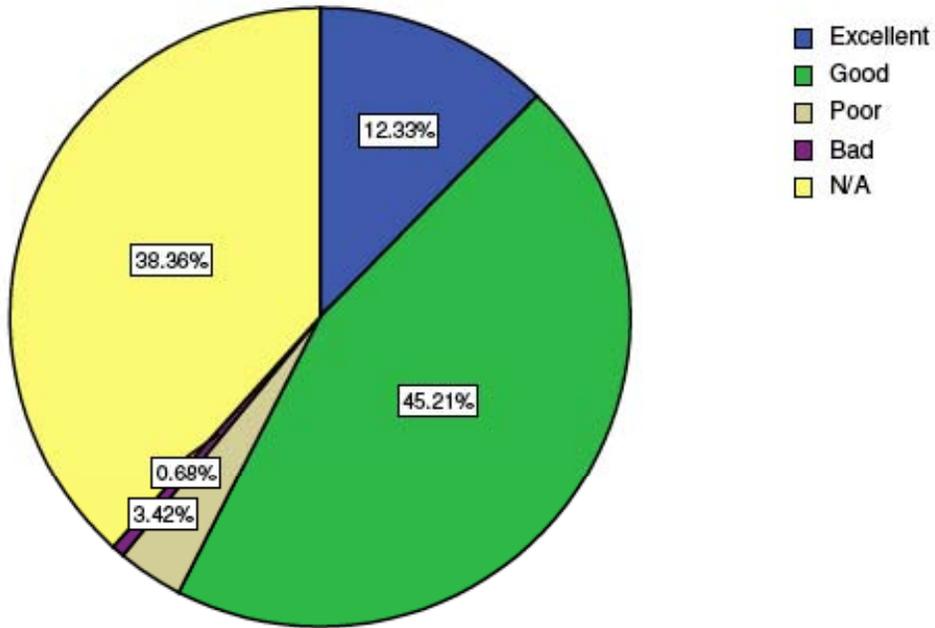
Legend:
- Excellent
- Good
- Poor
- Bad
- N/A

12.33%
38.36%
45.21%
0.68%
3.42%

Please rate the following delivery quality of podcast course materials. (Video)

Legend:
- Excellent
- Good
- Poor
- Bad
- N/A
- Missing

0.69%
10.34%
37.93%
46.21%
0.69%
4.83%
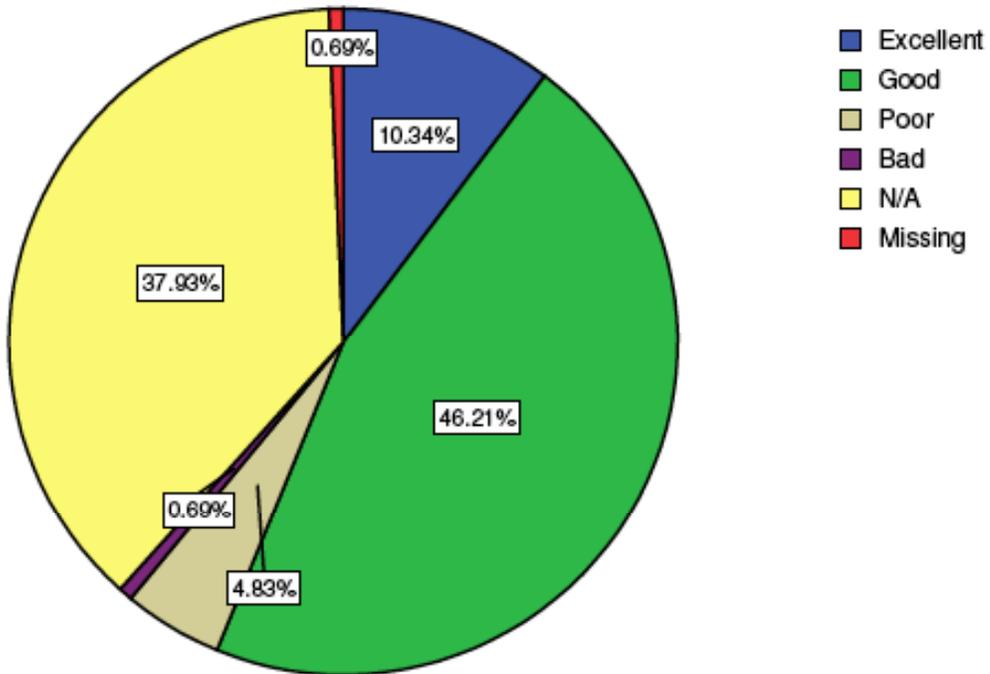
Effectiveness

The use of Podcasting by the Communication Department was well received by the student population. Most found the use of Podcasts improved their learning outcome and made their perceived learning more enjoyable. The students report that they had a better understanding of the course materials and that a sense of freedom was afforded them by allowing review of materials whenever they want. The concept of "Time-Shifting or the ability to listen material when we choose" (Duncan and Fox, 2005) is a key component to the control the students will feel over their own educational attainment. Still the students indicated their preference for a combination of podcasts and traditional face-to-face content delivery.

The addition of podcast material was helpful to the understanding of course content.
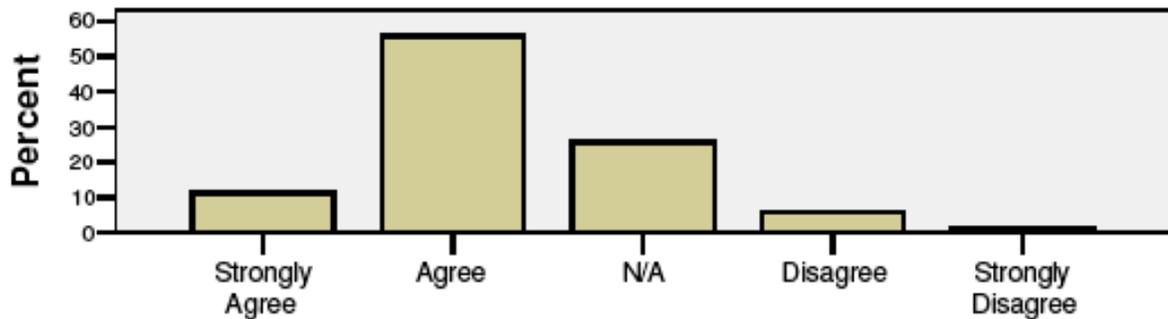
Listening to podcasts helped me better retain the content information.
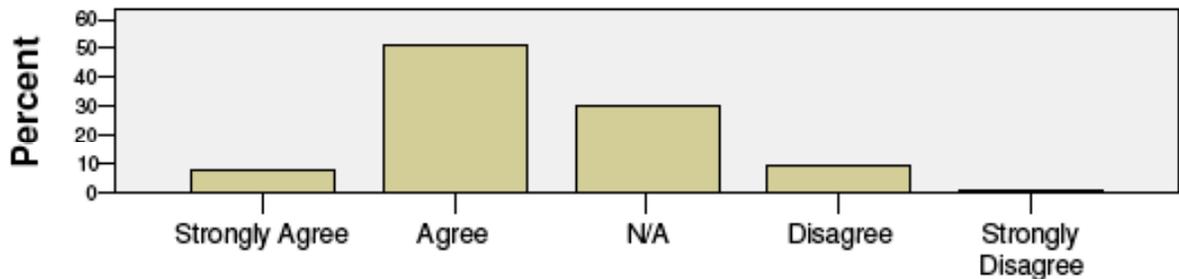
I prefer the combination of iPod/MP3 player course delivery with the face-to-face classroom experience.
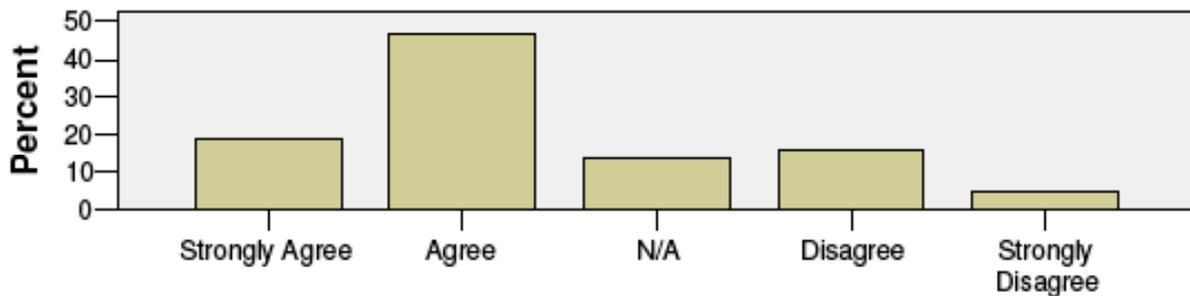
Which of the following features of podcasts did you find most valuable?
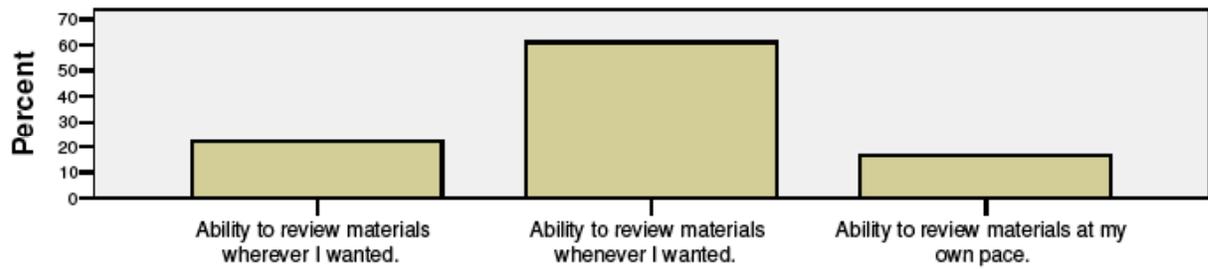
The podcast delivery format enhanced my learning experiences.
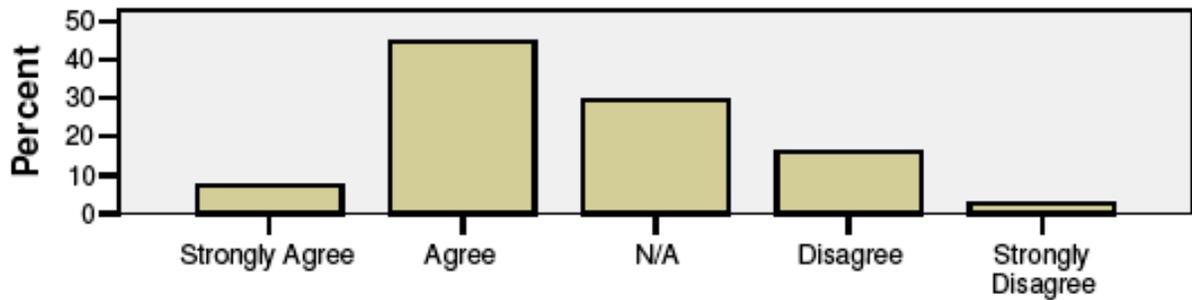
Podcast delivery format made learning more enjoyable.
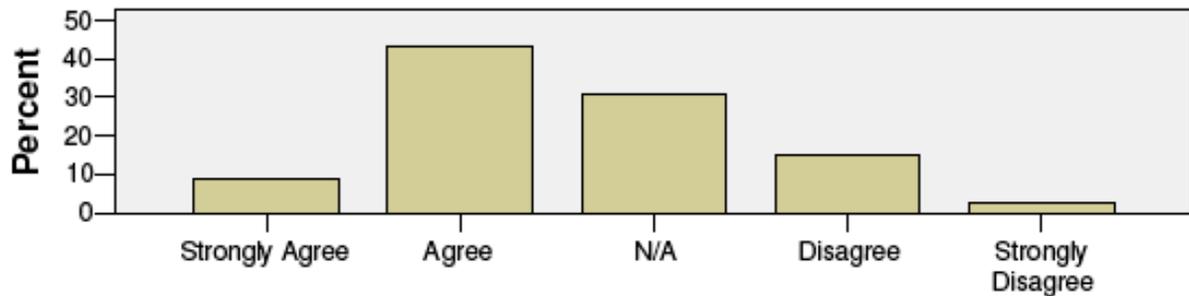
Conclusion

The School of Communication at the University of Houston has begun to investigate the various types, styles and effects of Podcasting. This paper is just a snapshot of an on going process. Further research will be conducted expanding the course offerings and widening the student population sample.

Our findings support that the "students are characterized as social, highly competent multitaskers, who expect immediate results and feedback and seek stimulation and interaction" (Tucker 2006). The computer literate, iGeneration, is aware of Podcasting technology. Receptive to its alternative delivery mechanisms for course materials can be used to meet their lifestyles and educational attainment.

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Strengthening Connections Between Institutional Staff Members and Clients: Design, Development, and Implementation of a Sign Language Learning Tool

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Abstract

Among its many uses, sign language facilitates communication by individuals with mental retardation, autism, and other similar conditions. Institutional staff members who work with these individuals often need to learn sign language to communicate with their clients. This paper describes a new approach to helping hearing people practice sign recognition and discusses a new sign language practice tool that incorporates this approach. The tool is currently being used by a population of institutional staff members.

Descriptors: Instructional Development, Training, Sign Language

Background

A major difference between sign languages and spoken languages is in the faculties and senses used. The means of output/expression for a sign language is primarily gesture, whereas output/expression of a spoken language is primarily by speech itself. Input/reception of a sign language is accomplished by means of vision or touch, as opposed to that of a spoken language, which is primarily through hearing (Armstrong, Stokoe, & Wilcox, 1995).

Prior to the 1960's all linguistic study was of spoken language (Klima & Bellugi, 1979). Sign languages were mistakenly considered a form of pantomime with none of the characteristics of language. At that time, it was believed that signs were the smallest components of meaning and that there were no separable descriptors of a sign that would convey meaning. Stokoe, Liddell, and Johnson (Stokoe, Casterline, & Croneberg, 1976; Schein & Stewart, 1995; Valli & Lucas, 2000) conducted pioneering analyses of sign language, specifically American Sign Language (ASL) the sign language of the Deaf community in North America, that demonstrated that signs are composed of meaningful sub-units that can be used to distinguish one sign from another. Those sub-units, handshape, location, movement, and palm orientation, are comparable to the phonemes of spoken language.

While there have been several attempts to develop a written form of sign language, none are generally accepted to the extent that the English alphabet is accepted as a method of writing English (Schein & Stewart, 1995; Wilcox & Wilcox, 1997). As a result, English glosses are frequently used to provide documentation of sign language. Hearing students learning sign language typically use glosses to help them understand and document the meaning of the signs. Sign phonemes and glosses are commonly used by sign learners to document signs, but neither of these descriptive techniques replace the need to see demonstrations of the signs themselves.

Sign language is often used to facilitate communication for individuals with mental retardation, autism, or other conditions that require that they live in a supervised setting. Use of sign language by residents and staff can help channel communication, reduce frustration, and facilitate positive social behavior (Kiernan, Reid, and Jones, 1982; Musselwhite & St. Louis, 1988; Rittenhouse & Myers, 1982). The sign language used in this setting usually takes the form of a local variation, composed of a limited vocabulary of signs that can be learned by the residents and used to convey basic needs, thoughts, and feelings. Local variation signs are usually borrowed from natural sign languages such as American Sign Language or an educational sign system and may be customized to provide memory cues (Musselwhite & St. Louis, 1988; Rittenhouse & Myers, 1982). It is extremely important that caregivers develop communications systems with clients (Musselwhite & St. Louis, 1988). Successful establishment of a communication partner leads to much greater success in language learning for clients.

Sign language is a visual-spatial language, in that production takes place in 4-dimensional space (i.e. width, height, depth, time). The shift in language modality from aural-oral to visual-gestural presents particular difficulties

for the hearing signer. They must develop both receptive (able to view and comprehend signing) and expressive (able to produce signs) sign skills. Hearing signers must be able to view others using the language and be able to identify changes in form and gesture instead of relying on already well-tuned aural skills to pick up changes in tone, pitch, and articulation.

Hearing people, when learning sign language, have much more difficulty recognizing signs than producing them (Poor, personal communication, July 17, 2003; Tennant & Brown, 1998). This means that opportunities to practice and reinforce recognition skills are particularly important.

Another difficulty novice sign language learners face is the need to mentally rotate the person who is signing. Since most sign conversations take place with one signer facing another, the mental model of sign production is at a 180-degree rotation from the mental model of sign reception. Bellugi, Klima, and Siple (1975) describe the required rotation of mental models as transformation. It complicates and slows sign reception further (Schein & Stewart, 1995). A sign learning approach should provide a variety of angles of demonstration to help learners internalize the two different mental models for reception and expression.

In order to further support the change in modality and interpretation of multiple cues, the instructional design should include sign demonstrations that are as close to real-life as possible. Signs should be demonstrated realistically, with the option to modify the viewpoint, in order to allow the student to review all of the relevant phonemes, to view multiple visual cues at once, and to adjust to the two mental models.

Some elements of sign language actually help the sign student. One of the most important is the use of handshapes to form signs. Most of the required handshapes are also letter signs of the American Manual Alphabet or variations on them. In most cases, the new signer learns to fingerspell before learning actual signs. This exercise helps the signer learn most of the handshapes required (Schein & Stewart, 1995). It also means that handshape is the first phoneme learned. Wilcox, Scheibman, Wood, Cokely, and Stokoe (1994) found that the handshape is the phoneme most likely to be perceived independently of other phonemes when identifying a sign. In many cases, local variations of sign language in institutional settings use letter-cued versions of an ASL sign, to help hearing staff remember signs.

Most members of the target group are adult learners. This is an important consideration because adult learners' needs and skills are different from those of younger learners (Knowles, Holton, and Swanson, 1998).

Time constraints further complicate the task of learning sign language. Institutional staff members are busy and have little free time during a typical workday. Funding reductions and hiring difficulties contribute to the need for institutional staff to multi-task, reducing free time further. In order to be useful to staff members, training programs and materials must be flexible in terms of resources and time required (Fitzgerald, et al., 1984). Staff members need to be able to develop signing skill in as little time as possible. This can be accomplished, in part, by dividing the signs into small subsets that can be studied in a minimal time frame. In addition, staff members should be able to focus on signs that are a part of the local variation instead of learning many signs that are not used or that are formed differently from the local variation. Thus, a sign learning tool should present a set of signs customized for the institution's local variation and that are segmented into manageable subsets.

Any learning approach should support flexibility for learners who may need a varying number of sessions to master a particular set of signs. This flexibility will encourage learners to use the approach because they do not need to start at or reach the same point as others who are also using the same approach (Bogue, 1989).

One recommended strategy for teaching psychomotor procedures, such as sign language, includes modeling or demonstrating the task, encouraging the student to form mental images of the procedure, and practicing (Morrison, Ross, & Kemp, 2003). As noted above, reliance on vision and lack of a written form make sign language learning a very different experience from spoken language learning. In order to successfully support sign language acquisition, instructional tools should include, at a minimum,

- demonstration – modeling signs consistently in 4 dimensions (width, height, depth, time) with unlimited repetition from more than one angle of observation

- access – allowing students to search for sign demonstrations for reference and follow-up based on an observable linguistic characteristic of the sign.

Previous Approaches to Sign Language Learning

Until recently, most sign language instruction had been conducted in person. The most predominant techniques were face-to-face classroom instruction and practice with other signers and sign learners. However, instructors and other signers are not always available to demonstrate signs for students and the demonstrations may vary due to fatigue, signing idiosyncrasies, and other considerations.

Sign learners have also used textbooks and other printed references to reinforce learning in study sessions outside the classroom. Students would study static photographs or drawings of sign production, usually labeled with an English gloss. As noted above, sign language conversations occur in four dimensions, and to be most effective, demonstrations of sign language should also occur in four dimensions. This means that instructional tools that do not support depth or time such as printed material or still images will not be as effective as those that do.

There are also a wide variety of videotape- and computer/CD-based products, from narrated demonstrations of individual signs to videotaped instructional programs that are intended to take the learner through an entire introductory course in sign language. However, videotape-based products are limited in presentation quality and access, in large part because videotape is a sequential medium. While videotape-based materials can be rewound to show signs multiple times, the action of working with the videotape player to access specific video segments distracts the student from the learning process. Existing CD/computer-based sign language products are limited in their ability to present demonstrations at various angles, quiz content, and sign vocabulary. Some products use recorded videos of human signers, while others present animated signers.

A New Approach

The PAULA sign language tutor was originally developed for a specific population of sign language learners: institutional staff at the Jack Mabley Developmental Center, a state-operated residential facility located in Dixon, Illinois. Information gathering to support this project focused on the needs of Mabley Center staff as they learn the signs of a local variation used at the Mabley Center. Local variations are sign languages developed to serve a particular population within a closed community, such as a hospital or care center. They have a limited vocabulary that is based on the needs of the population. Local variation signs are usually borrowed from natural sign languages such as American Sign Language or an Educational Sign System and may be customized to provide memory cues (Musselwhite & St. Louis, 1988; Rittenhouse & Myers, 1982).

The PAULA sign language tutor presents sign demonstrations via a series of 3-D graphical animations. Animations of three presentation angles, front, side and top, are available for each of 170 signs that have been transcribed for the tutor. The sign transcription process records both geometric and linguistic information, such as handshape, for the sign. The geometric information is used to generate 3-D graphical animations of the sign, and the same information is available in a database that can provide descriptions of the associated sign characteristics for the learner The transcription approach and the resulting database/animation synchronization eliminate the need for the tedious and error-prone post process of manual annotation of sign presentations used in many other products. Review of the resulting sign animations for visual accuracy provides a double check of the information. The database design(Furst, et al., 2000; Wolfe, et al., 1999) is based on the concept that the most important building block of a sign is the handshape, which is the most recognizable and memorable aspect of a sign (Wilcox & Scheibman, n.d.).

The author interviewed the Mabley Center staff to understand the needs that the tutor was to meet. This included observations of sign language classes conducted at the Center.

The first prototype allowed the user to look up a sign by gloss and provided a multiple-choice sign-quiz. The prototype also allowed the user to choose the angle of presentation (front, side, top). It included a multimedia

control so that the user could play and re-play the animated sign demonstrations. Screen shots of the first Sign Language Learning Tool prototype are included below as Figure 0.

Figure 0. Screens from First Prototype

Insights Gained Through User Testing of the First Prototype

      In September 2003, twelve Mabley staff members reviewed the first Learning Tool prototype. The staff members had a variety of levels of experience, training, and sign skill. Each reviewer started with the Quiz section of the prototype. The reviewer could view the Demonstration section at any time. Reviewers were encouraged to comment on the prototype interaction. The author noted interaction paths and variations, as well as reviewer comments. The Mabley project coordinator remained in the room during the reviews and testing, acting as a facilitator during the review process. She had contacted the volunteers and organized the sessions. All reviewers felt this tool could be useful to them as they practice sign language. All were very positive about it and saw its potential.

Changes Implemented in the Second Learning Tool Prototype

      User feedback dictated the development of additional features, including an open-ended, fill-in-the-blank quiz and a section that documents learning strategies recommended by the sign language instructor. The second quiz format is helpful for students who have progressed beyond the beginning stages of sign learning. In addition, the author simplified the controls by converting the view selection controls from tabs to radio buttons and providing a PLAY button instead of the multimedia control. The feedback area size, color, and position were modified to make it more easily noticed. The author implemented keyboard shortcuts and tab stops. The author installed the second Learning Tool prototype at the Mabley Developmental Center in November 2003.

Screen shots of the PAULA software are presented in Figures 1 – 8 below.

Figure 1. PAULA Main Menu

Figure 2. Sign Look-up by English Gloss

Figure 3. Multiple-Choice Sign Quiz
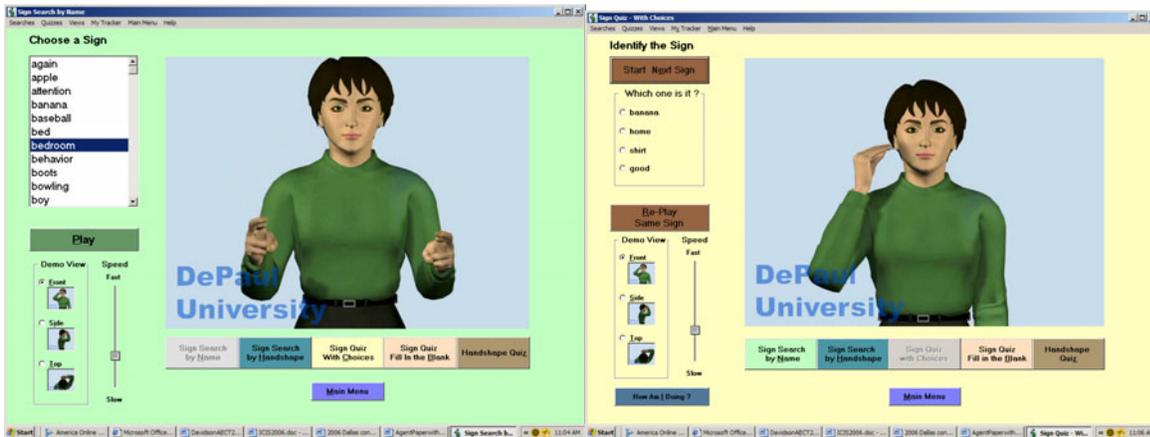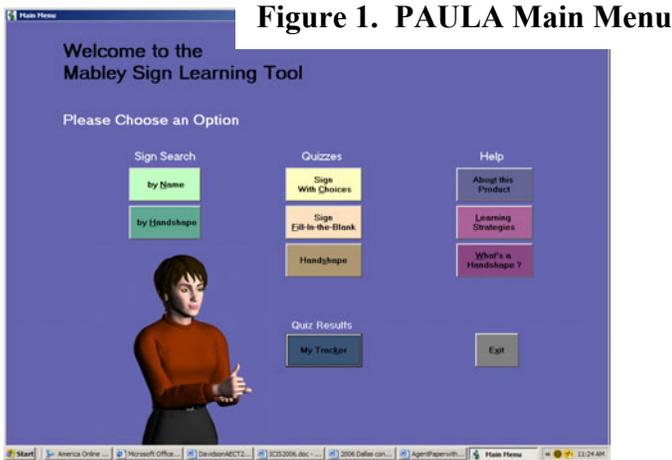
The user can also choose the angle of presentation --front, side, top (See Figure 4) . The side view is helpful in those cases where a sign includes location and movement that are difficult to perceive from the front. The top view is beneficial in helping users internalize the two different mental models for reception and expression.

| Front | Side | Top |
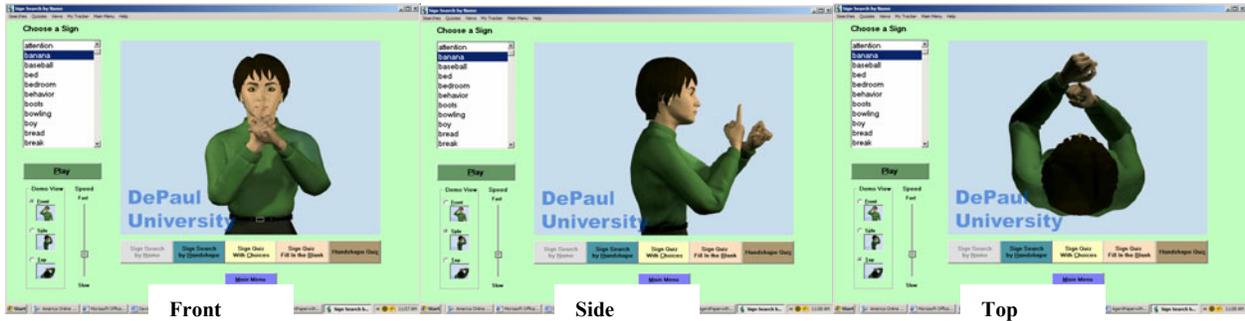
Figure 4. Presentation Angles

The tutor was enhanced to include an open-ended, fill-in-the-blank sign quiz and a section that documents learning strategies recommended by the sign language instructor. The second quiz format was developed for students who have progressed past the beginning stages of sign learning. When taking the fill-in-the-blank sign quiz, the user keys in a gloss that is compared with the gloss of the demonstrated sign. For all quiz types, the user receives text feedback, either CORRECT or TRY AGAIN (See Figure5a,5b).
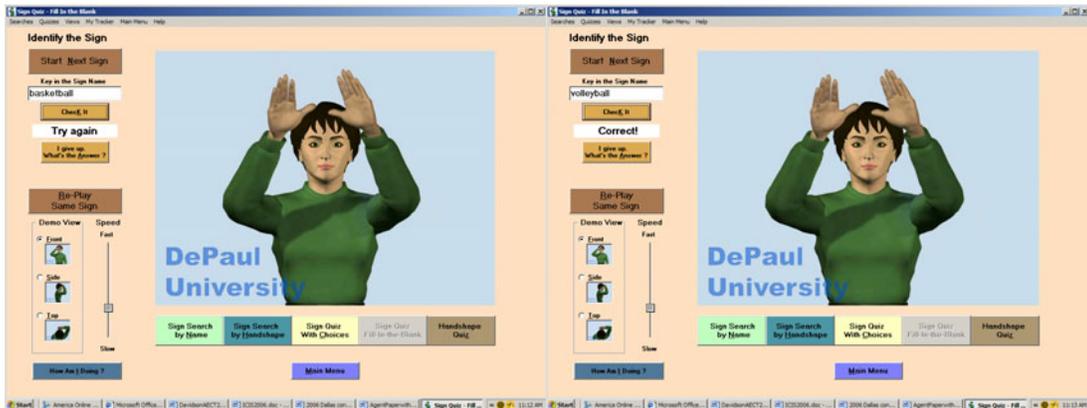
Figure 5a. TRY AGAIN   Figure5b. CORRECT

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Changes Implemented Based on the Results of *Sign Search* Testing

The author subsequently developed a learning tool feature, *Sign Search*, which allowed a user to search for a sign by handshape name or handshape appearance. The *Sign Search* software generates statements, which query a sign language database created by the sign transcription process. (See Figure 6a,6b).

Figure 6a. Handshape Choice   Figure 6b. Sign Choice

A new version of the learning tool software was created in response to the feedback received during the *Sign Search* tests. It combines the functionality of the sign learning tool and *Sign Search*. Based on comments about lack of handshape knowledge, the author added a handshape quiz (See Figure 7) and handshape information reference. In addition, the author developed a quiz results tracking function that the user can turn on if desired (See Figure 8).

Figure 7. Handshape Quiz   Figure 8. How Am I Doing ?
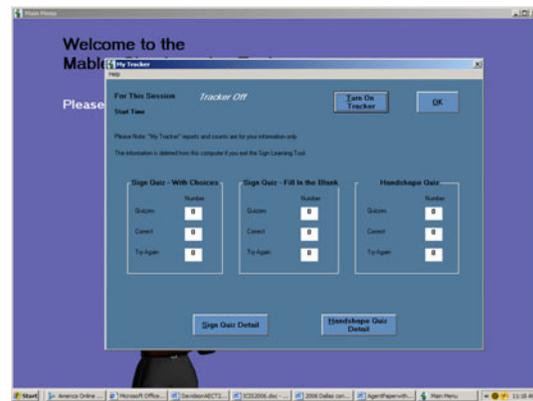
One of the most recent enhancements to the PAULA tutor has been the addition of a speed control. This control allows the user to modify the pace of the sign demonstration and is particularly useful when a sign is complex or includes more than one handshape.

Summary

The PAULA tutor:
- Focuses on development and practice of sign language recognition skills.
- Provides consistent demonstrations of signs at three different performance angles.
- Presents and reinforces the sign vocabulary of the local variation to be used by the learner
- Allows the user to control the speed of sign presentation
- Gives text feedback on three different types of quizzes (open- and closed-end sign and handshape)
- Tracks quiz performance upon user request.
- Allows the sign language learner to control the practice and feedback process.

The PAULA tutor has been packaged and distributed to Mabley Center staff members and families of Mabley Center residents. User comments have been very favorable and a second distribution was requested. This distribution was made possible by a grant from the Dixon Area Retarded Citizens group and was completed earlier this year.

The Mabley Center PAULA tutor can be used by hearing adults to learn and review sign language at times compatible with their individual schedules. The design of PAULA is centered on the needs of sign language learners and the iterative nature of the development cycle has provided many opportunities for the sign learners to make their needs known. Mabley Center staff and residents will continue to derive associated benefits from improved communication based on more confidence and skill in using sign language.

The Mabley Center Sign Tutor is also being used as the framework for sign tutors for other venues, including a major Chicago hospital.

Future Work

The author would like to develop and implement enhancements to the PAULA tutor that include more precise feedback based on the user's performance history and characteristics of sign language. Other potential development avenues include modification of tutor characteristics to make them less dependent on English glosses, (e.g. presenting feedback in sign language where appropriate) and work toward a full-featured computer-based sign language dictionary.

The current PAULA software supports selection of only one handshape per search. Users could benefit from the ability to input multi-stage queries, gradually narrowing the candidate sign list by excluding signs that do not meet all criteria. Creation of this feature would involve additional design and development.

One possible area of further inquiry would be a review of lexicography, especially studies of dictionaries of spoken languages. In particular, a review of look-up strategies could provide useful, generalizable techniques for further improvement of the search interaction, as well as, comparison of search efficiency and effectiveness.

The sign language learning tool described above is a great step forward for institutional staff members who are learning sign and for those who want to find a sign based on a visual characteristic. Staff members were able to find signs using the software; they wanted to use it in the future; and it was more accurate than prior sign look-up tools. The future challenges of PAULA software development include making the software even more useful and usable for a wider audience.

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Acknowledgements

Conversational Agents and Their Longitudinal Affordances on Communication and Learning

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Abstract

In this study, we investigate the effects of conversational agents on communication and learning when used to assist participants in developing an online portfolio. Data from 52 participants were gathered and analyzed through questionnaires, written reflections, transcripts of student-agent interactions, and focus groups. Data revealed that participants communicated with the agents on issues ranging from portfolio development to popular culture. Although participants did not view the agents as particularly helpful in completing class activities, they did use them as social companions throughout the four-week study. Implications of the findings for future design and research include: (a) learner-developed conversational agents, (b) improved "intelligence" with which agents deliver content-based knowledge, and (c) further developed virtual characters that can meet users' humanistic and utilitarian expectations.

Conversational Agents and Their Longitudinal Affordances on Communication and Learning

Virtual characters are becoming more common within industry and academia where they have been used in a variety of domains for multiple purposes, such as assisting learners on how to complete a task (e.g., Baylor and Ryu, 2003) or to report sports news online (e.g., http://sports.espn.go.com/chat/sportsnation). In response, a number of research studies have been conducted on the use of virtual characters in educational environments although these have come to no consensus as to whether virtual characters improve learning and teaching. Baylor (2002), Craig, Gholson and Driscoll (2002), and Mayer, Dow and Mayer (2003) for example, have argued that the use of agents does not generally contribute to improved performance, whereas Moreno, Mayer, Spires, and Lester (2001) found that students who interacted with an agent received higher scores than those working on their own. Dehn and van Mulken (2000) and Gulz (2004) examined the proposed benefits of agent-enhanced learning environments and found that the evidence for integrating agents in educational settings is at best mixed. This lack of unanimity is further complicated by differences in the design of agents and experiments (Clark and Choi, 2005). For example, Cole et al. (2003) had used an agent that was described as a disembodied head lacking natural facial expressions, while Louwerse et al. (2005) used a combination of animated cartoon-like and human-like characters. Only recently have researchers proposed frameworks for uniform research design so as to make meaningful comparisons possible (Clark and Choi, 2005; Ryu and Baylor, 2005)

The majority of studies concerned with virtual characters have been short-term experimental and quasi-experimental in nature (Mahmood and Ferneley, 2006), attempting to discover relationships between various virtual character features (e.g., image, voice, animation) and various variables of interest to educators (e.g., meta-cognition, motivation, self-efficacy). In this study, we attempt to complement the literature on which features of virtual characters may influence learning by examining students' multiple interactions with and responses to conversational agents *over time*, as well as the effects the students believe these agents had on their learning. An important weakness of the current literature is that researchers do not know what happens when agents are integrated in ecologically valid contexts where learners have the option to return or not to return to agent-based systems (Gulz, 2004).

We define conversational agents as virtual characters that are able to sustain a conversational interaction with students through students' textual input. We use the term conversational rather than pedagogical agent because pedagogical agents mainly seem to refer to non-interactive virtual characters that deliver content to students. In addition, we abstain from using the term intelligent agent because the word intelligence signifies a higher-order cognitive ability. Even though the conversational agents we employ may appear to be intelligent, in actuality they are not – the software is simply trained to match comments to responses. The interaction between student and agent is not pre-determined, but shaped by both student comments and agent responses. For example, if a user asks the agent, "What does it mean for a website to be accessible?" the conversation will center on this particular question. If the user then asks a further question about a specific aspect of the agent's answer, the conversation can be said to have been influenced by the agent response but would still be dependent on the user's subsequent comment. Using

an artificial intelligence engine (Program Z by Pandorabots), student comments are analyzed into meaningful segments and, through an iterative algorithm, are matched to responses. The knowledge base is created via the use of the Artificial Intelligence Markup Language (AIML), and the conversational characters utilized are a modified version of the A.L.I.C.E implementation. Specifically, we adapted the A.L.I.C.E 2002 AIML set to fit the needs of our research by customizing both the characters' personalities and knowledge base. Therefore, the characters had an encyclopedic knowledge base provided largely by the A.L.I.C.E AIML set that was also tailored to serve as an in-depth content-specific information source about electronic portfolios. We chose to work with AIML because of its ease of use, adaptation, and conversational believability.

Purpose

In this study, we seek to better understand how conversational agents (CAs) assist learners in developing an online portfolio over a time frame that allows for multiple interactions between students and agents. We specifically examine students' perceptions of the value of a CA in solving tasks that require both procedural and declarative knowledge. In particular, we address three related questions:

1. How do students respond to conversational agents?
2. How useful do students find the conversational agents in their learning?
3. How do students interact with a conversational agent?

Background

This study was conducted at a large, metropolitan university in the Midwest with preservice teachers who were required to enroll in an educational technology course that was content and cohort-specific. For example, the section designed for elementary education majors was focused on technologies targeted for the elementary level, such as Kidpix^{TM} and Kidspiration^{TM}, whereas that for the social studies majors focused on social studies-specific technologies, such as geographic information systems and Google Earth^{TM}. During this course, one technology was introduced per class period, and students met seven times throughout the semester for an average of three hours per class period.

Although each course section covered content specific technologies, students in all sections were required to develop an online portfolio, called *eFolio*. Faculty members had two primary purposes for the use of eFolio: (a) allowing students to showcase how they have met the state board of teaching standards, and (b) serving as a multimedia demonstration of students' progress to which instructors can refer throughout the students' teacher education program. Moreover, students were encouraged to develop the eFolio in ways that can assist them in their future career and job search.

The eFolio was a major element of the course, as it affected every student who goes through the university's licensure program - approximately 550 students every year. With the high number of students and the limited seat time within class, the faculty who teach the course initially developed several resources to support student learning, such as written and video-based tutorials, but soon found out that students were requesting additional support. The authors identified and adapted the use of a CA as the best option for providing instantaneous online support to students whenever needed. Students were given access to the CA throughout the four weeks they had to complete their eFolio assignment.

A conversational agent was selected because it can be useful to students on three levels. First, it functions as a personalized scaffold for learning. Students are able to ask questions that are of immediate interest to them and are not limited to a textbook or a set of predetermined frequently asked questions. Second, a CA acts as a human-like companion for the students, appearing polite and welcoming, and providing immediate feedback, support, and encouragement. Finally, regardless of the time and day (unlike instructors and teaching assistants), the agent is available to answer questions with consistent enthusiasm and clarity.

Method

Participants

The participants in this study consisted of elementary education preservice teachers (hereafter participants), who enrolled in a post-baccalaureate masters program in education. Participants in this study were in their first semester of the 15-month post-baccalaureate licensure program. Eighty-five students in the three elementary education sections were invited, and 52 elected to participate. Of these 52 students, 45 were women and 7 were men. Those who reported their age (47) ranged in age from 21 to 50 years (mean = 23.43, SD = 5.06). This was their first educational technology course.

Data Sources

All 52 participants completed a demographic questionnaire, wrote reflections about their learning experience, and interacted with the conversational agents. Approximately half (23) of the participants also attended focus group sessions, 10 in a focus group based on their interaction with a male CA named Alex, and 13 in a second focus group based on their interaction with a female CA named Penelope (Figure 1).

Figure 1 Conversational Characters Penelope and Alex.

All focus groups lasted approximately 1.5 hours and were audio-taped. Three researchers were present at the focus group interviews. The first author facilitated the sessions using a semi-structured interview protocol, while the other researchers observed and took notes. Open-ended questions were used to prompt participants' reflections on their learning experience with the CA. The questions focused on three topics: (a) the students' perceptions of the conversational agents, (b) how the students believed their experience with the agents influenced their learning, and (c) how the students generally interacted with the conversational agents.

During the educational technology course, the preservice teachers were assigned to write reflections about each technology they learned examining the instructional implications for the use of each technology in the classroom and providing examples of how K-12 students could use the technology to support their learning. Since the CAs used for the eFolio development was one of those technologies, these reflections were collected and analyzed.

Finally, all conversations that occurred between the CAs and each of the participants were recorded in a database that was later analyzed for the purposes of this study. These recorded conversations amounted to 216 pages of text. A question-answer pair was counted as one interaction between the agent and the learner. Each learner session with the CA was counted as one conversation.

Data Analysis

Because our research interest was in uncovering the design issues that impact the effective use of CAs to assist student learning, we employed a qualitative approach to analyze our data so as to identify emerging patterns across participants' responses. We believe that salient issues would emerge from this case study and such issues could direct future research, especially longitudinal investigations. Yin (1994) indicated that the case study helps explain the "links in real-life interventions that are too complex for the survey or experimental strategies" (p. 15). Since the setting of this study was a new approach to utilizing CAs to learn educational technology, using a case study and qualitative approaches to analysis would allow any complexities to emerge.

To guide the development of the salient categories and patterns in the data, we used a constant comparative method (Glaser & Strauss, 1967). First, we developed an individual data set for each participant by compiling their responses to the CAs across the various kinds of data collected. We then read through the data, noting common patterns that emerged across the responses of participants. After jointly compiling these patterns, we re-read the data to search for confirming and disconfirming evidence and reached a consensus on what salient patterns were emerging from our data. Although the focus group and questionnaire data were originally coded separately, the data were combined once the common themes were identified so that similar responses from the same participant within the focus group and the questionnaire were counted only once.

Results

The analysis of the above data revealed five major themes. Two themes were related to the participants' experiences using the CAs to meet their educational goal of successfully developing an online portfolio, while three themes addressed other participant responses to their experiences with a CA. The themes surrounding participants' experiences suggest that participants placed the CAs in the position of what researchers have called an "intentional social agent." Specifically, participants expect the CAs to be friendly, possess a unique personality, and have a broad knowledge base regarding popular culture (e.g., Alvarez-Torres, Mishra, and Zhao, 2001; Nass, Moon, and Green, 1997). Although students' responses made clear that the CAs within this study did not have enough content-knowledge to support the participants' development of the online portfolio at the level the participants had hoped, many of them also reported spending considerable amounts of time conversing with the CAs on issues quite

unrelated to the content knowledge the agent was initially adopted to support. As will be discussed below, the CAs intelligent functionalities and communicative capabilities led participants to engage in conversations with them on a wide range of topics (e.g., popular culture, intimate conversations, and politics).

Specifically, our analysis of these themes produced the following findings regarding the effectiveness of the CAs in supporting student learning:

1. Participants reported that CAs provided limited support of their learning process during the eFolio development.
2. Participants found that CAs were not as supportive as hoped for specific tasks in the eFolio development.
3. Participants claimed that CAs provided humanized social support.
4. Participants reported having multifaceted dialogues with CAs.
5. Participants wished to have some control over individual characteristics of CAs.

Each of these findings will be discussed in turn.

CAs provided limited support of participants learning process during the eFolio development

Sixty-one percent of participants made comments that their experiences with the CAs were of at least some help when developing their eFolio (Figure 2). Although participants reported that the CAs were not always accurate in their specific answers related to content-related knowledge, they also commented that the CAs provided assistance in a way that encouraged the participants to return to the CAs repeatedly throughout their learning experience. Jeffrey[1], for instance, commented "Granted, he wasn't accurate all the time, but he was still pretty accurate enough to where he would keep you involved in it. I anticipate it is very difficult to get him to say all the correct answers." Although not all questions were answered correctly, many participants reported being "surprised" and "motivated" by the CA's ability to accurately answer the multiple questions they posed.

To what extent was Alex/Penelope useful or not useful in learning to develop your eFolio?
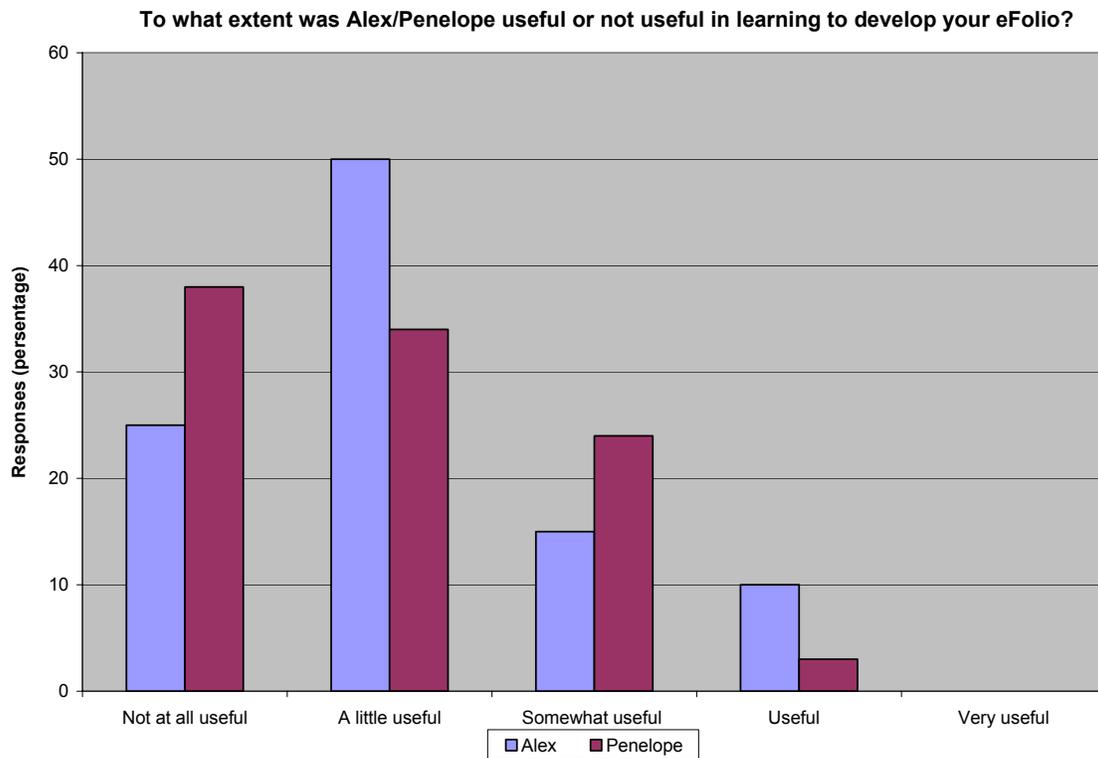
Figure 2 Participant responses to the question "To what extent was Alex/Penelope useful or not useful in learning to develop your eFolio?"

Students reported being motivated to ask the CAs a series of questions ranging from how to find the correct website address for eFolio to directions for uploading and displaying pictures. Mary mentioned how happy she was with the help given to her by Alex: "I liked how he explained how to upload a picture. Everything pertinent to the

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[1] The names of participants have been changed to protect their identity.

course that I asked was useful." Jill had a similar response, stating "Some questions [Penelope] did not know how to answer, but overall, the simple questions that I asked her she was able to help me out a lot along the way." Many participants noted being pleased with the CAs' answers to their questions and with the CAs being available to them whenever they needed assistance. Susan, for example said,

> I definitely think the concept of Alex is good, or something along that line, because we have class every other week, and sometimes it is once a month, which is fine, but it's hard when we are working on things at home or even come in to the lab and not know what we are doing. When some of us are intimidated by technology anyways, to have something that we can go to and get answers or ideas or suggestions is fantastic!

Jenny also reported being pleased that the CA was available at all times and felt like she had her own "personal lab assistant" throughout the day. She said that often as soon as she left class or the open computer lab times, she would have another question because, "the questions you could ask about eFolio are endless." Students often praised the availability of the CAs. Maddy, for instance, stated, "As far as convenience, at 10:00 at night when the lab is not open, it's nice to have her [Penelope] available. She was constantly on my screen with a smile." Joe also noted that, "The fact that he [Alex] was always available, when the professor isn't, is a nice aspect of Alex."

Participants reported that they found the dual format in which CAs delivered their answers – both text and audio – a very helpful feature. Sue said, "I think it was nice to have verbal guidance instead of just reading something because it is easier to understand." Matt commented that a great benefit of the CA was that everything the CA said was also written out, noting that he could not always understand all of the words that the CA was using but he could read along providing him another mode of learning.

In summary, participants identified three main areas in which they found the CAs supportive and helpful: (a) solving simple procedural steps when developing their eFolio as opposed to "complex" questions that involved more than one procedural step (e.g., How do I upload a picture *and* embed a link to a website), (b) having access to the CA at any time throughout the day to assist them in answering their eFolio questions, and (c) receiving answers in multiple formats thereby supporting Moreno and Mayer's (2002) contention that the combination of verbal and textual narration enhances learning.

CAs were not as supportive as hoped for specific tasks in the eFolio development

One-third of the participants made some comment about finding the CAs unhelpful when developing their eFolio, albeit most noted that they believed the CA was a technology that was "more than worthy" of being utilized in a learning situation. Although participants were not always satisfied with the results of the answers from their content-related questions, they still found the CAs engaging and spent numerous hours conversing with them outside of the content-related questions, as will be discussed below.

Many participants reported becoming frustrated when the CAs could not provide clear or specific answers to their content-related questions. Sarah, for example, said,

> Some of my files weren't saved as .doc, and I couldn't figure out how to change them and the uploading wasn't working. I asked Alexander, and he had no input for me [laughs]. He made some smart comment and changed the subject [more laughs]. That was probably the only issue I had with him. But the fact that he couldn't help me made me really angry at Alex.

Joe had an even stronger response: "I don't like Penelope. I asked her a question like five different ways and she still couldn't answer it. I don't remember what the question was but she should have been able to answer it." Three-quarters of the participants reported having to rephrase the questions they posed to the CAs in order to elicit an answer that was appropriate and not confusing. In Penny's words, "I felt that my question was just too difficult. I tried rewording it but I really didn't expect her to know, and then when she didn't know I wasn't that surprised." Some participants also felt responsible for the difficulties they had with the CAs. For example, Sue said, "When you are getting frustrated with a part of eFolio and you go to ask her, you'd think that she should probably know it, but you know you are not phrasing the question correctly; that becomes even more frustrating. Because you were like, she would know this if I just knew how to say it to her."

Participants were also frustrated by confusing answers. Misty said, "Every time I would ask [Alex] a question he would say, you need to download some software or something. I didn't know what that was about, so I didn't bother." Joel followed her comment with a similar story,

> I asked [Alex] what the eFolio website was because I wanted to go to the website because I deleted the email that told me. I wanted to go to the website and find their contact number and things like that and email them. He was explaining what eFolio was and I was like ... argggg … forget it. And so I did my own little search and then I found it, but I kept him there in case I got stuck.

Participants appeared most frustrated when content-related questions that they felt should be "routine" or "standard" could not be answered correctly. Sue, for instance, said, "You would type

something easy like 'burning a CD,' and it would bring you all these things but 'burning a CD' which is pretty standard." Participants often reported expecting the CA to have the answers immediately and in a format that could easily be used. When this was not the case, some participants reported that they became frustrated and sometimes gave up using the CA and continued to develop their eFolio on their own. Participants especially reported wanting an immediate answer for their eFolio-related questions and when they didn't receive it, became extremely frustrated. They did not "appreciate" it when the CA "didn't know an answer" and even worse, had an "attitude" when answering their questions, as they expected the CAs to be eFolio experts able to assist them with all aspects of their eFolio development. Sarah noted feelings of "anger" when Alex could not answer her question while Joe seemed "disappointed" that he could not elicit the help he desired. Six students commented that the more complex or advanced the questions they posed about development of their eFolio, the less it seemed that they would receive a satisfactory response.

Another finding was that when participants did not receive a correct answer to their on-task eFolio-related questions, they would often switch to asking the CA unrelated, off-task questions. When we analyzed the participants' on-task versus off-task questions to the CA, we discovered a novelty effect occurring the first few days of use. As Figure 3 shows, more than 91% of the questions participants asked Penelope during the first 2 days were off-task questions. The total number of comment-and-response interactions dropped drastically until shortly before the eFolio assignment was due; even then, the highest percentage of interactions were off-task.
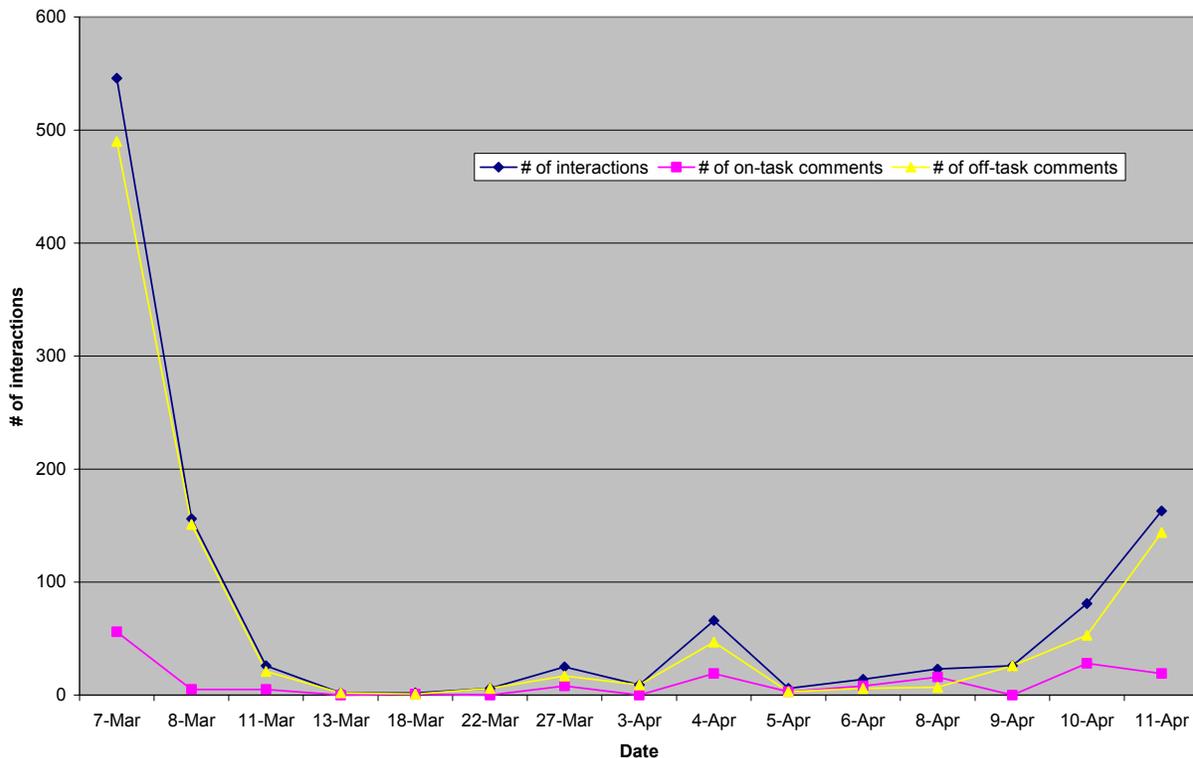
Figure 3 Number of participant-agent interactions: Penelope.

Similar data about the use of Alex can be seen in Figure 4. Almost half of the total interactions for the duration of the study took place during the first three days the participants had access to Alex. Use again peaked approximately one week before the assignment was due in class.

INSERT FIGURE 4 ABOUT HERE

To summarize, participants found the CAs unhelpful when they gave incorrect or confusing answers to content-related problems. A number of participants reported expecting the CAs to be able to answer their questions easily and after having a few questions incorrectly or unclearly answered, simply stopped using the CAs for eFolio assistance and looked to other means to have their questions answered. This would seem to support the suggestion of Norman (1997) that individuals may have inflated

expectations from agents that are presented in human form. The combination of a human-like image, conversational ability, natural language interaction, and lip-synchronized audio may have led participants to expect a higher level of agent intelligence and expertise than they might from a similar informational exchange with a computer by means of just a text box.

CAs provided humanized social support

Eighty-four percent of participants' responses focused on the humanizing features of the CAs. Participants reported perceiving the CAs as humans, commenting on such things as the agents' ability to remember, looks and clothing, and how the CAs made them feel. Prior research indicates that users ascribe social rules and human-like characteristics to media (Reeves and Nass, 1996) regardless of how unsophisticated these media may appear to be (Nass, Moon, and Carney, 1999). Most of our participants reported connecting emotionally with the CAs due to the human-like interactions, which some researchers argue may facilitate learning (Lester et al., 1997; Moreno et al., 2001).

Ninety percent of the participants reported they enjoyed the presence of the CA on their screen which, in Joan's words, made them feel as if they "had a friend available to talk with." Sara said,

It's kind of lonely at the computer, because you know, there's nothing else on the computer that I can really talk to, and when you talk to Alex and he responds, it's kind of like a person there with you. Even though it's an artificial person, it's nice to have someone respond back to you instead of you putting all your energy into the technology.

Eighty-two percent of the participants were motivated to talk to the CAs because they felt they appeared to be like an actual person. Lauren commented, "I thought it was weird. When I opened [Penelope] I thought I always had to say hi to her like an actual person, I would always say, Hi Penelope!"

Over 80% of the participants remarked that they could not believe how true-to-life the CAs appeared to be, repeatedly commenting that they were surprised by the CAs social presence, intelligence, and ability to converse and remember. Commenting on Penelope, Peter reported that "Honestly, when I first saw her I was kind of freaked out by how much she was talking like a real person." Participants also appreciated that the CAs had their own identities, voice tones, and that they weren't developed after a celebrity or someone recognizable. Sue said, "If it was like a celebrity, it just wouldn't seem as real as Penelope. She was kind of like her own person." Taylor couldn't believe how "real" Penelope was and that her voice was not "alien or monotone." He and 14 other participants commented on how much they enjoyed repeatedly interacting with the CA. As Sara commented about her interactions with Alex,

He was fun to talk to. He knew lots of other things, like every question I could come up with he knew how to answer. He was pretty good. He was pretty on top of stuff. He knew why the sky was blue and he was funny and good company.

Half of the participants also mentioned enjoying the CA asking questions back and having a sense of humor. Sue said, "I liked that Alex had a sense of humor. If you asked him the same question more than once, he would have a different answer each time. He had personality!"

Another participant who described being pleasantly surprised by the human-like capabilities of the CAs was Laura who stated, "I actually asked her what my name was and she told me like a guy's name or just made one up and then I said, 'No, my name is Laura,' and then we kept talking and asking her questions and I said, 'What's my name again?' and she goes, 'I already told you, it's Laura'." Rebecca commented, "I liked that [Alex] had a memory. Like he would bring up things from, you know, ten questions ago. He would bring them back to the conversation like he had some concept of what you were asking him." Lauren continued, "I asked her some question and then I asked her another question relating to it, and it was like we were having a conversation because she kind of remembered what I asked before. She related the questions to what I asked her before, and I was just like, Oh, wow!"

Participants also described the personality of the CAs. Some participants commented on how cynical some of the agents' responses seemed and how the developers should make the CAs have a more positive outlook. Four of the participants stated that they received "rude" comments from the CAs and were upset when they received the comment, "What's it to you?" However, they also noted that they probably shouldn't have been asking the question to begin with. Rebecca said, "I thought it was more fun to play with her. I did play with her for quite a while at night just because she did have lots of funny stuff to say." Joey said, "I was kind of rude to her one time and then she was rude back. But then I told her she was nice, and she said 'thank you, you seem nice, too'."

Eighty-five percent of the participants also commented on how they liked the CAs' appearance, and they made numerous comments related to how they noticed their clothes had changed. Rosie said, "I really liked when Penelope changed her clothes. I felt like, hey, this is so much fun, and why wouldn't I sit and talk to her?" Jill added, "[Penelope's] appearance was friendly and welcoming." Everyone in his focus group laughed as Jeff commented that, **"**I might go and visit her just because I wanted to see what she was wearing." He said he had told Penelope that he liked what she was wearing and she replied, "Thanks!" He commented, "It was just too real and too

cool." Six other participants also mentioned returning to interact with the CAs to see what clothes the CAs were wearing.

Five participants commented that they liked to show the CAs to their friends as they thought they were "cool" and that Penelope, the female agent, was "sexy." Ten of the participants noted finding the CAs attractive and enjoying looking at them. The majority of participants also mentioned that they would rather talk to the opposite sex because they found them more attractive and approachable. Brad noted, "I don't think a guy would feel not comfortable or anything, but I just think having a woman, it probably makes it more casual versus instructional. Whereas like a guy might, I would think that he might be a little more demanding."

Within both focus groups, the topic of sexually explicit comments arose. The participants laughed a great deal during these conversations. Two participants went into great detail explaining how they and their friends enjoyed conversing and asking any questions on their mind, ranging from sex to the weather. Taylor said, "Because she had an answer for everything, it was like pushing her limits. You know it wasn't a real person, so it's not that you are offending her." Participants would talk with the CA to see what he/she knew, and it commonly became a social event where the participants and their friends outside of the technology class would interact with the CA at their dorm or a coffee shop. For example, Sue said,

I asked him everything I could possibly think of and my roommates could think of regarding [his] personal preferences, and I wanted to know if he changed his answer, too. Maybe, if his favorite movie changed, or, you know, religion, politics, general questions about the world. I was just curious if he knew.

Misty commented, "When I was with other people, that's when all the dirty questions came up, they were like try that, try that, so I was like, 'Ok, this better not come back to my name.' Brad said,

We were just trying to see what she would answer and so we were asking her, 'Would you go out on a date with this person?' 'Are you smart?' A lot of people asked her, 'Are you smart?' Especially after she didn't answer something you wanted her, she was like 'Why would you question my intelligence?' or something like that, it was funny though. We got a kick out of her, me and a bunch of my buddies.

Participants also discussed the impact the agents' appearance had on their perceptions of agent intelligence and ability. For example two participants commented on how smart they perceived the CAs would be by how they looked. Molly specifically said,

I think that how they look might depend on how smart you thought they were too, like if it was some guy in a doctor's coat with glasses or something, you might think that guy would be able to answer more of your questions than, you know, a lady in a dress or you know what I mean? That's wrong and totally stereotypical but I think that a lot of people would have those feelings about it.

Forty percent of the participants also commented on the CA's age. Although participants didn't know the CAs "actual age", they stated that they felt the CAs were old enough to be intelligent, but still young enough to relate to.

Finally, over 80% of the participants said they had the CAs available on their computer at all times. They perceived the CAs as a companion that was there to talk, amuse, and share ideas and stories. Participants reported feeling safe to share "just about anything" with the CAs, and this feeling allowed them to converse openly with the CAs on a variety of topics.

In summary, it appears that the participants perceived the CAs as being human. Over 90% of the participants made comments about the authenticity of the CAs, ranging from their looks to their personality. It seems that they were amazed by the CA technology and would spend hours interacting with them to see what the CAs knew. They enjoyed that the CAs had a human-like memory and could engage in a dialogue with them. The participants felt a sense companionship with the CAs and would log on to the CA's web site on a regular basis to have them present on the screen to interact with at their leisure. Lastly, the participants stated how comfortable they were when conversing with the CAs. They felt safe and were willing to freely ask questions and share details of their lives.

CAs and participants engaged in multifaceted dialogues

We also analyzed the data to determine the nature of the interactions between participants and CAs. We found that these dialogues were prompted by 4 types of questions: (a) questions related to developing the participants' eFolio, (b) questions about the CAs' personality, (c) questions about the CAs' general interests, and (d) questions about encyclopedic information.

Questions related to the development of the participants' eFolio occurred mostly during the beginning and the end of the four-week assignment period. Participants asked numerous questions trying to find the procedural steps needed to complete a task. They would continue to ask questions until they began to get incorrect or confusing answers. At that time, they would immediately switch to a dialogue that normally was inquiring about getting to know the CAs' personality. Comments relating to the CAs being friendly, nice, sarcastic, and rude were common.

Those participants who normally spent more than five minutes interacting with the CAs led to dialogues on the CA's general interests. Questions such as "What do you like to do on the weekend?" and "What do you think of President Bush?" were common. Moreover, when these conversations began on general interests, an informational dialogue would ensue that mimicked a free flowing exchange of information between two individuals. Analysis of the conversation logs revealed that participants elicited answers to interesting questions such as, "What is the distance to the center of the earth?", "What is the meaning of life?", and "What is your stance on the legalization of marijuana?"

Participants requests to have some control over individual characteristics of CAs

Over 90% of the participants shared suggestions on ways that they believed the CAs could be improved. Seventy percent of the participants commented that they believed the CA was one of the best technologies available for providing assistance to students during the learning process. The most common suggestion was that the agents be made "smarter" so that participants would be able to obtain more accurate answers to their questions. Sara said, "I think the key really is to make [Alex] smarter, to have basic knowledge, because if he doesn't, we are going to go to a real person or email you guys." Most of the participants felt as if the CAs were intelligent enough and could help them, but that they were phrasing their questions incorrectly. Ideas on how to improve students' way of asking questions, such as using keywords followed by a list of questions, were mentioned. Molly said, "Maybe if you wrote a keyword in and then the most frequently asked questions about that appeared. Like if I had a question about the standards, how to put standards in, I could type in *standards* and it would come up with 10 different questions people asked and I can go."

The second most commonly mentioned suggestion was giving participants an opportunity to customize the CAs. Participants wanted to be able to develop their own CAs and modify their personality, skin and hair color, hair style, face and body structure, clothes, and looks. For example, three participants stated that having the ability to develop a CA having a gender of their choice would make the CA "more attractive." If participants could not develop their own CAs, they said, they would like the opportunity to choose from a set of profiles. Jessie said, "Can we pick? Yeah, can we pick who we talk to? Cause what if you get tired to talking to Alex? You should give us profile choices." Participants thoroughly enjoyed interacting with CAs who had their own personality but wanted to change the CAs' personality and moods according to their own needs. Jeff said, "Maybe [Alex] could have different moods or something. Like if you want him to be sarcastic or cynical one time, or you want, like, positive thoughts."

In short, participants wanted to develop their own CAs with an appearance and personality that fit their preferences. If they could not develop their own CAs, they wanted to have the option of selecting one that "fit their own style." In addition to having customizable CAs, the participants either wanted the CAs to be intelligent enough to decipher their questions or have the technology to predict what the participants were going to say or ask.

Conclusions

In this paper we examined students' perceptions of the value of CAs in solving tasks requiring procedural and declarative knowledge. We addressed three questions: (a) how do students respond to conversational agents, (b) how useful do students find the conversational agents in their learning, and (c) how do students interact with a conversational agent?

We found that although the CAs were not perceived as extremely helpful by participants when developing their eFolio, the agents engaged learners far beyond the eFolio content knowledge. At all times throughout the day, participants would utilize the CAs for activities ranging from assistance in class to the latest in politics and popular culture. The social interactions were plentiful with more than two thousand interactions over a four-week period. Participants' questions were limitless as the design of the CAs allowed for a free-flowing dialogue at all times. Participants perceived the agent technology as an advantage to common assistance tools, such as frequently asked questions (FAQs) and "Help" sections, as they felt they were not impeded by the design of this tool. The ability to discuss any issue at length with the CAs led participants to feel as though the CAs were an excellent companion and someone they could talk with and discuss issues at length. The participants perceived the CAs as an on-demand friend and wanted to have input on all facets of how they looked, as well as their personality.

The CAs also elicited many feelings from the participants. Participants were amazed by the technology and motivated to use the agents, which included a comfort of sharing and questioning literally anything that seemed to be on their mind – from sex to Britney Spears to the background color choice for their eFolio. Although participants expressed a feeling of comfort, they also became very upset and frustrated when the CAs didn't know an answer to a question they posed or when the CAs became "cynical" and "had an attitude."

Implication and Recommendations

This study informs educators, instructional/human computer interaction designers, and learning technologists on issues that should be taken into consideration when developing conversational agents to provide long-term assistance to learners. These issues include designing and developing: (a) a workflow for "smarter" agents, (b) learner-created agents, and (c) agents for humanistic expectations.

If learners are to utilize CAs with success, the CAs need to be intelligent enough to accurately comprehend the questions the learners are posing or the software application needs to offer an interface that guides the learners to ask their questions in an appropriate manner. The challenge in designing an agent that has content-based intelligence is that the designer needs to collect and predict what questions a learner may ask within a given learning situation. Thus, the development of effective conversational agents requires several stages of development that include collecting content-specific material, developing the knowledge database, and deploying the information in any given learning environment. In addition to developing a comprehensive knowledge database, designers using CAs for specific functions, as in this study, need to predict the multitude of ways in which questions could be asked by a learner. For example, a learner attempting to embed an image on his or her web page may ask the same question in any of the following ways: How do I upload a picture? What are the ways I can embed a photo on my web site? How do I put an image on my web page? The algorithm that deciphers the key words to answer the questions therefore must be able to "understand" synonyms and different approaches to posing a question. At the same time, to maintain its human persona and to engage users, such a conversational character should not present itself as all-knowing and autonomous right away, which may lead users to relinquish all responsibility for finding a solution or answer on their own.

Throughout the development of the field of instructional design and learning technologies we have seen a move toward learning *with* technology rather than learning *from* technology (Jonassen, 1995; 2000). As they engaged with the CAs, participants in this study were learning by actively asking questions, discussing issues, and reflecting *with* the CAs on the course content. Indeed, it could be argued that participants were collaborating with the CAs by dialoguing to find a common answer. Yet, a number of students wanted even more participation in the learning situation by wanting to create their own CA according to their individual specifications. The most requested specifications were gender, attractiveness, personality, age, and perceived intelligence. If learners are able to share in the development of their own CAs, in essence personalizing the tools they are working with, they may become more motivated to work with the CA to elicit the correct answers and enhance their learning experience. This hypothesis is one that seems worthwhile to pursue in future research.

This study also demonstrated that learners were most attracted to the CA's ability to behave in a human-like manner, repeatedly commenting on how they perceived the CA as a companion or friend. Several mentioned that they enjoyed that the CAs had an "attitude," regularly changed their clothing, and personally greeted them. This suggests that CAs may be more effective if designers create CAs that adapt over time, and act and appear as a real person. Thus, designers' changing a CA's hairstyle, clothing, or glasses, to produce visible change in the CA over time could possibly influence learners' motivation to return to the CA for answers or dialogue. The data gathered in this study also support the findings of Wang et al. (2005) that the level of politeness presented by CAs does influence learning. While participants did not mind the CAs having an "attitude" when discussing issues unrelated to class, they were upset when the CA did the same when the participants were trying to find answers to their class-related questions. It needs to be noted however, that a believable human-like representation is likely to induce greater expectations in terms of agent abilities and intelligence. Therefore, designers are advised to be cognizant of the conflicting effects of agents' image and language.

Participants' responses demonstrate that they felt comfortable and motivated to interact and share their questions and thoughts with the CAs about issues related and unrelated to their eFolio assignment, viewing the CA as a personal assistant and companion that was available on-demand. The overwhelming positive response and motivation reported by participants shows that this technology has a promising future as instructional designers strive to develop CAs with greater content-based intelligence and toward allowing the learners to modify their own CAs.

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Figure 4 Number of participant-agent interactions: Alex
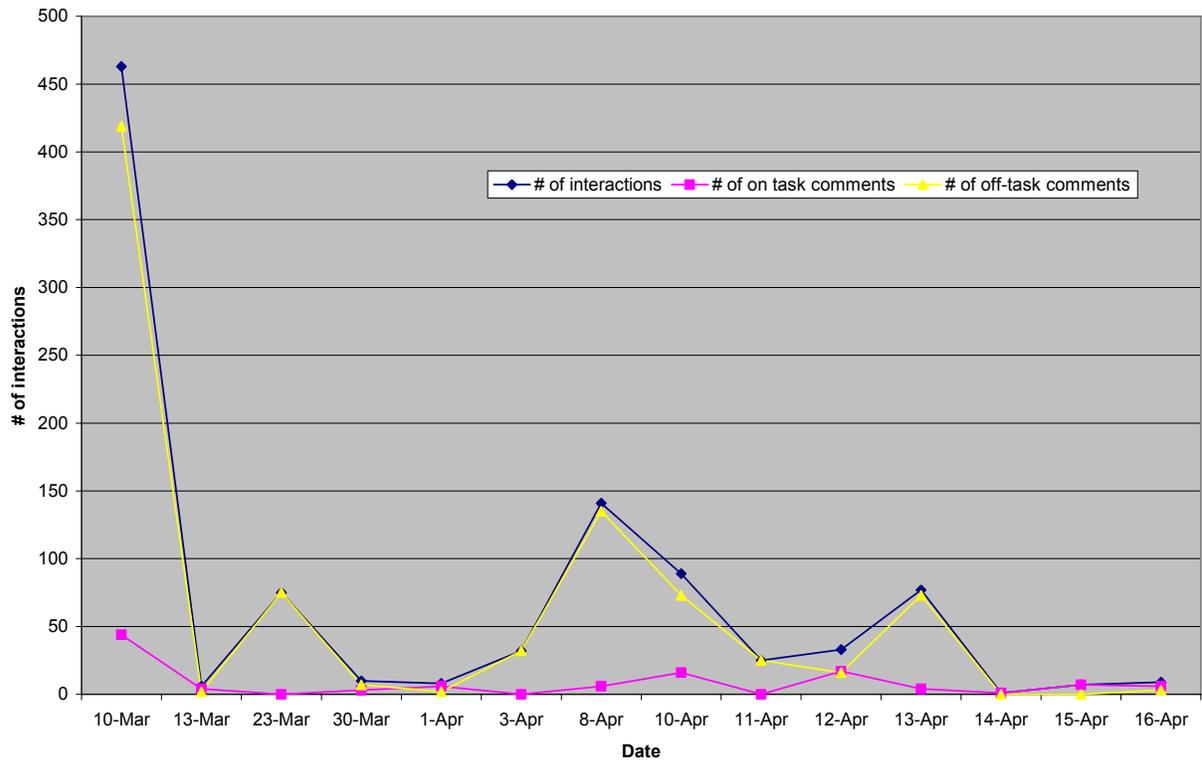
Adventure Learning: Transformative Hybrid Online Education

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Abstract

Adventure learning (AL) is a hybrid distance education approach that provides students with opportunities to explore real-world issues through authentic learning experiences within collaborative learning environments. This paper defines this online distance education approach, outlines an Adventure Learning Framework, and showcases an adventure-learning archetype. In AL environments, classroom teachers are not positioned in the role of teacher/facilitator/designer in the online learning spaces. AL online spaces are collaborative spaces where students, teachers, experts, and AL team members interact with one another; these are community spaces where traditional hierarchical classroom roles are blurred. Students' roles transform due to the flexibility and design of the AL learning environments as they move from student to reflective practitioner providing for new ways of learning and teaching.

> "School should be less about preparation for life and more like life itself."
> John Dewey

Introduction

Education delivered via the Internet is given many terms throughout the world ranging from virtual education to web-based learning. A snapshot of distance education practices reveals great variation from country to country as well as the extent and form of implementation (Farrell, 1999). One view of distance education is online education within the United States where the landscape of K–12 education is rapidly changing. Online education in K–12 schools is gaining a great deal of attention as more school districts utilize the Internet, which enables teachers and students increased educational opportunities and flexibility. Online education is feasible and supported by the high percentage of K–12 classrooms with Internet access; ninety-two percent of public schools have Internet access in instructional rooms and the ratio of students to instructional computers with Internet access in public schools is 4.8 to 1 (NCES, 2003). Ninety percent of children aged 5-17 use computers and seventy-five percent of 14-17 year olds use the Internet (NTIA, 2002). Moreover, in the 2002-2003 school year, approximately one-third of public school districts had students who were enrolled in an online distance education course (Setzer and Lewis, 2005) and, in 2003, nearly 300,000 high school students were engaging in online classes in the United States (Wood, 2005). With this high percentage of individuals connected to the Internet and with students and educators embracing distance education using online strategies, a variety of instructional design guidelines and pedagogical approaches are being implemented to guide online education.

One trend in online education is the utilization of hybrid learning environments, primarily at higher education institutions, which offer a combination of online and face-to-face (F2F) instruction. The goal of hybrid learning is to improve the educational experience for students by joining together the best features of in-class teaching with the best features of online learning to promote active independent learning and reduce class seat time (Garnham & Kaleta, 2002; Young, 2002). Garnham and Kaleta (2002) at the University of Wisconsin-Milwaukee, a leading institution in hybrid course development, assert that hybrid courses offer many advantages over F2F or completely online courses including convenience, interaction, flexibility, and increased learning and retention. Research on the effectiveness of online education in general also demonstrates that students who learn at a distance do not learn any worse, or any better, than traditional students (Simonson, Smaldino, Albright & Zvacek, 2003, pp 8-9).

Hybrid learning is not being discussed in as much detail at the K–12 level; however, many high schools such as the Florida Virtual School are implementing this hybrid approach. In fact, some educators believe hybrid learning could become the norm in K–12 settings (Wood, 2005). Two different approaches to K–12 hybrid learning are being utilized within the United States – 1) students taking courses *in school* in a face-to-face environment and *out of school* in an online education course and 2) students enrolling in online education courses within school while teachers are facilitators assisting when necessary and instructing lessons that enhance and/or complement what they are learning online (Wood, 2005).

Adventure learning (AL) encapsulates this second approach to K–12 hybrid learning providing students with opportunities to explore real-world issues through authentic learning experiences within collaborative learning environments (Doering, 2005). AL utilizes both F2F and online learning environments but is subtly different from

traditional hybrid environments. For example, in AL environments, classroom teachers are not positioned in the role of teacher/facilitator/designer in the online learning spaces. AL online spaces are collaborative spaces where students, teachers, experts, and AL team members interact with one another; these are community spaces where traditional hierarchical classroom roles are blurred and learning is transformed. Learning is transformed as students no longer initially look to their classroom teachers for knowledge, but utilize the online collaboration zones to interact and search for answers while developing new questions with other learners throughout the world. Additionally, student motivation to enter the online learning environment is significantly enhanced as real-time features and unknown locations of adventure learning environments provide a hook for learners to enter and return to the online environment frequently (Doering, 2005). Furthermore, students' roles also transform due to the flexibility and design of the AL learning environments as they move from student to reflective practitioner (Palloff and Pratt, 1999). AL students become more assertive, directive, enthusiastic, and motivated as they collaborate, construct, and learn with others around the world (Doering, 2005).

As a result of the changing roles of the teacher and students, AL encourages transformative learning (Mezirow, 1990, 1991), learning that occurs through dialogue based upon collaborative opportunities, authentic experiences, and interpretation of the AL experiences (Doering, 2005). Palloff and Pratt (1999) assert that transformative learning is the result of intense collaboration and reflective participation in a learning environment; transformative learning seeks to enable learners to understand why they see the world as they do while understanding the impact of prior knowledge on their newly constructed knowledge (Palloff and Pratt, 1999).

Defining Adventure Learning

Arctic Transect 2004

Arctic Transect 2004: An Educational Exploration of Nunavut (AT 2004) was an adventure learning online education program designed to engage learners in authentic content through a real-time adventure - a 3,000-mile dog sled expedition across the newest territory in the Canadian Arctic, Nunavut. This online program provided a free, eighteen-week, K–12 curriculum and online education environment for students and educators around the world. The *Washington Times* gave the AL site, www.polarhusky.com, an "A" *(*Szadkowski, 2004) and the *e-Learning Advocate* noted, "This is what online learning is all about. Transporting students to the Arctic where they can experience a learning adventure in real time" (Hall, 2004). A middle-school teacher who used AT 2004, commenting on the interaction of the "real world" with the curriculum in the online learning environment stated, "This is history in the making and that it's delivered to us daily --it's just a phenomenon…I have never seen students motivated to learn like this! That is, where they are motivated to go online into the environment and share their experiences with other students from around the world"

If this is what "online learning is all about," what is adventure learning and what does it mean for distance education? This paper describes this online education approach, outlines a framework for the instructional design process needed to develop an effective adventure learning education, and showcases an adventure-learning archetype.

The term "adventure learning" has been used in many instances to describe entirely different learning opportunities and environments. For example, team building resources and activities hosted by The Tahoe Adventure Learning Institute (http://www.tahoeadventurelearning.com/) to "multi-disciplinary" online programs such as The JASON Project (http://www.jasonproject.org) and The Wilderness Classroom Organization (http://www.wildernessclassroom.com/). Some "adventures" are programs that have teacher and student lessons (The Blue Zones, 2006); others have a curriculum attached to the adventure with videos, online chats, and digital labs (The Jason Project, 2006); while others yet are simply an expedition masquerading with education as the reason for the human need to explore the earth, but oddly put education in the last development phase of the project (yourexpedition, 2006). Across all of these online projects, all toting "adventure" in their descriptions, never is there a definitive sense of what adventure learning is nor mention of principles that guide meaningful learning in the classroom. John Dewey (1938) notably acknowledged, "the belief that all genuine education comes about through experience does not mean that all experiences are genuinely or equally educative" (pp 25).

I define adventure learning (AL) as a hybrid online educational environment that provides students with opportunities to explore real-world issues through authentic learning experiences within collaborative online learning environments. Duffy and Kirkley (2004) state that the quality of distance education, just like any face-to-face course or seminar, comes down to the "design of and student's engagement in the learning environment" (pp 4). Researchers have identified approaches to develop online courses in *general* (Collis & Moonen, 2001; Jolliffe, Ritter & Stevens, 2001) that have provided guidelines for designers; however, there are few established guidelines for designing and developing adventure learning distance education environments.

Adventure Learning Framework

　　　　Designers of adventure learning online education environments may consider employing the Adventure Learning Framework developed from four years of designing, developing, delivering, and assessing adventure learning environments to students and teachers throughout the world. This framework is comprised of seven principles, which are interdependent of one another: 1) a researched curriculum grounded in problem solving, 2) collaboration and interaction opportunities between students, experts, peers, and content, 3) the utilization of the Internet for curriculum and learning environment delivery, 4) the enhancement of curriculum with media and text from the field in a timely manner, 5) synched learning opportunities with the AL curriculum, 6) pedagogical guidelines of the curriculum and online learning environment, and 7) education that is adventure-based (Figure 1).
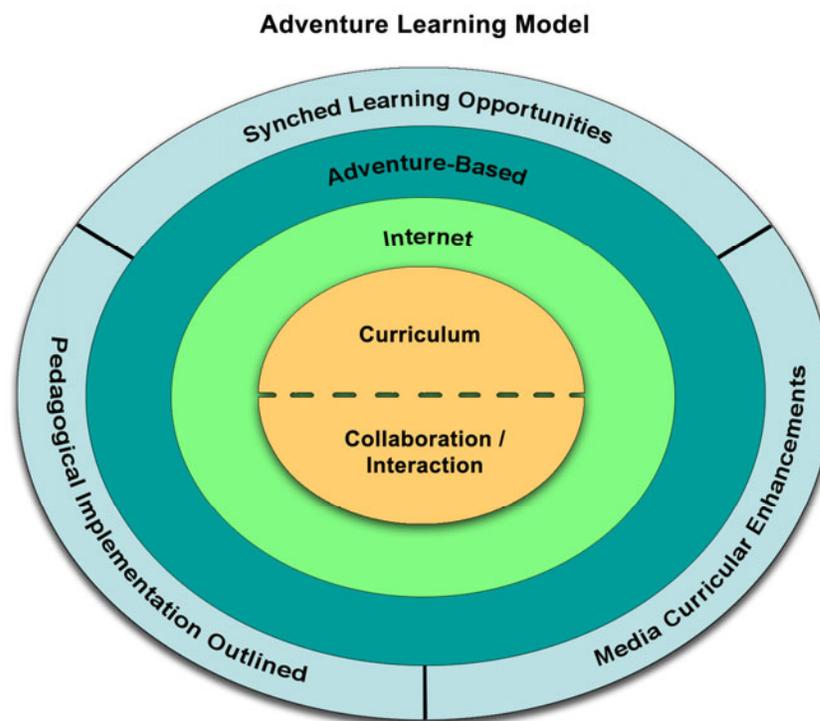
Figure 1: Adventure Learning Model

　　　　These seven principles, which collectively comprise the Adventure Learning Framework, are expanded upon and outlined below using examples from an adventure learning archetype (Arctic Transect, 2004). These principles can be utilized as a guide for designers who wish to provide transformative learning opportunities for students within an online distance education experience.

1. Adventure learning education begins with a researched curriculum grounded in problem solving.

　　　　Description. The majority of curricula are not written with AL in mind and the majority of adventures or expeditions are not developed with its curriculum in mind. For example, as one researches many "adventure learning" online education environments, the curriculum that is written does not interact and correspond with the activities within the field, as the curricula are disparate from the adventure. Prior to planning any learning adventure, learning outcomes must be identified. From the start, learning outcomes, based on authentic problem-solving tasks, should guide the development of the curriculum and the online learning environment (Dexter et al., in press) *as well as* the planning of the adventure. In other words, AL should not focus on the exploration or adventure, but rather on the learning goals. The development of curricula and online environments must situate the learning in an authentic environment knowing that the experiences are first and foremost for educational purposes, not the thrill of adventure. Lastly, the work of cognitive psychologists illustrate that students learn best when solving real-world problems and the number of instructional models related to this learning approach reinforce this thinking (Mayer, 1992). AL curricula are problem-driven with an overarching question that needs to be solved through interacting with the AL online environment. Students interact with their peers, experts, teachers, and curriculum to solve the problems that are driving the curriculum modules. Students most often do not look to their teachers for answers as

the problems being solved utilize information delivered from the field as well as the interactions with others outside of the classroom. The traditional approach of teacher-directed learning is transformed allowing students to take charge in the search for answers.

Example. *Arctic Transect 2004: An Educational Exploration of Nunavut* (AT 2004) had two main portals, a public audience portal and a student and teacher portal - *The Online Classroom*, which was a collaborative online learning environment developed concomitant with the curriculum to create a seamless learning experience. The Arctic expedition captured the interest of the general public creating the opportunity to educate both formal audiences within the K–12 classroom as well as informal audiences. Therefore, both portals had the same content, but *The Online Classroom* was gated for the students' safety and featured the collaborative opportunities. Because students were sharing their projects and their perspectives while interacting with peers, teachers, and experts from around the world, the collaborative areas were gated with a username and password. This filter process began when teachers signed up for the program as their names, school, and locations were confirmed prior to issuing a username and password.

The free AT2004 300+ page paper-based curriculum was researched and developed one year prior to the beginning of the project, and was based upon the pre-determined region of travel. Learning outcomes were established taking into account the grade levels that were going to use the program, the technology and data that would enhance the curriculum, and the online interactive activities supporting the paper-based curriculum. The curriculum unit plans were developed in three levels named *Experience, Explore, and Expand* ranging from a directed to a constructivist approach to the problem-based content. The curriculum is written where the students must take an active role in solving the module question. For example, one module question was: "How are peoples' actions in the mid-latitudes impacting the life of the Inuit in the Canadian Arctic today?" Only one facet of the answer to this question could be elicited from the curriculum. A complete understanding of this question came from the numerous interviews with the Inuit delivered to the online learning environment from the trail as well as the collaboration opportunities with Arctic experts the took place within The Online Classroom.

Teachers had ready and early access to the curriculum giving them ample opportunities to work with and plan their teaching in advance of the school year. The curriculum was made available for download via multiple portal document files (pdf) (Figure 2).
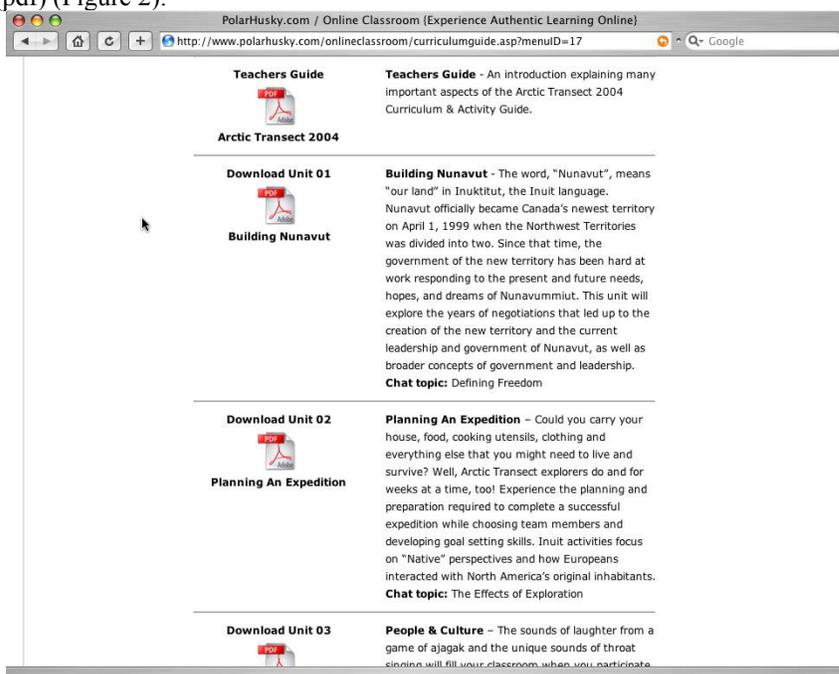
Figure 2: Curriculum available for download via the Internet

2. Adventure learning education provides collaboration and interaction opportunities between students, experts, peers, and content.

Description. Although all AL education must begin with a solid curriculum, collaboration is the heart of the educational experience. Internet isolation should be removed by providing collaboration and interaction opportunities (Bransford et al., 1999) which encourages transformative learning at multiple levels– between students and teachers; between students and subject matter experts; between teachers and subject matter experts; between

students, teachers, subject matter experts and the adventure learning content; and lastly, between students themselves, teachers themselves, and between the subject matter experts (Figure 3). The collaborative and interactive opportunities were designed within *The Online Classroom* in an environment named the *Collaboration Zone* (the term used for the collaboration environment in the AT 2004 AL educational program).
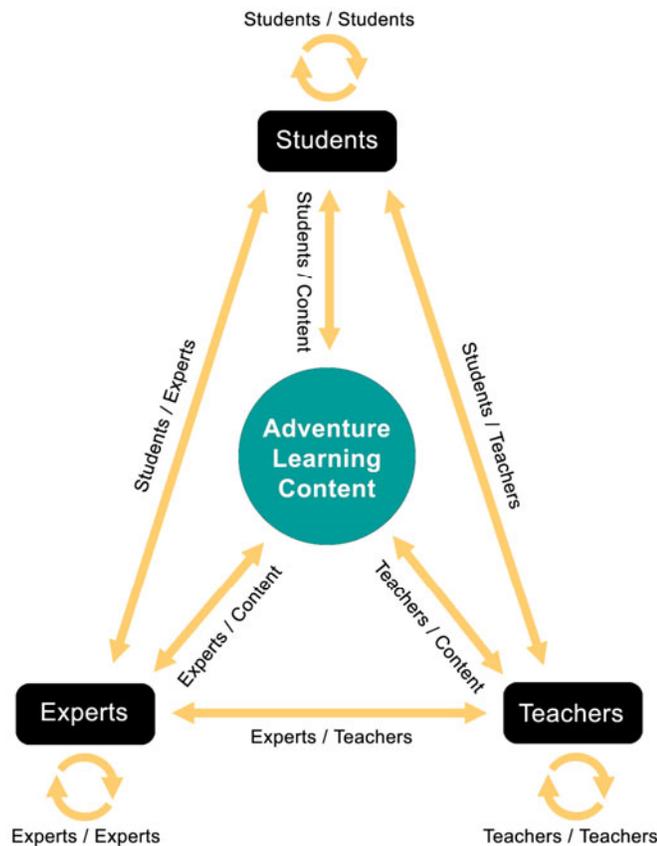
Figure 3: Adventure learning interaction model

Student-teacher and student-teacher-content interaction and collaboration. Student-teacher interaction and collaboration occurs primarily within the brick-and-mortar classroom as teachers utilize the curriculum and *The Online Classroom*. Teachers guide students to investigate the problem that needs to be solved within the unit lesson plan while using the many media and interactive options online. Teachers are available to answer student content and technology-based questions while assisting them in interacting and collaborating. Students interact with the curriculum-based content, access the real-time content delivered from the field, and collaborate with students from around the world within the collaboration zones in *The Online Classroom*. Furthermore, teachers are able to access content within the curriculum to aid their content knowledge before and during teaching while also accessing the real-time content online. Lastly, teachers are able to interact and collaborate with other teachers for content and pedagogical knowledge – both online and within their own school building.

Student-expert and student-expert-content interaction and collaboration. Adventure learning affords many opportunities for students to learn from subject matter experts. Primarily, this occurs within moderated chat environments based on the unit lesson plan topic. Teachers scaffold their students on subject matter prior to entering the moderated chat environments. Students submit their questions within the chat environment to a moderator at Education Basecamp who chooses the questions that would most enhance the learning discussion. The questions are in turn submitted to the expert where s/he chooses what s/he wishes to answer before submitting it into the chat environment. Thus, it is not until the expert releases the submitted question(s) and answer(s) that the students see the synchronous discussion (Figure 4). The collaboration opportunities continue through asynchronous discussion and file sharing within collaboration zones.
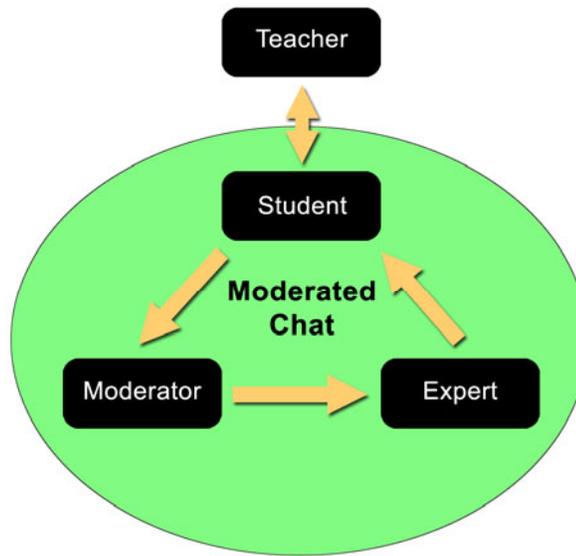
Figure 4: Adventure learning moderated chat & flow

Teacher-expert and teacher-expert-content interaction and collaboration. K–12 teachers are required to be subject matter experts in multiple areas. Social studies teachers many times are required to teach numerous courses in areas that they have not been prepared. Therefore, the opportunity to collaborate and interact with practicing subject matter experts can be a unique advantage and rare in classrooms today. An AL environment provides these opportunities through synchronous and asynchronous discussions within the chat environments and collaboration zones respectively. The subject matter experts are identified prior to the release of the curriculum to the teachers. Thus, teachers have the opportunity to augment their content-knowledge by interacting with the subject matter experts.

Student-student, teacher-teacher, and expert-expert interaction and collaboration. All AL participants – students, teachers, or subject matter experts – benefit from interaction and collaboration opportunities with their peers. Within AL, students work with each other in the classroom, but more importantly, with students from throughout the world within the chat and collaboration zone environments. Students share media (e.g…photos, videos, and Microsoft Powerpoint™ files) and discuss the content through various opportunities. Teachers normally interact and collaborate on lesson plan ideas and appropriate pedagogy, and subject matter experts normally discuss their area of research and how to effectively communicate this with the K–12 population.

Student-content, teacher-content, and expert-content interaction and collaboration. All AL participants also have numerous opportunities to interact with the content in various formats ranging from the paper-based curriculum to the real-time updates delivered from the field. It is important that the teachers have the curriculum to study the content prior to the adventure for planning purposes; the subject matter experts must also know their discussion content topic weeks before entering the chat and collaboration environments.

Typically within society, we solve problems by working and conversing with others; but despite research that points to collaboration as an important aspect of meaningful learning (Jonassen et al, 2003) in the classroom, students are usually encouraged to solve problems and learn independently. Adventure learning is based upon creating opportunities for students to collaborate and reflect within the online learning environment in order to encourage transformative learning. Transformative learning requires all learners to work together through social negotiation - discussing, solving, and reflecting on the problem to be solved. Social negotiation can arise at high levels with an AL approach as individuals who are goal-directed are working together to solve a common task within a common place – a collaboration zone. Furthermore, distributed cognition (Vye et al., 1998) can occur when students collaborate within an online AL learning environment and research indicates that solving problems as a group is much superior to individual problem solving (Evans, 1990).

Example. AT 2004 provided *collaboration zones* for social negotiation, which fostered problem solving and motivation (Doering, 2005). *Collaboration Zones* provided learners with the opportunity to post and share learning objects while also providing the opportunity to chat with subject matter experts, with expedition team members,

with teachers, or with other students throughout the world. The lesson and chat topic on global warming involved students interacting with meteorologist Dan Dix from The Weather Channel[TM] in Atlanta, GA. Moderated by Education Basecamp located at the University of Minnesota, students were able to ask Mr. Dix questions, which were then selected to be answered by Mr. Dix himself; the result being a controlled, synchronous chat environment (Figure 5).
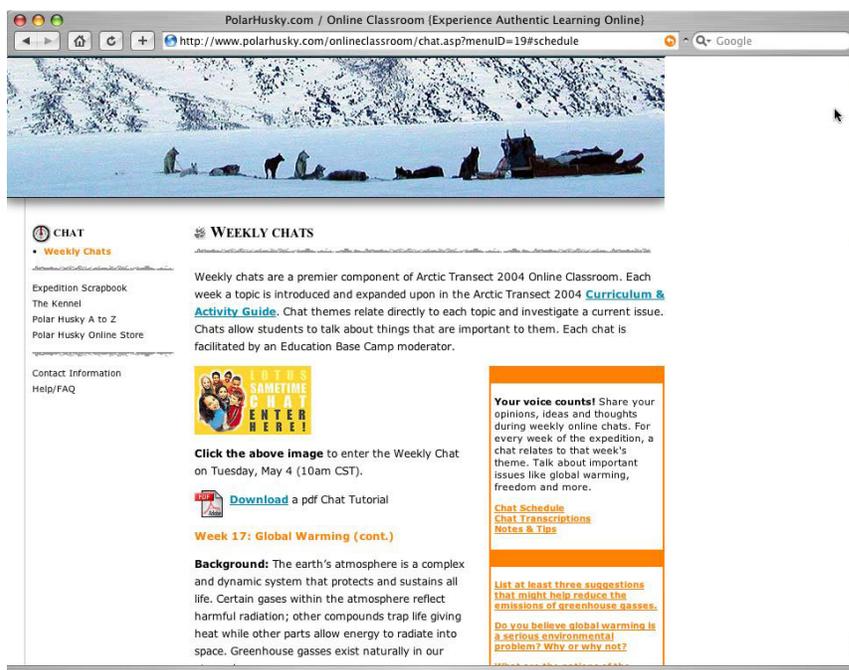
Figure 5: Expert chat schedule and directions with direct entry into chat environment

3. Adventure learning education utilizes the Internet for curriculum and learning environment delivery.

Description. Achieving true collaboration and receiving timely updates from the field requires the use of the Internet. The Internet also provides ready access to a curriculum for students and teachers throughout the world. If one does not utilize the Internet for an AL project, the heart of AL – interaction and collaboration with experts, teachers, and peers throughout the world and timely and frequent updates from the field - cannot occur. Furthermore, the opportunities for transformative learning are diminished, as students cannot collaborate with any content or individuals outside of their classroom

Example. AL projects are able to reach millions of students, offer collaborative opportunities, and provide real-time experiences when the Internet is utilized effectively and efficiently. Figure 6 showcases the "dog kennel" which was the most frequently visited page of the AT2004 3,000+ page web site. Students would visit this page daily "connecting" with their favorite Polar Husky (there were 31 dogs on the expedition). Students would consistently be motivated to sign-in to *The Online Classroom* to see what and how their favorite dogs were doing. One of the most frequently read features of the site was a daily update delivered from the trail titled, "Timber Tales", which were the trail happenings from the perspective of the dog, Timber. The ability to provide these frequent updates or to provide collaboration and interaction opportunities are based on utilizing the Internet. Furthermore, educators participated in online professional development activities that were available to those teachers who wished to learn about AL teaching and learning approaches and received credit from the university without leaving their classrooms or homes.
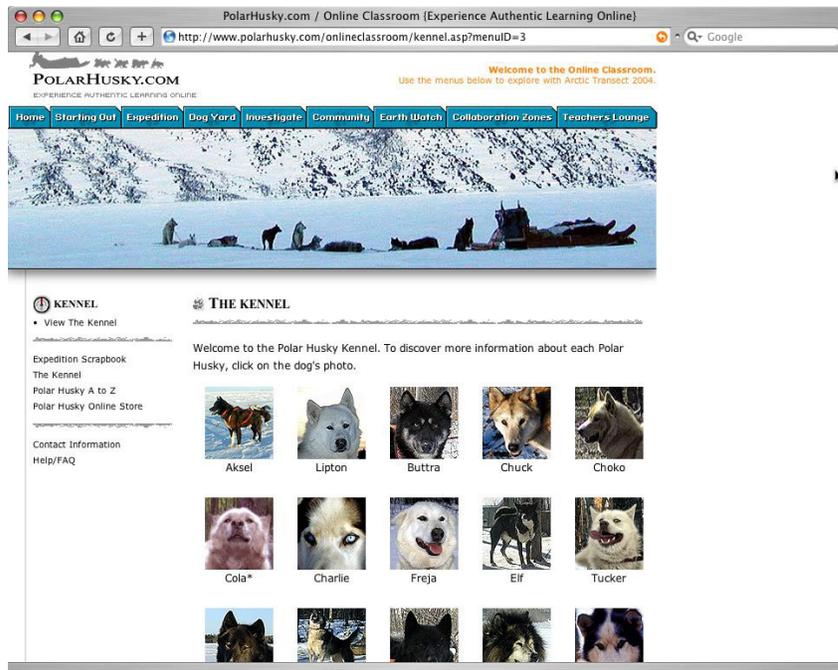
Figure 6: Polar Husky dog Kennel featuring bios of the dogs on the expedition

4. Adventure learning education enhances the curriculum providing authenticity with media and text from the field in a timely manner.

Description. Media (e.g., video, sound, QTVR, and photos) and text from the field provide authentic enhancements to an AL curriculum and motivation for student learning (Doering, 2005). The media along with appropriate pedagogy motivate students as every update from the field reinforces the content of the curriculum situating the learner's participation in an authentic real-time environment. Teachers and students must know when the field updates are expected to be available within the learning environment. Teachers can plan their lessons accordingly and also the timely updates provide motivation for students entering the learning environment seeking the latest adventures from the field.

Example. The AT2004 paper-based curriculum was enhanced with frequent trail reports delivered in a timely and predictable manner. The trail reports, which included movies, sounds, photos, and interactive content opportunities, were delivered to the classrooms on a detailed schedule (Figure 7). During AT2004, the expedition team would not travel on Fridays as it was coined, "Education Day." This non-travel day was used to write the weekly trail report and upload sound files, movies, and photos that were available for teachers and students at 8:00 A.M. every Monday morning.
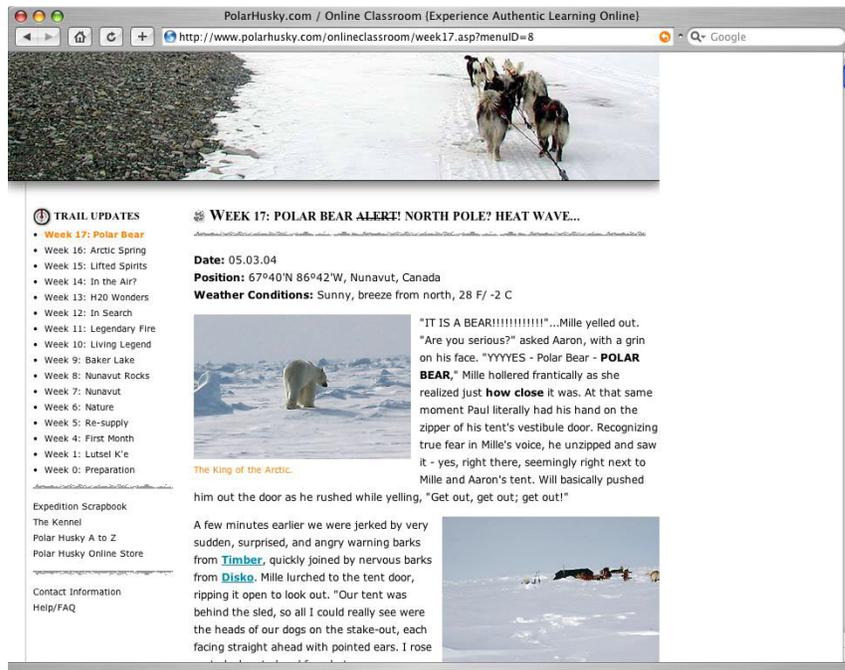
Figure 7: Weekly trail reports delivered from the Arctic

5. *Adventure learning curriculum provides synched learning opportunities.*

Description. The AL curriculum is enhanced with a strict practice of providing synched instructional learning opportunities. These opportunities begin with learning tools within the online learning environment that enable the learners to interact live with explorers, educators, subject matter experts, and fellow users. These tools include web offerings (thematically-based virtual tours and educational animated movies), multi-media (access to images, audio, video and data from the field that is central to the learning experience), integration of geographic information systems technology, collaboration zones, and moderated chats. The online learning environment where the media opportunities exist must be designed in tandem with the curriculum.

Example. Learning opportunities must exist online for students that are synched with the curriculum. During AT2004 when students studied the unit entitled "Water, Water, Water," the teachers and students read the newly posted trail report entitled "H_2O Wonders" which was synched with the content of the unit (water). In the trail report, the students read about the amount of water the explorers, educators, and Polar Huskies used on the trail; how the Inuit obtain their water in the Arctic; the impact of rising sea levels; and numerous other examples delivered with movies, audio files, and photos. For example, photos and movies showing how snow and ice were collected on the trail and melted for water gave students an idea about life on the trail. Scientific information such as the impact of a polynia (open water year-round on the Arctic Ocean) on local weather phenomena and animal habits were also documented as one team member routinely collected snow samples for the National Aeronautics and Space Administration (NASA), which was also shared with the AL users.

A "local activity" was also available in every unit plan where students were encouraged to act locally at some level. During the water unit plan, students recorded their water usage for a week and a link was provided within the text from the trail report that took them immediately to a collaboration zone to post their own findings (Figure 8).
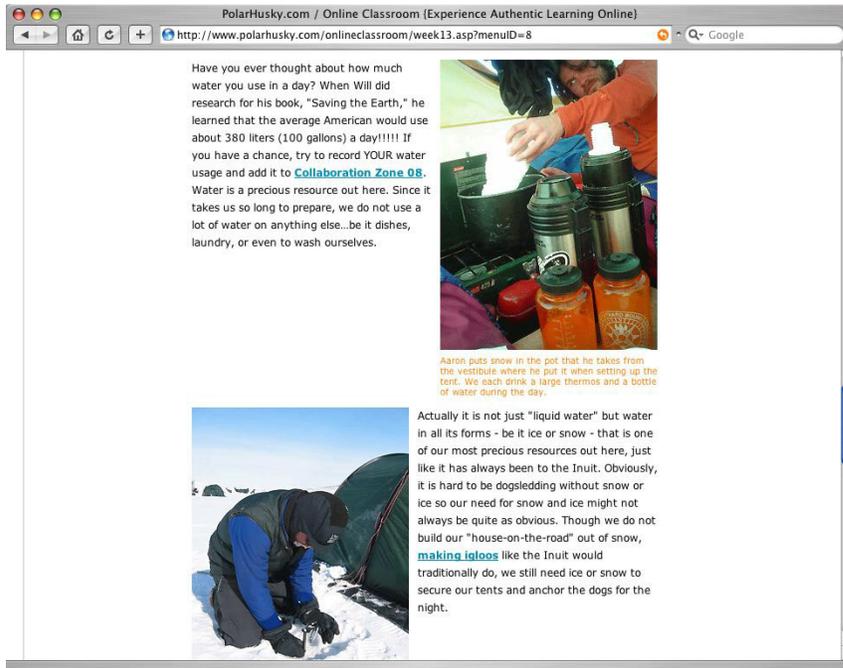
Figure 8: Trail report with links to collaboration zones and media opportunities

6. Adventure learning education has pedagogical guidelines for the curriculum and online learning environment.

Description. The utmost value of the AL environment is achieved when the appropriate pedagogy is defined and aligned with the curriculum and online learning environment. An effective learning environment should not be designed without the instructional uses of it in mind. These uses of the online environment, as well as the curriculum, need to be outlined in detail so the curriculum can be implemented effectively and easily.

Example. Examples of successful pedagogical practices are vital to an AL project. Teachers must understand how the curriculum was written and how it works together with the online learning environment. Because the paper-based curriculum and features within the AT 2004 learning environment were synched according to the experiences on the trail, a detailed calendar was also necessary (Figure 9). Integration techniques were available in every unit lesson plan through screen-capture videos and tutorials from experienced educators who have successfully integrated an AL project within their classrooms.

Figure 9: "How to Use" Calendar

7. Adventure learning education is Adventure-Based.

Description. AL education captivates and motivates learners. Traveling to any location on the earth provides the mechanism to bring authentic content into the classroom. Because AL education is delivered via the Internet, the adventure that may be local for one individual is a remote unknown distant location for another. As we strive to make learning opportunities more authentic so that it is meaningful to students, the AL model delivers.

Example. AT2004 was based upon the investigation of the Arctic and the traditional ecological knowledge (knowledge of the environment that is passed down from one generation to another) of the Inuit. The slow traverse by dog sled across Canada's newest territory, Nunavut, peaked student interest to comprehend the unknown. The trail updates enhanced the curriculum by providing authentic data in real-time. For example, when the AT2004 expedition team left Baker Lake, Nunavut and encountered an Inuit igloo, photos and videos of the igloo were captured along with interviews with the local Inuit providing knowledge on how igloos were and are still used within their environment. Moreover, prior to arriving in Pelly Bay, Nunavut, Inuit elders greeted the team on the ice spending two nights with the team. During this time the Inuit hunted wolves and fished for Arctic char on the land. The Inuit shared their Arctic char with the team members as we learned about this native food and how to effectively prepare it. The fish traps and the exchange and preparation of the food was documented and shared online as students studied the fauna of the Arctic. The unknown Arctic continued to interest users as the expedition team crossed the Arctic Ocean, encountered polar bears, learned about global climate change, and the loss of the Inukituk language.

The adventure for AL education does not have to be an extreme Arctic location. The education provided by individuals sharing content from their local environment such as a trip to a local river investigating shipping lanes or a trip to a local crop farm will assist students by providing authentic content that makes the unknown real.

Encouraging Transformative Learning

Within this paper, a hybrid approach to K–12 online education, adventure learning, has been defined and described using an AL design framework. An archetype of this approach, the AL project, Arctic Transect 2004, was showcased identifying the features of the program as defined by AL principles. These principles support the goal of transformative learning by providing numerous opportunities to collaborate and interact in real-time with real-world content, peers, teachers, and subject matter experts throughout the world. Learners have the opportunity to share and discuss their perspectives and prior knowledge, acquire content through a flexible curriculum, while acquiring supporting content through multiple modes of media that are grounded in authentic situations.

Adventure learning is an exciting approach to hybrid online education, especially as the traditional field trip is threatened because of the lack of funds and major focus on test scores (Standen, 2005). AL projects do not need to be as extreme as crossing the Arctic by dogsled, but can be a teacher's trip to the local river utilizing the AL design framework. As educators strive to have students achieve meaningful learning in online learning environments, an AL education gives students and teachers the tools to create and participate in learning that is meaningful. Transformative learning moves students from the traditional learner to one who is a reflective practitioner within online collaboration spaces as well as their brick-and-mortar classroom.

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Enhancing Online Student Motivation and Cognitive Strategies with Interactivity

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Introduction

Paris and Winograd (2001) describe three characteristics of self-regulated learning: (a) metacognition, (b) strategies, and (c) situated motivation. This paper combines theory and research and practical application examples to instructors using online delivery to model and scaffold interactions which promote student motivation and learning strategies. Based on a study of 132 undergraduate students using the Motivated Strategies for Learning Questionnaire (MSLQ) and related articles providing best practices, this presentation will help you to improve interactions in your online course. The MSLQ was developed by Pintrich, Smith, Garcia and McKeachie at the University of Michigan (1991) and consists of 81 items and 15 sub-scales or factors which can be divided into a motivation section and learning strategies/resource management section. The MSLQ was administered to a sample of 132 undergraduate students and this paper provides an analysis of their motivation and learning strategy levels accompanied by practical application tips for teachers using online delivery.

Results and Discussion

As shown in Table 1, both motivation and strategy factors showed a normal distribution. While the developers of the instrument avoid discussion of norms, this sample would seem to be high in the motivation factor with a mean value of 5.31 out of a possible 7. Perhaps even more significant is the lowest value of 4.13 which puts 100% of the sample above the mean possible score of 3.5. A variety of strategies are recommended to achieve best results in improving motivation.

Table 1
Descriptive statistics of motivation and strategy variables

Statistic	Motivation	Strategies
Mean	5.31	4.34
Standard Deviation	0.49	0.68
Skew	-0.10	-0.29
Kurtosis	-0.33	.017
Minimum	4.13	2.38
Maximum	6.52	6.10

The strategy variables also indicate a normal distribution with a mean of 4.34 and a slightly truncated range from 2.38 to 6.10. While these levels would not indicate a need for concern about improving motivation and the use of strategies, it is necessary for enhancing motivation for online students. Because learning, recall, and retention improve when a variety of

strategies are employed, it is important to know how to improve motivation and strategy use through online interactions.

Review of Theory

MOTIVATION
Figure 1 illustrates the key factors of the motivation theory outlined by Keller in 1987 which shows that to be motivated a learner needs: (a) to attend to the information, (b) to find it relevant, (c) to believe he or she has the capacity to learn, and (d) to actually learn the material. Because learners occasionally arrive less than fully motivated, the challenge is to implement teaching strategies that (a) arouse and sustain interest, (b) connect with learner needs and interests, (c) build and support feelings of self-efficacy, and (d) support their success and satisfaction.
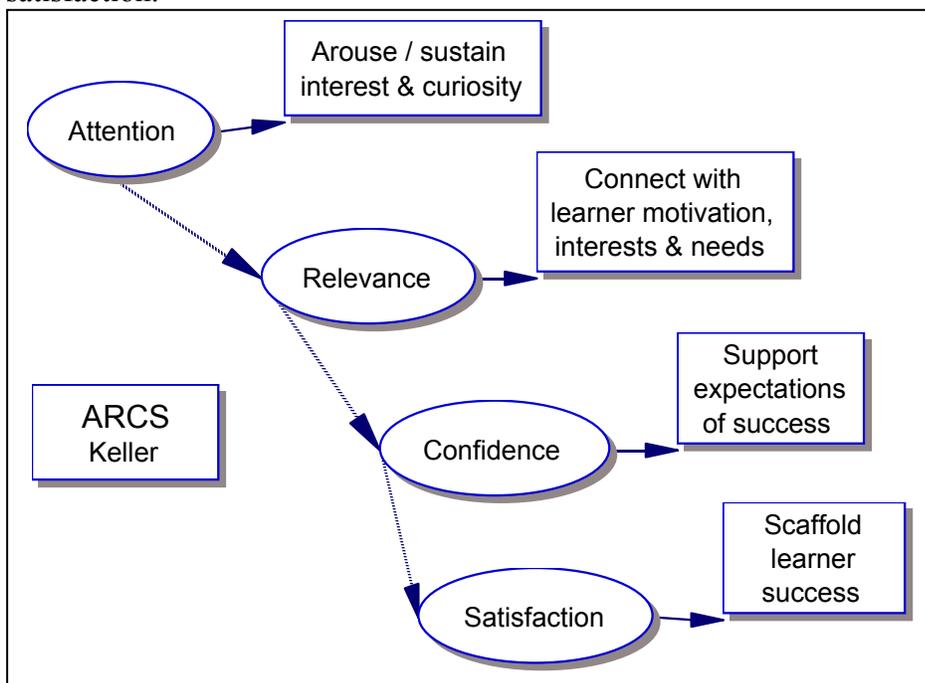
Figure 1 Keller ARCS Model of Motivation

Because motivation is such a broad concept, it is helpful to focus in on specific constructs for discussion. As shown in Figure 2, Miltiadou and Savenye (2003) illustrate constructs relevant to this discussion of online learning motivation. Specifically these are (a) the learner's perception of whether or not they are able to learn the material, (b) whether their goals are based on ideas such as performance or mastery and the source of their motivation, and (c) whether or not they have the skills and ability to evaluate and control their own learning. Supporting evidence for improving learner motivation comes from Lim and Kim (2003) who offer the following as sources for improving motivation (a) reinforcement, (b) peer support, (c) relevance, (d) interest, (e) self-competence, and (f) affect. Therefore, any activities that an instructor can promote which support these constructs will lead to improved motivation and performance by the learners.

Excellent advice on motivating instructor behaviors comes from a book on improving adult motivation by Wlodkowski (1999). Among those are the need to create a safe and

respectful learning environment, to have empathy for the learner, to demonstrate clarity, offer expertise, and to be enthusiastic. While these are not easily attainable they should still be goals to strive toward.
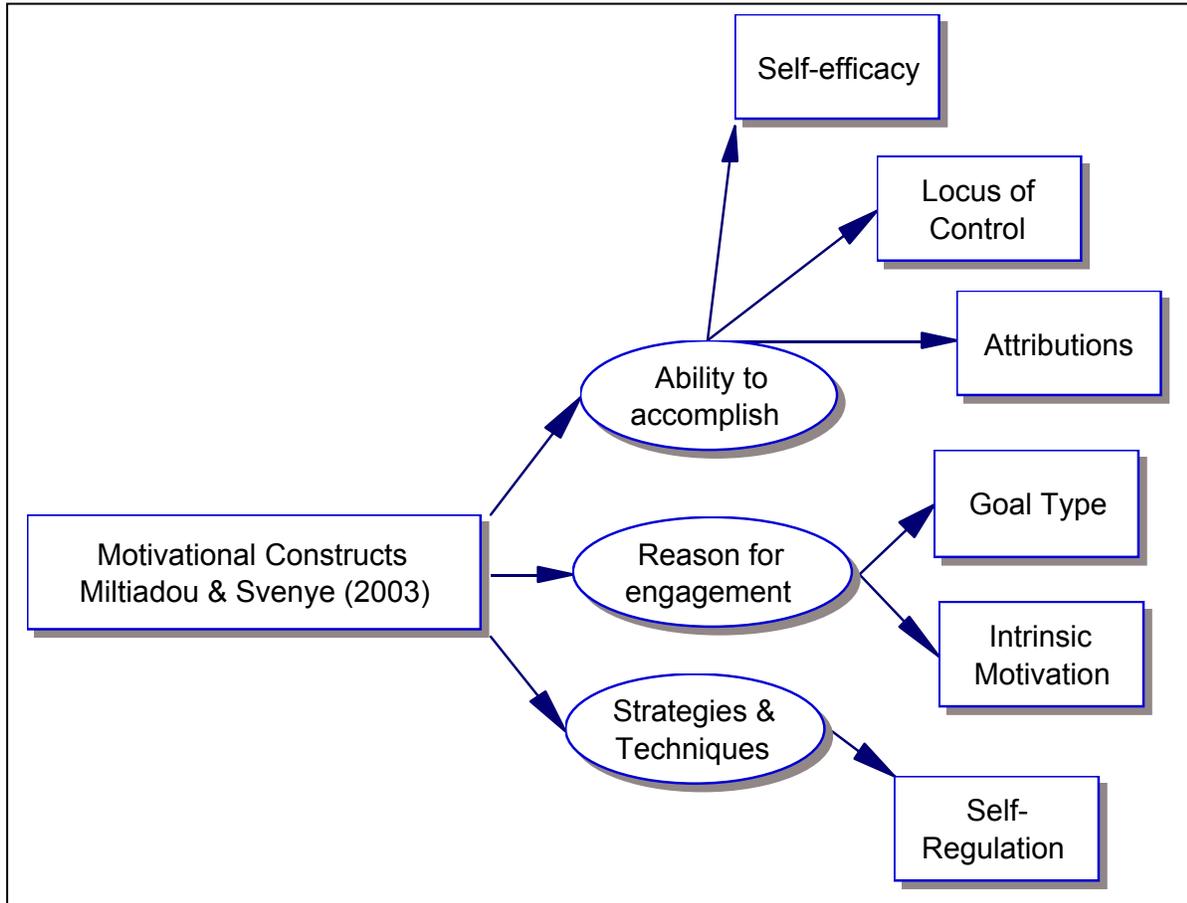
Figure 2 Miltiadou and Savenye Categories of Motivation

STRATEGIES

The fact that teaching is accomplished does not indicate that learning has taken place. "If learners are to be afforded the opportunity to regulate their own learning, then a metacognitive theory of learning has to be developed in order to redefine the outcome of learning" (Singh, 2005, p. 1). One possibility is self-regulated learning which Singh (2005) defines as "an interaction of…metacognition, motivation, and creativity" (p. 1). Paris & Winograd (2001) described three ways that self-regulation can be taught including (a) explicit instruction, (b) directed reflection, and (c) metacognitive discussions. Further guidance from McManus (2000) suggests that self-regulated learners benefit from a non-linear course organization and advance organizers to activate prior knowledge. Other strategies for promoting self-regulated learning comes from Paris and Winograd (2001) who recommend that instructors model self-regulated behaviors and support student self-regulation by having them keep reflective journals and by using frequent assessment to chart individual growth. The benefits of instructional feedback on achievement were further supported by Lim and Kim (2003). Dobrovolny (2006) includes

frequent opportunities to assess and correct learning such as questions, quizzes, exercises, and simulations to promote enhanced metacognition.

Designers and instructors should "help learners personalize new information before, during, and after the instructional experience" (Dobrovolny, 2006, p. 161). An important method for helping students to improve motivation and strategy is interaction. Miltiadou and Savenye (2003) added Learner-Interface interaction to the traditional trilogy of interaction which includes (a) Learner-Content, (b) Learner-Learner, and (c) Learner-Instructor. In Learner-Instructor interaction it is important to stimulate and maintain learner interest, reinforce motivation, assess learner progress, and to provide support and encouragement to the learner.

Table 2
Important teacher strategies

Jonassen, Strobel, and Gottdenker (2005)	Lim and Kim (2003)
Teach knowledge and skills in real life, useful contexts	Ample opportunities to practice
Provide new contexts for practicing new ideas	Incorporate student's own job examples in authentic problem-solving situations
Engage students in solving complex, ill-structured problems as well as simple problems	Check learning progress and provide timely feedback and support
Collaborative learning where they socially negotiate a common understanding	Interactive learning activities
Help them create mental models and concept maps	Feedback and encouragement emails

A primary factor in determining online course quality is students' awareness of the degree of interaction according to a rubric developed by Roblyer & Ekhaml (2000). Interactivity in online learning is equivalent to feedback in the traditional classroom setting. Social rapport building is also near the top in the list of activities necessary for high quality course delivery. It is a motivating factor that instructors can acquire from a variety of means. Utilizing a bio sheet equivalent of a syllabus with photo of the instructor, contact information and virtual office hours is essential for those online students who are self-regulated or who have an internal locus of control (Walters, 2002). But students who lack self-regulatory skills may require instant-on video with voice and in particular, easy navigation to proceed. To avoid heavy download from video, still portraits of several poses with fade-in view take little download time and are very effective particularly with instructor voice over.

After instructors provide the much needed social rapport, instructional design considerations for learning require one-way delivery of information such as lectures, text delivery and readings. At the end of every one-way delivery and throughout the content, short quizzes or feedback pop-ups should be presented to maintain focus, remediation and enrichment. These activities can be presented in an online accounting classroom for example. While accounting education is transitioning from bookkeeping to accounting technology, the proper mix of multimedia and interactivity is proven to be powerful teaching and learning technique. According to Mckee (2005), the only thing that is holding accounting instructors back from truly effective online instruction is a lack of creativity.

A rail system module depicted by Mckee (2005) provides students with an opportunity to observe the nature of cost accounting data extracted from the manufacturing process. A schematic was applied to a job-order cost system and then a cost flow schematic was transformed into an electronic cost engine. The student user can select various buttons to confirm what is going on behind the scenes such as journal entries, transaction files, master files and trial balances. The student user can also display animated clips that depict receiving raw material, stockroom requisitions, time card punching, and transfers to warehouse and shipments to customers. This can be accomplished by simply linking an image to a page with journal entries then providing a navigation button back. A quick video clip of the proper way to punch time cards can easily be uploaded to your website and linked accordingly. The module employed graphics and animation. Mckee admitted the incorporation of lots of bells and whistles into this module was tempting but the purpose of this module design was to draw attention to cost accounting systems and not computer-based accounting systems.

The third element of importance is levels of interactivity of technology resources. This level is where creativity helps instructors to design meaningful assignments. An example is a program, Calibrated Peer Review (CPR) implemented by Dungay and developed by Chapman (2004). This online program allows students to critique each other's writing. Students critique sample essays, either authored by instructor or choose from an assignment library, and the computer keeps track of how well they can critique. Their review of another student's review is weighted by their skill level. With one assignment, students learn about a topic, improve their writing, and improve their reading skills. Instructors are empowered to give frequent writing assignments without increase grading workload. After submission of electronic essays, students read and assign a score to three "calibration" essays. When students demonstrate they are competent reviewers, they read and assign a score to three anonymous peer essays, and finally, to their own essay. Online, interactive assignments much like this one will become more available in the near future.

The fourth element is impact of interactive qualities as reflected in learner response. By the end of the course, all students in the class should be interacting with instructor and other students whether it is through email, chatroom, discussion board or utilization of Skype. Skype is a free voice over Internet protocol that allows the ability to record and play audio. The ability to call out and into standard phone lines makes this a method of synchronous and asynchronous communication (Descy, 2005).

Online learning is becoming an established method of teaching and is a modern form of independent study that has changed the way in which the student and teacher interact (Wedemeyer, 1981).With the infusion of technology in the mix, a current and more realistic definition of online learning is characterized as education or training courses delivered to remote (off-campus) locations (s) by means of existing and evolving computer technologies.

Shifting from traditional to online teaching requires a paradigm shift (Brown, 2004). In general, navigating through course material that has not been meticulously well designed can be difficult if not impossible for students. For distance education, learner-centeredness is the focus and is strongly associated with the interface design of an online course (Brown, 1997) as well as other central design features. Learning management systems (LMS) can provide good design and navigation. Regardless of how it is presented to students, interaction, immediacy and social rapport building are essential to motivating student. Shea, Motiwalla and Lewis (2001) found that the two most important requirements for online student success are immediacy in terms of feedback and added student-instructor interaction.

Awareness of the Degree of Interaction (feedback)

Interactivity is one of the main factors that distinguish online distance education from the previous forms of distance education (Magjuka, Shi & Bonk, 2005). New online students may not be aware of the just how they will interact with their instructor. Many researchers believe that a higher level of interactivity between the instructor and students correlate with higher quality of the course. To set the stage for a more quality online learning environment, Holmberg (1983) and Moore (1989) found in their studies that student-student interaction was not necessarily significant to learning but that instructor-student interaction was an essential component of online instruction.

What constitutes interactivity? What is necessary for interactivity in online courses is immediacy for information. The NET generation views the world as 24 hour/7 day demand for real time and fast processing of information (Skiba, Barton & Amy, 2006). Feedback has become more of a reactive than proactive task (Flowers, 2005).

With an emphasis on high levels of interactivity in distance education, problems usually arise early in the program with the demand for immediate feedback from students. Thus, instructors are dissuaded from teaching distance courses fearing the increased workload brought about by the demand for high levels of interactivity (Hislop & Atwood, 2000; Pachnowski & Jurczyk, 2003; Young, 2002) and immediacy. Roblyer & Ekhami (2000) have developed a rubric for online interactivity which can be found at http://www.westga.edu/~distance/roblyer32.html.

Levine and Sun (2002) contend that interactive and individualized pedagogy is important whether faculty are deeply involved in distance education or continue to teach traditional courses. The authors outline three barriers to distance education. First is that higher education lacks a pedagogy for using the Internet. The second is that the role faculty assumes in using technology remains uncertain, and the third is that faculty needs to know more about "interactive and individualized pedagogy" (p. 6).

Interactive distance learning (IDL) is a two-way video and audio interaction between the instructor and student at remote sites. IDL, which most closely simulates real-time teaching (Dyrud, 2000), may be the most appropriate training system for undergraduates, K-12 and those who need creative "social-based" teaching interfaces.

Elements of Importance

1. Awareness of the degree of interaction (feedback)

2. Levels of Interactivity of technology resources

3. Social rapport building

4. Impact of interactive qualities as reflected in learner response

Levels of Interactivity
Low level interactivity

The first level of interactivity is analogous to a lecture. For students, they only need to be able to read online (e-reading) and have the ability to navigate the site. The Web designer need only to set the pace of a presentation in multiple media. The "automated lecturer" accepts no

input from the audience except when to turn the page to the next topic or previous topic (Schlei, 2000). In low level interactivity, the sequence of the presentation is fixed and linear. This form of interactivity is useful for teaching sequential topics.

Medium level interactivity

A medium use of interactivity gives the student (end user) the responsibility for choosing from multiple paths through subject matter. The Web site responds to the student's choices (clicks) without engaging in any dialog. A multimedia encyclopedia provides this level of interactivity. This level is void of teaching but does provide an atmosphere where a student can easily locate and manage information (Schlei, 2000).

High level interactivity

High levels of interactivity between instructor and student encompass responding to each other using electronic dialog. Asynchronous learning is not coordinated in terms of time such as synchronous learning. This is where high levels of interactivity are most useful.

Learning management systems (LMS) such as WebCT, e-College, etc.), for example, can provide high levels of interactivity through its various tools such as email, bulletin board, chat rooms, etc. LMSs can determine the user's individualized path through the Web site resulting in a log of every step a student takes in the virtual classroom. I my experience, those student who access the site the most, generally receive a higher grade for the class.

An example of high level interactivity is a simulation of an environment where the student is prompted to respond to simulated conditions with tools comparable to the controlling factors of real conditions in an actual environment. Because problems encountered in everyday situations are typically emergent and not well defined, Jonassen (2003) recommends interactivity for learning by using multiple representations to help students transfer their skills when problem-solving (Brown, 2004).

High levels of interactivity do not have to be developed through complicated authoring software such as Authorware, Quest, Toolbook and others. Representations can include structural knowledge, procedural knowledge, reflective knowledge, images and metaphors of the system of strategic, social/relational, conversation/discursive and artificial knowledge. The author suggests courseware with capabilities for posting discussion, data displays and threaded conversations support using cognitive tools to introduce and solve problems (Brown, 2004) can be found in any LMS.

Other examples that provide online interactivity are blogging which is a web-log that allows students to contribute to and comment on the blog entries. Living books help learners work their way through the chapters of electronic book by providing directions to web sites to find information and respond to questions. To view interactive chapters of The Net Generation: Implications for Nursing Education and Practice, go to www.electronicvision.com/nln/.

Other levels of interactivity can be obtained by using games and simulations. The results of research conducted by Evans (2002) indicated that computer games help develop problem-solving, reasoning, and sequencing skills for students and that students cooperate, concentrate, and make a sustained effort when they are involved in computer games.

Nurses can master clinical skills in virtual settings by role-playing patient interactions, changing the race, gender, or ethnicity of their of their virtual doppleganger, which are an astral projection of the human double (Simpson, 2006).The data collected from the student can be used

for scoring or not; however, it helps the program make judgments about what the user understands and doesn't understand (Schlei, 2000) .

In their study, Amor, Naicker, Vincent & Adams (1999) stated adventure games appear to provide the best foundation for the development of teaching resources. Skills required to play adventure games identified by students include logic, memory, visualization and problem solving.

Games and Simulations

Embedding JavaScript games into your Web site to create high level interactivity for online students is easy. Mind Guesser teaches students how to follow directions. Mind Guesser is JavaScript free of charge and can be found on JavaScriptKit.com Web site. The site provides simple two simple steps for cutting and pasting script. Always get permission to use the JavaScript. Or the Memory Game is at http://www.igor.net/games/memory/that provides the game for any end-user. This is a great one for building memory skills. Reflexer Test is another one from JavaScriptKit that tests student's response time. Trail Cursor can be found at http://web.coehs.siu.edu/wed/wallace/htm%20pages/fun_page.htm. This game is designed to teacher students how to communicate accurately. Build your own game using PowerPoint or go to this Web site http://teach.fcps.net/trt14/Power%20Point%20Games/power_point_games.htm to find more.Generators to help build scripts are plentiful on the Web. Lizardpoint.com and Myspace-Generator are examples.

Rule-based simulations developed by using computer-based training software such as Quest, Toolbook and Authorware will request some training; however, if you need to teach student performance skills, these interactive modules can be designed to teach skills with lots of interactivity. For example, modules designed using Authorware (Figure 3) can teach gardeners when to plant certain varieties of plants. The scene is a sketch of a garden with four spots ready for planting. The user is instructed to drag the plants to the plan so that each is in it optimal growing location. Hosta's should be planted in a shady spot, the user would click and drag the image of the Hosta to spot under the Silver Maple, and so on. If the user makes a mistake, the image dings and automatically moves back to its original spot.

Figure 3 Authorware module

Social Rapport Building

Building social rapport involves the forging of trust and respect among online students (Kanuka, Collett & Caswell, 2002). When instructors begin their online course with a welcoming email, this sets the tone for the entire course. A still photo with an audio message with closed caption (marquee or scrolling text) provides more kinesthetic welcome to students. Since online students rely exclusively on what the instructor provides online, due dates, assignments, quizzes, and any promises made, it important that the instructor adhere to dates and promises given (Sull, 2006).

Promptness to emails on the instructors' part is essential to social rapport building. Regardless of the content of the email from students, a timely reply is mandatory. This acknowledgement goes a long way to earning student respect. Send general emails throughout the course. In the traditional classroom, eye contact, voice inflections, etc. set the social stage of rapport building. Online students must be made aware that someone cares about their success in the online classroom; immediacy to email will provide rapport similar to the face-to-face classroom.

Quality feedback equates to student motivation. Give students as an entire class and individually compliment them on their work and what they did wrong or did right. Use casual language which translates into a mix of conversation and formal writing. In this way students will not feel like the instructor is someone who thinks he/she is better and above the students (Sull, 2006). Sull suggests the use chat rooms, threaded discussion boards and e-journaling so that students can be spontaneous and be involved which allows for more ownership of the course on their part.

The ideal online classroom might consist of the student sitting with a book, pad of paper, and PowerPoint slides which are designed so that they can work along hitting the space bar or mouse and unveiling the next step or answer to a problem (Sull, 2006).

Communication methods that students enjoy

- Skype has voice over internet protocol (VoIP) or softphone(Descy, 2005). It is free, it has chat, and it has instant messaging.
- Blogging -- According to Miles (2006), a rich environment can emerge if careful introduction to blogging has been established. With sufficient guidance offered through class time, participation and simple technical support, scholarly bloggers can collaborate with much academic freedom. "Blog entries can range from three-word bursts of sarcasm to carefully honed 5,000-word treatises. The sweet spot lies somewhere in between, where scholars tackle serious questions in a loose-limbed, vernacular mode" (Glenn, 2003, ¶. 4).
- Text messaging -- compress a few words to get a message to someone. It is powerful to pick up a cell phone then read a message on the screen.
- Instant messaging -- send messages to all of the people in your buddy list as long as that person is online. Both people can type in messages that both can see.
- YouTube -- upload, view, and share video to YouTube for all to view.
  The only thing holding back educators is creativity.

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Learning Resources in a Competency-based Distance University

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Abstract

Since diplomas are awarded based on the demonstration of knowledge, skills, and abilities through assessment (not on accumulated credits through time spent) at a competency-based university, how do adult learners become competent? What is the role of distance learning resources (online courses, e-learning, library, and bookstore services) within this model? This article presents distance learning resource philosophy, procedures, and issues that arise when providing instruction at the US's premiere, accredited, competency-based distance university.

Introduction

Imagine earning a college degree from the convenience of your own home or office. Sounds like online distance education, right? However, what if you didn't have to take a set number of courses and amass credits, but instead you could demonstrate what you already know and can do through assessments – affirming that prior learning and ensuring all new learning would be fresh and new. Add to that the benefit of a of a faculty member who works closely with you throughout your degree, and an individualized program of study, tailored to your background and eagerness to progress rapidly toward completion. Couple that with peer interaction throughout your studies with other students and faculty members in learning communities. Suppose that you could acquire new learning through online courses, where you might feel more comfortable in unfamiliar subject matter with the structure and expert guidance and feedback from an instructor – or, could have the flexibility of doing guided self-study of textbooks or e-learning modules for content in which you were familiar and only needed brush up before assessment. Finally, imagine that your diploma was from a university that was both regionally and nationally accredited, refined to meet the stated needs of major employers, associations, state and national standards, as well as industry certifying bodies. Does this sound intriguing? Such is the exceptional educational model being implemented by Western Governors University.

In 1998 the governors of 19 states founded Western Governors University (WGU) to provide a competency-based online alternative to the campus-based post-secondary educational enterprises in their states. Although the University had the backing of over 20 prominent corporations and foundations, at the time of accreditation by the Distance Education and Research Council (DETC) in 2002, the offerings were limited to a handful of bachelor's and associate degrees, and enrollments had reached a plateau at roughly 200 students. The receipt of unprecedented regional accreditation by four western commissions and grant support and funding by the US Department of Education in 2003 turned the corner for this innovative institution. As of September 2006 WGU is realizing its original potential by providing distance education to over 6,100 students seeking 35 bachelor's and master's degrees in Teacher Education (many including initial licensure), Business, and Information Technology, (with Health Profession degrees being added in late 2006). The University has over 1250 graduates.

WGU's mission "is to improve quality and expand access to post-secondary educational opportunities by providing a means for individuals to learn independent of time and place and to earn competency-based degrees and other credentials that are credible to both academic institutions and employers." At the heart of the institution is "competency-based education." This commitment to CBE translates in into all University policies, practices, and procedures, such as mentoring, use of third-party learning resources, and assessments.

Throughout their degree program, candidates demonstrate their competencies through a series of 15 to 25 substantive assessments. To ascertain students' proficiency, WGU adheres to rigorous assessment procedures to measure competency. This includes proctored objective and essay exams (delivered at testing sites through contract arrangements throughout the country and overseas – for active-duty military personnel), performance tasks, portfolio items, and capstone projects. The University uses both internally-developed assessments and externally-developed ones. The latter consist primarily of industry-recognized certification exams, such as the SHRM for human resource management, or widely-used and validated teacher education assessments, such as the Praxis examinations for secondary education content knowledge. Only the demonstration of competencies through assessment counts

toward academic progress and degree completion. Program councils, comprised of national experts from the academy, business and industry, government, and school systems, oversee the development of WGU competencies. These senior academics consult for the University on all aspects of the academic programs and serve as our most senior faculty members. They typically meet in person at WGU offices four times a year to monitor program effectiveness, evaluate learning resources, and provide advice on program planning issues.

This competency-based approach allows affirmation of prior college-level learning, while integrating it with new learning. Not surprisingly, WGU's average student is around 40 years old, working full-time, and hoping to accelerate through WGU's degree program because of relevant experience before and during the degree program. Students are drawn to the University for its convenience, as well as its relevance; for instance, all study is done at a distance, and students can start any month of the year in one of WGU's six-month terms. WGU courses of study include: (1) mentoring by faculty experts who assist student work throughout their programs; (2) learning resources like study guides, textbooks, Web sites, and full online courses, that students take to brush up or build competencies from scratch in some areas; (3) learning communities for peer interaction and learning under mentor guidance; and culminate in (4) assessments where students demonstrate competency for completing degree requirements.

Purpose

Because of the University's competency-based education (CBE) approach, faculty roles, distance program delivery, and the provision of learning resources is quite different than at other higher education institutions. The remainder of this article focuses on the implications of CBE for learning resources (LR). It details the role that these LRs play, the University's philosophy about their use, and practices WGU follows in collaborating with other institutions. This information can benefit you, the reader, in several ways. You will gain insight into how this innovative model of higher distance education has been successfully implemented over the past decade. The University's policies, practices, and procedures can inform similar initiatives within the agencies, institutions, and organizations where you are involved with distance education. Additionally, since the CBE approach to learning resources is collaborative, this article may give you ideas to effectively link your own distance offerings to similar consortia to create synergy for your own distance education enterprise.

WGU's learning resource brokering model

From its inception Western Governors University (WGU) has acquired the learning resources (LRs) that it provides its students through licensing agreements with third parties. WGU uses the term "learning resources" to refer to the wide variety of instructional supports that students use to gain competency. These include online instructor-led courses and independent learning resources (ILRs), such as web accessible e-learning modules, CD ROMs, Videos and workbooks. LRs also encompass textbooks, and library materials. The primary purpose of LRs is to enable students to develop the skills and knowledge necessary for them to successfully demonstrate competency through assessment.

WGU seeks LRs that fit its model of competency-based distance education. These LRs need to be:

- independent of time and place – since WGU students are located through the country as well as some stationed overseas;
- scalable – since there are hundreds of students in each degree program with likely increases throughout the foreseeable future;
- affordable – since LR costs are paid through WGUs own low-cost general tuition, with 70 percent of WGU students receiving financial aid;
- available for open or frequent enrollment – since WGU students start monthly and are on individual six-month terms;
- modularized – since WGU recognizes that prior competencies shouldn't require students to repeat material they already know;
- feedback affording – since students require response about their capability and readiness to assess; and
- self-paced – since students need to be able to progress according to their schedule; particularly, WGU seeks LRs that allow students to accelerate.

WGU's LRs come from accredited higher education institutions, like Rio Salado Community College, Chadron State University, and Davenport University, as well as from commercial educational enterprises, such as American Museum of Natural History, Wasatch E-learning, Canter and Associates, Thomson NetG, and Abromitis Online. WGU seeks the highest quality LRs that fit its model, and retain the flexibility to use similar LRs covering the same content and swap out LRs as it identifies better ones.

WGU faculty members, known as mentors, assist their students in taking pre-assessments that identify individual areas of strength and weakness. The mentor works with each student to build an online academic action plan that schedules the assessments that they will complete during the term with appropriate learning resources. The possible learning resources include two types: (1) guided independent study LRs -- for students with competency in the domain and who are self directed; (2) more structured LRs – usually instructor-led courses, for students with little or no competency in the domain and who with limited self direction. Students enroll in their LRs directly through their online academic action plan, allow them access within minutes to web-based e-learning LRs, triggering same-day shipment of materials, and/or getting them instructions to enroll in their selected term-based online course within days.

WGU seeks, as much as possible, to identify existing resources that align closely to its competencies and performance tasks and use them "as is." When off-the-shelf LRs cannot be found, WGU works with its providers to first delivery modifications – packaging the LR into smaller units or larger modules (courses) or creating open-enrollment or staggered offerings, fitting enrollment demands. If actual course content and learning activities need to be addressed, it will do so by asking EPs to perform content customization – inserting or elimination of objectives, content, and activities. In rare cases WGU asks a provider to build LRs to WGU specifications with WGU academic personnel providing occasional input with content expertise, assessment suggestions, delivery requirements, and learner characteristics.

Although adult students come to WGU expecting to take online courses (chiefly reflecting their former experience with higher education), increasingly the University is moving toward offering independent learning resources (ILRs) supported within its learning communities. WGU's goal is for students to become independent self-directed learners. However, third-party online courses too often foster reliance on course pacing, structure, content, and professor direction that may not meet individual student needs. Also, the University's institutional research indicates that those students who dropped out preferred courses, whereas those who progressed and graduated preferred ILRs. Learning communities provide similar peer discussion and expert feedback from community leaders as their course counterparts do, but the instructional content comes through e-learning modules, online articles, Web site links, and other learning objects with which students engage. Students can independently interact with the learning assets of these learning communities – at their own pace, structure, and according to their own competency-development needs. Similarly, WGU wants to bring the various functions of its online library services (described below) within these learning communities with enhanced interfaces to specific content. In the future it also wants to make relevant portions of its adopted textbooks available within these communities in electronic format as well.

Library and bookstore services

WGU's competency-based approach enables student independent study under guidance of a mentor, following study guides, and aided by the peer support found in learning communities. Since its opening in 1998 the University has contracted with the University of New Mexico for library services to support all academic areas. A librarian provides the primary interface with UNM library resources for reference services, database search and full-text resource acquisition, interlibrary loan services, and for electronic reserves. Orientation to this distance library is an integral part of a mandatory course in which students participate when they join WGU. Through early research projects, they become familiar with using library resources. Similarly, WGU contracts with an online library vendor to keep a constant supply of its primary textbooks on hand. The bookstore sells these at discounted prices to students, while providing reliable shipping and buy-back services.

The LR model in action

The following depiction of a fictitious student, Laura, represents the detailed learning experience in the University's business degree program. Laura works in the personnel department of a major corporation. She advanced quickly in her job during early years with the company based on ability to quickly pick up necessary skills and a natural

knack for working with various types of employees. A year ago, Laura was chosen to work closely with the human resource manager, shouldering many of the responsible duties herself when there was a department crisis. However, recently she has felt stifled recently because promotions have gone to those with bachelor's degrees, and rather than doing the human resource management tasks of which she is capable, she has been relegated to the more routine and clerical tasks. Recognizing her need for a bachelor's degree in human resource management to move ahead, Laura confronted the difficulty of trying to "go back" to school – now married with an infant son and need for full-time employment to pay the bills. Her husband and Laura talked about how she might capitalize on the several semesters of college she had right after high school, and possibly incorporate some of the human resources training and experience while she has worked in this field over the past seven years. When they discovered WGU, it seemed like an answer to prayer.

After visiting the WGU website and expressing interest through an online form, she appreciated the personalized attention of an enrollment counselor who addressed her concerns and answered her questions in a telephone call and exchange of emails. An inquiry session via telephone conference with a business faculty member (mentor) and a group of other prospective students answered her questions satisfactorily. She was pleased to be able to start within weeks of applying, since the introductory course, "Education Without Boundaries," for new students, starts every month. During this course she learned how to juggle her time to fit in the 15 to 20 hours per week demanded by the program, learned to participate in learning communities, and learned to use the University's bookstore and library. Her first writing assignment, a mini-research paper on a business topic, required that she pull several full-text articles from the online library's databases, and use them correctly, following APA format (which was new to her). During that first month Laura took pre-assessments to determine her content strengths and abilities. She also met her mentor by phone, they shared each others' backgrounds, and together developed an academic action plan (AAP) – based on transcript evaluations, pre-assessment scores, and Laura's commitment to work hard and progress rapidly through the program. Her mentor inspired confidence in Laura's decision to get a Bachelor of Science degree in Business with a Human Resources Management emphasis, and Laura felt the mentor had the skill, empathy, and expertise to guide her through.

Starting with liberal arts, Laura centered her studies in that first six months on completing the Language and Communications (L&C) Domain and Quantitative Literacy Domain assessments. It had been quite some time since Laura had written formally, so she enrolled in an eight-week instructor-led Composition course taught by one of Abromitis Online's instructors (an education provider with whom WGU contracts). The online course followed an ambitious syllabus, moving through the mechanics of writing (e.g., grammar), expository essay writing, to even developing a 10 page research paper (getting references from the WGU library). While taking the course (and immediately afterward), Laura worked with WGU to schedule herself for assessments, a comprehensive objective exam and essay exam (which were taken at a proctored testing center of a local community college near her home), and she was able to turn in the research paper (with modifications suggested by her mentor) to pass the performance task requirement of the L&C domain. Math had always been Laura's strong suit, so she opted to self-study the competency requirements, using the WGU study guide, the recommended textbooks which she purchased from WGU's online bookstore and a self-paced "Thinkwell's Intermediate Algebra" package of CDs and Website e-learning; the package arrived in the mail, within five days of enrolling in this LR through her AAP. Laura enjoyed the QL assessments – a proctored objective examination taken by computer at the same testing center, covering algebra, probability, and statistics, as well as a more involved performance task – working with an Excel spreadsheet to demonstrate working knowledge of home financing, analyzing amortizations covering several scenarios.

The next few six-month terms allowed Laura to "get down to business" as she addressed the lower-level Business Core while also completing other liberal arts domains like Natural Sciences and Visual & Performance Arts. Much of the business core involved "brush up" work, using the study guides, textbooks that she ordered from WGU's online bookstore. She also used e-learning modules in various business topics such as in accounting, law, economics, marketing, management, ethics, and information technology from the Thomson NetG library, which had been tailored to fit WGU's business competencies. Laura particularly enjoyed these studies because she could relate these concepts to the multifaceted corporation in which she worked. The connections were remarkable! The liberal arts enabled Laura to study new areas which she only had minimal exposure to in high school. This refreshed that knowledge by Laura taking online classes, engaging with CD ROMs and websites (e.g., Thinkwell's Science program). Those were fascinating at first, but Laura breathed a sigh of relief when she passed the associated assessments in those areas. An intriguing assessment, required of all bachelor's degree students, is Collegiate-level Reasoning and Problem-solving Skills (CLRPS). A course from Abromitis Online which prepared Laura for this

assessment, involved researching a contemporary business topic from several perspectives, and writing a comprehensive essay explaining those sides as well as arguing for one's own position. Laura chose to examine positions to make US companies and executives act ethically. Following the course study guide, she accessed some articles placed on e-reserve at the WGU online library about her specific question, and found related full-text articles from the library's online ABI/Inform database to buttress the various viewpoints and her own perspective. She received great satisfaction from the feedback she received as she progressively completed the various CLRPS assignments, and was pleased when her final essay, which she turned in to WGU assessment, passed the requirements.

Laura's final three (six-month) terms were devoted to upper-division business studies in the domains of Leadership and Professionalism, Business and Technical Knowledge, and Human Resource Management. Her managers at work recognized the additional knowledge and skills that she was learning in her business program, and Laura found herself with opportunities to use these in additional and more responsible duties on the job. Doors were starting to open at work, even though she had almost a year to graduate. Learning resources for these domains include textbooks, the NetG e-learning modules, as well as some targeted online courses from WGU's education providers. To get the degree with an emphasis in human resource management, Laura had to pass the rigorous Professional in Human Resources (PHR) certification exam, developed and administered by the Human Resource Certification Institute or the Society for Human Resource Management. For this high stakes assessment, Laura spent over three months preparing diligently in an online course for that specific purpose, offered through WGU's provider contract with Davenport University. Not only did she interact with the instructor and other students through online discussions, there was a certification preparation package that came with the course – textbooks, workbooks, and access to practice exams at a website. Laura was thrilled to finally pass that assessment and receive the industry standard, PHR certification; this is an important credential in addition to the WGU diploma that would further her career within her company or elsewhere.

The final requirement in Laura's degree took most of her final semester: to compile a portfolio and develop a capstone project that demonstrated the breadth of her learning as well as the integration of knowledge and skill. For the portfolio the Laura wrote a reflective essay integrating the work she had done throughout her degree on a decision she made, revisiting that decision in light of who she had become. Additionally, for the capstone Laura completed a major project that integrated and synthesized competencies in all domains required for the bachelor in business degree; she demonstrated various competencies in language and communication, quantitative literacy, leadership and professionalism, and the several business areas of management, marketing, economics, ethics and professionalism, along with her major of human resource management.

  The learning resources Laura used for these projects included the study guides in the WGU learning community, exemplary sample projects done by previous students, articles from the library, and review of textbooks and Thomson NetG modules. She chose a capstone that examined the human resource department within her company in light of the research and academic scholarship about successful human resource operations. Constant guidance from her mentor was integral to the successful completion of these items. When complete, Laura submitted her materials electronically for grading.

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

Since students utilize learning resources primarily to refresh and develop competencies that they then demonstrate through assessment, learning resources play a unique role at WGU. Mentors work with students to identify to best fit of LRs that will enable them to move at the appropriate pace through these assessments and their degree programs. The WGU experience with learning resources demonstrates how a competency-based higher education institution can collaborate with other educational enterprises to provide high quality instruction that fits the needs of working adult students. Such innovation leads the way for other programs to work on similar collaboratives in system, state, national, or international distance education consortia or initiatives.

Podcasting: A New Medium for Distance Learning

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Abstract

The recent popularity of podcasting provides the distance educator with a new medium for delivering content to online students. Podcasts are audio programs delivered to users via the Internet, often on a subscription basis. Instructors can present via podcast much like they would to a face-to-face audience. Students can access the podcasts while they are living their busy lives. The process of podcast creation is described, and tips for successful podcasting are provided.

Introduction

Distance education has too long been tied to text as the primary means of delivering instruction. From the old correspondence days through today, the vast majority of information communicated to the online student has been in the form of text, whether it be web pages, Acrobat PDF documents, or even text-heavy Flash files. As an experienced distance educator, having taught a fully online course since 1998, I have always felt that this was a stifling limitation. Why couldn't I speak to my distance students as easily as I could to my face-to-face students? This past year, I have experienced using podcasts as the way to break through this wall of text.

Definition of Podcast

A podcast is a digital audio recording that can be downloaded from the Internet. Since the first appearance of the term online in February 2004 (Wikipedia, 2005), podcasts have become a hugely popular medium for news, information and entertainment. It has been estimated that 4.8 million people downloaded a podcast in 2005 (Bridge Ratings, 2005). Podcasts are designed to be delivered to the recipients on a regular basis, and to be downloaded to a device upon which they are played. While the name obviously suggests the Apple iPod, an external, portable USB or Firewire hard drive with additional hardware and software to play digital music files, podcasts do not require iPods for delivery. They can be played on any device that supports MP3 files, which includes any modern computer and most if not all portable digital music players. 140 million such devices were sold worldwide in 2005, and it is projected that this number will more than double to 286 million by 2010 (In-Stat, 2006). Therefore, access to podcasts should not be a problem for most distance education students.

Another important aspect to podcasts is that they can be made available by subscription. The instructor creates a text file in a relatively easy-to-understand XML format, called an RSS file, also known as a feed. RSS stands for Really Simple Syndication, and RSS files are often also used with blogs and wikis, as well as news websites such as CNN (http://www.cnn.com). The RSS file is composed of basic information about the podcast series, such as title, publication date, length, a short summary of the content of each episode, and most importantly, the web addresses for each episode. The RSS file is uploaded to a web server along with the podcast's MP3 file. Subscribing to a podcast is as simple as entering the address (URL) for the series into a podcast aggregator, also known as a podcatcher. Some browsers now have built-in support for these RSS files. Another popular way to subscribe to podcasts is through Apple's iTunes program, which incorporates a podcast aggregator.

Integrating Podcasts into Distance Education

In the past, I have provided my online students with a large amount of reading, including the course text, selected websites and scanned-in articles in the format of Acrobat documents. I would also provide content to them through discussion forum postings, email and announcements via the learning management system (LMS). I was dissatisfied by this, however. Often, I would find myself assigning an article or website page that was more-or-less what I would say about a subject, but not exactly, and wishing I could directly speak to the students, as I would if we were meeting face-to-face.

Podcasting has allowed me to do this. Of course, I could have typed out an essay on the subject. But speaking is faster and easier for me than typing, even with today's voice recognition software. Podcasting allowed

me to present content to my distance students in much the same way as I would if they were sitting in front of me in class.

Podcast Production

For recording my initial podcasts, I used the built-in microphone and speakers in my Apple eMac. For software, I used iMovie to record and edit the audio, and iTunes to convert it to an MP3 file. I did this because I was very familiar with the iMovie program, which is of course designed for use with video, but can also edit and export audio tracks. For recent episodes, I have used my new Apple MacBook Pro laptop, again with a built-in microphone and speakers. For software, I used Apple's Garageband 3 (http://www.apple.com/ilife/garageband/), which has been updated to include features specifically for podcasting. For interviews, I have used both Skype (http://www.skype.com), in combination with Audio HiJack to record the session, and iChat which interfaces with Garageband directly. But podcasts can be created using any software that will allow you to record audio and export it as an MP3 file. Many Windows- and Linux-based podcasters use the Audacity audio editing program (http://audacity.sourceforge.net/) along with the LAME mp3 encoder (http://www.edhsonline.org/other/audacity/program/lame_enc.dll) to record their sessions. If your computer does not have a built-in microphone, or if you want to upgrade for better sound, you may wish to purchase an external microphone or headset.

Garageband has a couple of especially useful features for the podcaster. One is easy access to other sound files. You can import audio files from your iTunes library (though of course copyright issues must be addressed) and Garageband also includes its own internal database of sound effects, jingles and stingers (small snippets of music and/or effects), such as are used by radio disk jockeys, which are all copyright-free or "podsafe." Other sources of "podsafe" music include: the Podsafe Music Network)   http://music.podshow.com/) and Podsafe Audio (http://www.podsafeaudio.com/). Another advantage of Garageband is its integration with iChat. An audio conference in iChat can be recorded in Garageband, with each side of the conversation separated into its own channel, for ease of editing and stereo effect.

Usually some editing of the audio file needs to be made. Coughing fits, cell phone rings, pauses for thought, words like "um" and "well" and network congestion-based sound glitches all need to be taken out, in order for the podcast to seem professional. An answer may go on too long, or the subject may go off on an irrelevant tangent. Sometimes it may take an interview awhile to really get started. Even if you are simply presenting a lecture recording, you should edit out anything that is not meaningful communication.

Once the audio file was in MP3 format, I uploaded it to our university's web server, and created a link to the file from the relevant page on my website. It is worth pointing out that podcasts do not require streaming software to be installed on the server, since they are meant to be downloaded. Since I wanted students to be able to subscribe to the podcast series, I also created an RSS file to provide aggregators with information about the podcast. I did this by hand, but there are programs that will create the file for you, such as Podifier (http://www.podifier.com/) or RSS Publisher (http://www.rsspublisher.com/). At my university, our LMS has recently gained an integrated podcasting tool, which creates the RSS file automatically.

If you wish your podcast to reach an audience beyond your students, you may want to publicize it. One way is to enter it into the iTunes podcast database, or to submit it to a directory site with an Education section, such as Podcast Alley (http://www.podcastalley.com/podcast_genres.php?pod_genre_id=7), Yahoo! Podcasts (http://podcasts.yahoo.com/search?t=1&p=education)   or Educate (http://recap.ltd.uk/podcasting/index.php).

This procedure may seem somewhat complicated at first, but once you have produced a couple of podcast episodes, it shouldn't be that time-consuming. If you only plan to podcast once a month or less, you may want to create a brief job aid for yourself, a paper document describing the basic steps of the podcasting procedure using your hardware and software.

Tips for Podcast Creation for Distance Education

Here are some specifics I learned during my first semester as a podcaster:

1. Get to the point. Podcasts should be small packages of unified content, easy to take in during a short walk across campus, a session at the gym, or a commute to work. Chunk your material into thirty-minute-or-less podcasts. Make a Part 1 and Part 2 if absolutely necessary for a specific topic. Remember, student time is as valuable to them as your time is to you.

2. Enjoy yourself. Just as with an in-class lecture, if you show some humor and/or personality during the podcast, students are more likely to continue to listen to you, and have a better attitude and higher motivation level

towards the course. But don't go overboard; don't get silly. As the Spinal Tap guys say, there's a fine line between clever and stupid. Be yourself--distance students often complain that they don't feel like they know their instructor well—hearing your voice can help them get a sense of you as a person.

3. Consider having a co-host or guest speaker, someone to offer a different aspect on an issue. Dialogue is generally more interesting to listen to than monologue. Think beyond your campus borders for conversation partners; with the widespread availability of audioconferencing and high-speed connections, almost anyone in the world can be brought into your distance classrooms.

4. No citations, please. Don't load down your talk with references and URLs for the students to check out. Chances are, your listeners are going to be walking across campus, in a hallway waiting for the next class, at McDonalds waiting for their order, or in similar circumstances, far from a pencil and paper or a computer. Provide this info in print or on your website or blog.

5. A small, quiet place. While Starbucks may be where you do your best thinking, you need the minimum of background noise when you are podcasting. A computer lab may not be much better, because all those machines can be pretty loud. Even the fan in your office should be turned off when you are recording.

6. Interviewing. Should you rehearse your interview? I would suggest going over the questions and possible answers with your subject beforehand, but not getting into a full discussion. This way, the conversation will sound more spontaneous, and both of you will be more interested and involved. You can always rerecord an exchange if things don't go well, but it isn't as easy to get back enthusiasm once it's lost.

7. Encourage feedback. Invite your students to give feedback about your podcasts, both their style and content. Did you speak too slowly, too fast? Was the audio quality good enough? Was the amount of content presented too much or too little? What needs clarification? You may want to create an online survey about your podcasting, in order to measure student satisfaction. After all, it is relatively easy to go back and edit an existing podcast, and to replace sections that are not effective.

Integrating Podcasts into Your Course

The most obvious use of podcasts is to record lectures, especially if you have previously taught the course face-to-face and have prepared lecture notes. But podcasts can also be used to provide supplementary material, extra credit content or material relevant to only a segment of your students. Podcasts can be used to record guest lecturers or one-time-only presentations or discussions. You might want to share a conference presentation that you've recently given with your students.

There is other audio content out there besides your voice that might be useful to your students. An English professor might record plays, poems, short stories or essays performed by others. Field interviews are an important research technique in many fields; these can be presented through podcasts. Historic radio shows or speeches can be distributed (many of these are out of copyright). Language lessons are an obvious choice for this new medium; why confine your students to a stuffy language lab when they can sit in the park and repeat their vocabulary words? Many discipline areas have audio content: students can learn about birdcalls for ornithology class, the sounds of instruments in music history class, pronunciation problems for speech class.

Another use for audio recording is to give student feedback. Instructors do enough typing in a given day; why not give your fingers a break and provide your comments on student work in audio format? In some cases, this could lead to longer and more in-depth commentary from an instructor who is weary of incessant keyboarding. (Of course, this type of audio recording may not precisely fit the definition of podcasting.)

It is also important to consider student-created podcasts. Your online distance education students are in front of a computer anyway; by plugging in a headset and following the procedure above, they could be making their own podcasts. They could document their small group discussions by having them via audioconferencing and providing a recording for the instructor. Individual and small-group presentations could be given to the whole class by podcast, and then shared with future students via an archived file.

Finally, there may be existing podcast series that might be relevant for your students. A quick search of the Education category in iTunes shows podcasts on grammar, vocabulary, math, a large number of foreign languages, philosophy, history, biology…you may even be able to find your exact course content as presented by another professor.

Student Reaction to Podcasting

I requested student comments about my use of this new technology. Here are some representative comments from three different online students:

"I enjoyed the convenience of being able to listen to a 'lecture' from a place other than a classroom. The convenience factor is the biggest benefit I see."

"I downloaded the podcast onto [my] memory stick and took it [to] listen to at [my] son's basketball practice! I remember having to get someone's notes when you missed a lecture - what a pain! Also a good way to review for a test by listening to lecture again!"

"For students who are not native English speakers, having a podcast that they can listen to and stop as they need to grasp the meaning [is] a valuable tool."

Overall, student reaction to this instructional innovation was positive. The fact that they could multitask—listen to course content while accomplishing other tasks, was also mentioned by a number of students. Especially since the students were already working within a mediated environment, the transition to podcast use was relatively easy. Some students had to purchase headphones so that they could hear the podcasts without bothering others, so this was an additional, if minimal, expense.

Conclusion

Based on my experience in a distance education setting, I found that podcasts can provide an exciting new option for online instructors. This new technology can provide a fast, efficient, comfortable way to deliver information for instructors, and for distance students, it provides a convenient way to access and review information, as well as to present it themselves.

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Predicting Education System Outcomes: A Scientific Approach

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Abstract

Many people want to improve education. So do we. Many researchers argue that such change must be systemic, since attempts at piecemeal change have made little difference in our current education systems, which still operate largely as they have in the past. The major question is: What should we change in the current education system, and how do we know it will work?   We argue that what we need is a good systems theory for predicting outcomes of such changes. Otherwise, we may be making changes that, while well-intended, may not result in desired outcomes—possibly even making things worse, rather than better.

In this paper we provide an overview of a change strategy that is inquiry-based and which relies on a scientific systems theory (ATIS). This is followed by a simple example of how this theory can be applied to a fictional school system. After discussing the foundations of Axiomatic Theories of Intentional Systems (ATIS) and examples of systems properties, we describe computer software programs now under development that allow people to apply this theory, to make predictions, and to measure change: 1) PESO: Predicting Education System Outcomes, and 2) APT&C: Analysis of Patterns in Time and Configuration. APT&C provides an alternative measurement and analysis paradigm for investigating dynamic and structural relations in systems. Finally, we discuss work remaining to be done on this long-term research and development project before it can be implemented in practice.

Overview

Many well-intentioned people want to improve education. So do we. We believe that education could be far more effective, efficient and satisfying than it is in our current educational systems—both K-12 and higher education.

Educators who have taught for awhile have seen several widely talked-about changes come and go. For example, some of the innovations have been referred to as: site-based management, constructivist classrooms, technology integration, school restructuring, and yes, even systemic change. Educators have correctly observed that not much has really changed from what they can see. They view new calls for change with a certain detachment and skepticism. We find these attitudes understandable, given the history of numerous innovations that have largely failed to make significant improvements in education. Many think: "Just another buzzword. Just another fad. Ho-hum."

Why? We believe that the following questions have not been adequately addressed:

- "Change what?"
- "Change how?" and
- "How do you know the change is working?"

We must know *what* to change in order to know *how*. We must know whether the change accomplishes the goal and that the change does not have negative, unintended effects. Change for the sake of change is nonproductive. And, without knowing what to change, the "how" is irrelevant.

As an analogy, consider an old bridge that is failing—it is structurally weak and is impeding the flow of traffic. If the bridge is not fixed, it will collapse and vehicles will plunge into the river. When engineers design a new bridge, they utilize adequate scientific theories. No one in modern times would consider designing a new bridge by trial and error.

Up until the present, we have had no *valid* way of predicting that new educational system designs will work any better than what we now have. We have had no valid way of describing the elements of any educational system or of evaluating the effects of change throughout the system. New designs and curricula have been patches—much like fixing rust spots on an old car with body filler and paint, putting on new seat covers, or getting new tires. The overall structure remains unchanged.

Many researchers have focused on the change *process*. We believe it is equally important to focus on the outcomes of change—i.e., how well the new system is predicted to work and how well it does work. We need both approaches—process and outcomes: they are complementary. The change process could be effective, *but* the

resulting new system may not have the desired outcomes. The new system may be effective, *but* the change process may leave staff and families, teachers and students bitter and exhausted. For best results, both processes and outcomes must be satisfactory.

We are working squarely on the problem of predicting education system outcomes. The predictions must be based on scientific theory, its implications, and data to support the theory. If the predictions are not based on scientific theory, then how can we justify expending great effort and resources, only to end up with something that is no better—or possibly even worse—than what we now have? It is no wonder that educational practitioners often distrust, resist and undermine the efforts of educational reformers. The stakes are very high. The consequences of mistakes can be devastating—particularly when changing a whole system of education.

Understanding systemic change is not a simple matter. Educators will need to learn new thinking patterns. Hart (1993) has noted that the vast majority of individual belief patterns do not contain dynamic cycles. Cognitive maps of belief structures tend to be linear with few, if any, feedback loops. Hart indicated that exceptions occurred with those people in professions which taught them to think in dynamic cycles (e.g., ecologists, systems engineers). Similarly, Senge (2006) has provided insight into business organizations by identification of archetypal patterns of *dynamic* cycles. These patterns are not easily described or understood through static print and diagrams. To address this problem of understanding, Senge and his colleagues have developed role-playing activities and computer simulations in order to help business people understand these patterns of dynamic relationships—some of which run counter to individual intuitions about how systems such as business organizations grow and change.

For these reasons, we believe that it will be very helpful to educators, if they can use computer software that will help them to design new educational systems.

SimEd Technologies

SimEd Technologies consist of four parts:
1. The 'Get Ready, SET, Go!' change model,
2. The theory model options set called Axiomatic Theories of Intentional Systems (*ATIS*),
3. Computer software: Analysis of Patterns in Time and Configuration (*APT&C*), and
4. Computer software: Predicting Education System Outcomes (*PESO*).

Designed to work together, *SimEd Technologies* use computer technology to help describe educational systems, predict system changes and document the outcomes of change.

We will describe the '*Get Ready, SET, Go!'* model to predict educational system outcomes to guide the change process. This inquiry-based change model will utilize adequate theory and computer programs which are currently under development. Then we will give more detailed discussion of other parts of the *SimEd Technologies*. The model is outlined below.

Get Ready, SET, Go!
Phase 1: Get Ready
- o Identify the specific current education system to be improved.
- o Over some interval of time, measure system properties using our computer software *ATP&C* (more below).
- o Predict outcomes under existing conditions *if nothing is changed in the system* using our computer modeling tool *PESO* (more below).
- o If these outcomes are what are wanted, then do not modify the system. However, if the outcomes are not desired, then the system must be changed so that the desired outcomes can be obtained. If change is desired, proceed to Phase 2.

- **Phase 2: SET**
  - o Use *PESO* software to model newly envisioned educational system designs, the desired feasible changes.
  - o Run *PESO* predictions out far enough in time to make sure all the consequences of the newly designed system would be acceptable. This iterative process will determine the outcomes of the system under the conditions defined by the changes. Are these the wanted outcomes? If yes, proceed to Phase 3.

- **Phase 3: Go!**
  - o Implement the new design chosen in Phase 2 in the education system.

- o   After the new education system has been established, then over some interval of time, measure system properties with *APT&C* software.
- o   Verify that the measures confirm the predicted system outcomes. If not, then analyze the Phase-2 processes to determine what modifications are required.

PESO Simulation

We are building a software simulation called *PESO*: *Predicting Education System Outcomes.   PESO* will model system concepts and allow educators to focus on the predictions. *PESO* is a logic-based simulation.

The most familiar simulations are scenario-based programs that provide "scripts" to determine outcomes. A familiar example is SimCity (see http://simcity.ea.com/). Scripts for simulations can be narrative or quantitative. Narrative scripts characterize the qualitative parameters of a system—i.e., the social, philosophical, and individual descriptions and the uncertainty of future outcomes. Quantitative scripts define the scientific facts, known or credible data, and quantitative models that are used to determine future outcomes. However, in both narrative and quantitative scripts, the content is closed. There are a limited number of possible outcomes, and the scripts predetermine the outcomes.

If the script lacks fidelity, then users may learn the wrong things. For example, consider what might happen *if* modern flight simulators that are used to train military and commercial pilots lacked fidelity. A pilot in the simulator might discover that he or she can land the plane successfully in a thunderstorm with lightning. However, in reality such an action would be dangerous and the plane could crash. These would be devastating consequences for making the wrong decision. The better course of action is to not attempt to land the plane under such conditions, and wait until the storm passes. Thus, a simulation script that lacks fidelity could be misleading and dangerous.

Friedman (1999) recognizes these kinds of problems with scenario-based models in his report, "The Semiotics of SimCity," when he states:

"Of course, however much 'freedom' computer game designers grant players, any simulation will be rooted in a set of baseline assumptions. SimCity has been criticized from both the left and right for its economic model. It assumes that low taxes will encourage growth while high taxes will hasten recessions. It discourages nuclear power, while rewarding investment in mass transit. And most fundamentally, it rests on the empiricist, technophilic fantasy that the complex dynamics of city development can be abstracted, quantified, simulated, and micromanaged." (n.p.)

On the other hand, *logic-based* models depend on the logic of a theory that has been shown to be valid for the targeted empirical system, in this case, an education system. The theory describes the empirical system in terms of its affect relations, properties, and axioms. The theory is then used to project outcomes founded on the theory with respect to input parameters. The instantiated axioms would generate a set of outcomes, which become input parameters that instantiate yet more axioms. Unlike scenario-based models that are closed due to the limited number of scripts, logic-based models potentially have an infinite number of outcomes. Such models are more flexible.

PESO is a logic-based software tool that makes predictions for a specific educational system, based on current conditions. One must first observe properties of that system and determine how the values of those system properties change over some time period. Properties may increase, decrease, remain constant, or increase to some value then decrease. When those changes in system property values are entered into *PESO*, the software finds relevant axioms and theorems which match those conditions, and then executes the logic of Axiomatic Theories of Intentional Systems (*ATIS*: Thompson, 2005). *PESO* effectively applies relevant parts of the theory in order to make predictions of what will happen in the system.

Significant progress has been made on *PESO* software. The current prototype is built in Flash using a programming language called ActionScript. Each of the axioms, antecedents, consequents, properties, and property attributes are treated as 'objects'. What this technical capacity of software means is that the software can be easily extended and modified as the theory is further developed and validated. In effect, *PESO* handles the complexity of the theory by carrying out the reasoning according to the theory and the specific conditions that are typed into the software. The examples and figures below illustrate how *PESO* does the reasoning – based on the axioms and theorems of *ATIS*.

An Example of PESO: Predicting Education System Outcomes

In the United States, all public schools are affected by *No Child Left Behind* (2001) legislation. NCLB requires schools annually to assess student achievement at numerous grade levels. Based on average test scores, schools are identified as succeeding or failing. Schools that repeatedly fail to meet current state standards for student achievement are held accountable. Parents have the opportunity to send their children to different schools, if their present school is not succeeding.

Consider school #9 in Smithtown, USA, a fictitious school created for our example. Smithtown #9 has been identified as a failing school. If a particular school is identified as failing according to state standards, NCLB permits parents to move their children to a different school. What would happen as a consequence of falling enrollment? Student enrollments are a type of *input* in a school system. Axiom 13 predicts that decreasing input implies increasing filtration. *Filtration* is a system property. A filter is something that allows certain things into a system but not others. One may not think of a label of "failure" according to state standards as a filter, but it is.

Figure 1. *ATIS* Axiom 13: If system input decreases, then filtration increases.
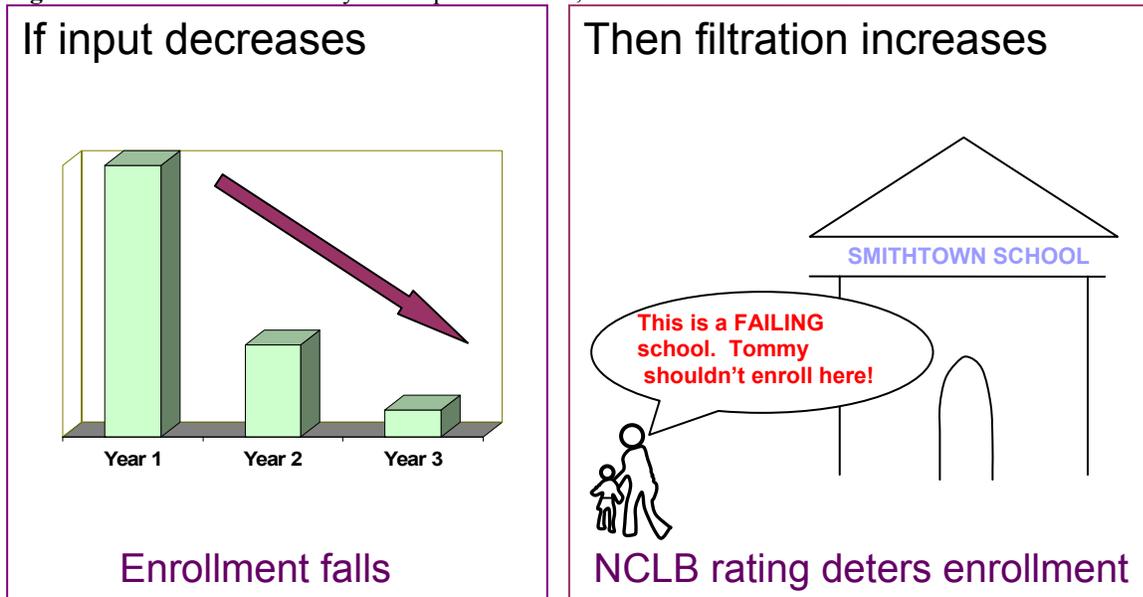
In this example, we are using systems language that is not familiar to most educators. In each graphic, the system property (such as 'filtration') and its value (e.g., increases) is listed for an educational system. Each axiom is an "if …, then …" statement that is part of the theory. These "if …, then …" statements are called logical implications. Axiom 13 states that: If system input decreases, then filtration increases. This is not a temporal relationship, but a logical relationship. If it is true that input decreases, then it is also true that filtration increases. It does not matter which occurs first.

Does the systems theory make any other predictions? Yes, *PESO* identifies axioms 11, 10 and 16 as relevant. See Figures 2-4.

Figure 2. Axiom 11: If system input decreases, then storeput decreases.

If input decreases

Year 1 Year 2 Year 3

Enrollment falls

Then storeput decreases

Fewer students attending classes
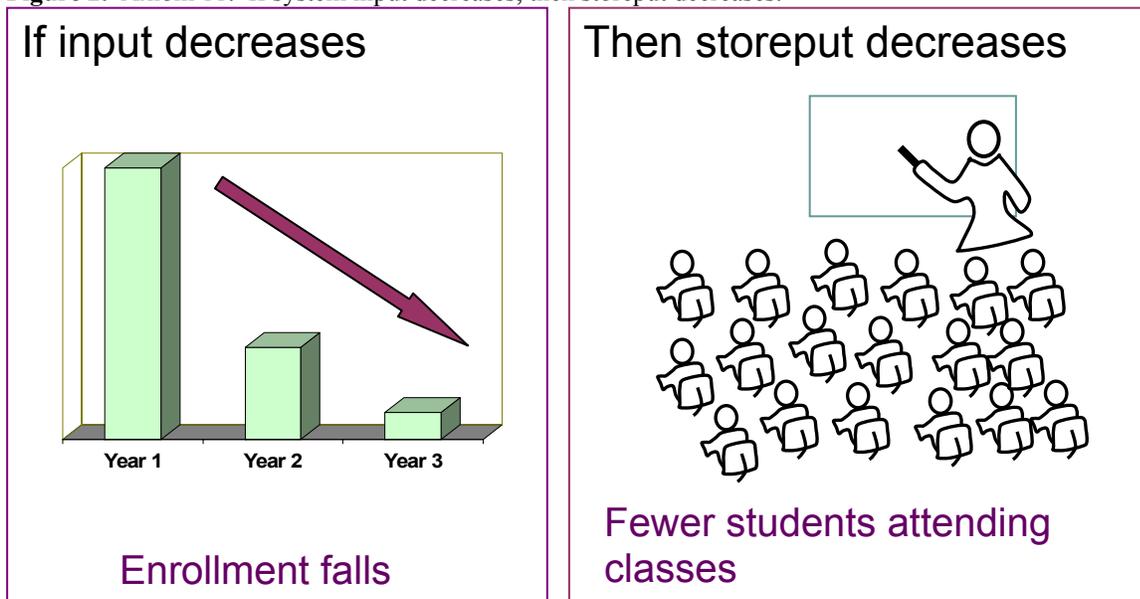
Figure 3. Axiom 10: If system input decreases, then fromput decreases.

If input decreases

Year 1 Year 2 Year 3

Enrollment

Then fromput decreases

Hmm…there aren't as many diplomas to print this year!

ADMINISTRATION OFFICE

Fewer students to graduate
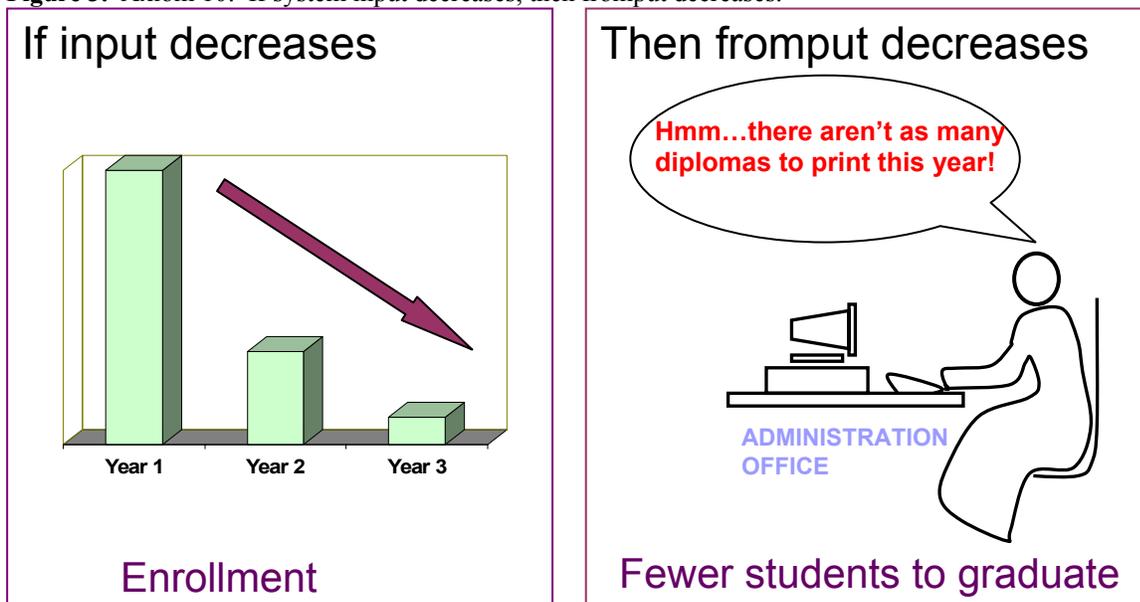
Figure 4. Axiom 16: If system input decreases, then feedout decreases.

If input decreases

Year 1 Year 2 Year 3

Enrollment falls

Then feedout decreases
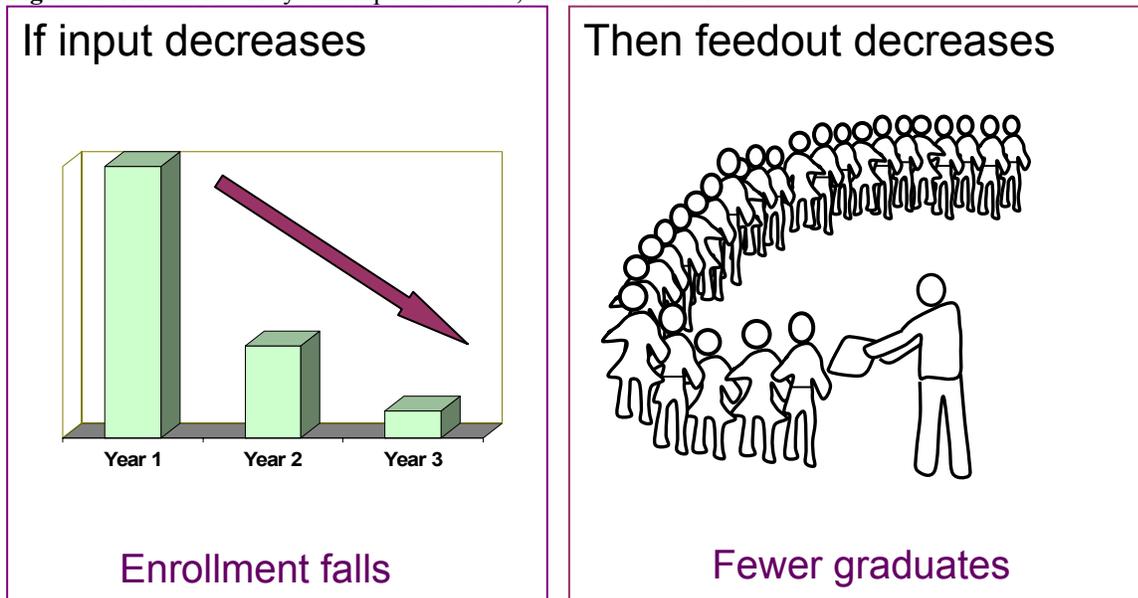
Fewer graduates

The predictions, pictured in Figures 2-4, tell this story. If enrollments are decreasing, then the overall number of students in the school will go down, and eventually fewer will be eligible to graduate and leave this school.

But wait—there's more! In fact, this is one of the most significant features of the *PESO* simulation: chains of implications. These chains are based on the premise: If A implies B, and if B implies C, then A implies C. To continue the example, Axiom 28 is triggered by Axiom 13. Axiom 28 states: If filtration increases, then adaptability increases.

How could Smithtown School #9 adapt? Given the prediction that the NCLB label of 'failing school' will result in a lower student enrollment, actions can be taken to prevent that from occurring. System theory embedded in the *PESO* software offers Smithtown School options for actions that could prevent lower enrollment. Smithtown could consider actions *increasing system strongness with respect to instructional affect relations*. If strongness of instructional affect relations is increasing, what does *ATIS* predict?

055: If *strongness increases*, then hierarchical order decreases.
056: If *strongness increases*, then flexibility increases.
106: If *strongness increases*, then toput increases.
107: If *strongness increases*, then input increases.
108: If *strongness increases*, then filtration decreases.

How could Smithtown increase strongness of instructional affect relations? The school could offer more guidance of student learning by bringing in teaching aides, either paid or volunteer, or by providing more instructional technology that can actually guide learning. Peer tutoring programs in which more advanced students could tutor less advanced students would increase the guidance of learning. As can be seen above, the theory predicts that quite a few things would change in the system if strongness were increased.

Axiom 56 states that if strongness increases, then flexibility increases. Flexibility means here that there are more different kinds of alternative paths through which guidance can occur. For example, the teacher could be guided himself or herself by e-learning materials and then guide students, and likewise for teacher aids. Or the teacher can instruct some students, who then in turn instruct others, etc. Filtration is decreased by removal of the "failure" rating by meeting NCLB criteria for annual yearly progress. Axiom 108 predicts that if strongness increases, then filtration decreases.

There are additional axioms and theorems that are triggered by increasing strongness of affect relations, but space precludes discussion here.

ATIS: The Basic Concepts

ATIS (Axiomatic Theories of Intentional Systems) is a theory model options-set that is designed to construct scientific theory for certain types of behavioral systems. In particular, it is used to develop behavioral predictive theories and technologies.

ATIS is founded on a basic principle that we all rely on day-to-day to make decisions about what we do. The principle is based on Jerome Bruner's (1990) conclusion about how we derive meaning from our cultural contexts—i.e., the systems in which we live:

> We will be able to interpret meanings in a principled manner only in the degree to which we are able to specify the structure and coherence of the larger contexts in which specific meanings are created and transmitted. (pp. 64-65)

We normally do this interpretation and integration of observed phenomena intuitively. If in fact our world were not well-organized and intuitively predictable, we would not be able to function in our daily lives. We know that if we show up for work and do what we are supposed to do, that our job will still be there the next day—assuming that the larger context in which we work does not change.

Students know that if they study their text assignments, listen in class and comprehend what the instructor is saying, and work the problems for the class in such a manner that they get the correct answers, that they will receive a grade that reflects the quality of their work. That is, if a student consistently receives an "A" on quizzes, tests, reports, etc., then that student expects to receive an "A" for the course. If such students end up with a "C" for the course, they know that there is "something wrong." Why is there something wrong? The continual integration of data into their thinking gave rise to a new structure that reaffirmed their perceptions that they were doing well. When they received a "C", it was not consistent with the principles upon which they had been relying. Their immediate reaction—the instructor really messed up! They will go and get the grade changed because it does not reflect the structure of the system that they had come to expect.

ATIS relies on the observable fact that our lives are more predictable than not. If the outcomes are not what we expected, then we did not have full knowledge. The behavioral sciences are distinct from the physical sciences mainly in terms of what we actually know about any particular event. If we knew more about an event, our prediction may have been correct. We all believe that events are predictable—if we only knew more. It is the basic tenant of *ATIS* that such is correct.

If we did not know that, if we treat our children in a certain way, they will respond predictably, then child rearing and education would be impossible. The slogan that "all children are different" is a platitude, but, if they were, education itself would not be possible. Children are all "different" in that we know that we must treat them and recognize them individually if we want them to achieve, but we also know that children learn by just such attention.

Are different outcomes predictable for educational systems? Of course they are. Differing outcomes can be attributable to a variety of conditions including "attention of the child," "teaching skills of the teacher," "intellect of the child," "intellect of the teacher," and "physical surroundings". The question is not whether an event is predictable, but whether we know what we need to know in order to make the prediction. *ATIS* helps to focus attention on what one needs to know, and provides the structure to make a reasoned decision concerning the outcomes.

Background of ATIS: General Systems Theory

The concept of general systems theory (GST) was first introduced by Ludwig von Bertalanffy in 1949. Bertalanffy (1968) argued that there exists a general theory that could characterize the behavior of systems, regardless of whether these are scientific, natural or social; and he proposed GST as an interdisciplinary theory that could contribute to the unity of science. System behavior results from the relationships between its components, and is not just a simple summation of its parts. The characteristics of each system component therefore cannot adequately explain how the system itself behaves.

Since then, there have been extensive contributions by others in the development of GST as a logical and mathematical theory to provide an "exact language permitting rigorous deductions and confirmation (or refusal) of theory" (Bertalanffy, 1972, p.30). Others have also contributed well-developed descriptive theories (e.g., Wymore, 1967; Cornacchio, 1972; Mesarović & Takahara, 1975; Lin, 1987; Lin, 1999; Bar-Yam, 2003). In education, GST has been used by researchers to discuss educational systems design and systemic change, but these approaches have not been grounded in scientific theory about educational systems (Banathy, 1991; Caine & Caine, 1997; Duffy, Rogerson & Blick, 2000; Senge, Cambron-McCabe, Lucas, Smith, Dutton & Kleiner, 2000). Rather these approaches largely describe processes through which organizations can change, not whether those changes are likely to result in desired outcomes.

The *SIGGS* theory model provided the first extensive formalization of a GST model for educational theorizing (Maccia & Maccia, 1966; Steiner, 1988). Through the synthesis of four theories: Set, Information, di-Graph, and General Systems, *SIGGS* provided a logical description of general system properties, which enabled

retroduction of 201 hypotheses in a theory of school systems. Frick, Hood, Kirsch, Reigeluth, Walcott and Farris (1994) extended Maccia and Maccia's work by classifying the system properties into basic, structural, and dynamic properties. This classification recognized that some *SIGGS* properties were structural as they described the connectedness between system components (*SIGGS* Website, 1996a). Yet, others were dynamic and described how patterns of relationships between system components are altered due to changes within the system or between the system and its environment (*SIGGS* Website, 1996b). Thompson (2005) recognized that the structural properties essentially defined the system topology.

To provide a theory that is logically and mathematically sound, a system-descriptive axiom set is needed. Although *SIGGS* was fairly comprehensive, there was no attempt to analyze the 201 hypotheses for consistency nor to finalize an axiom set that would be the underlying axioms for a GST. Thompson has since been developing Axiomatic Theories of Intentional Systems (*ATIS*), which is a logico-mathematical theory model for analyzing and predicting behavior of systems that are goal-directed or intentional. Using the original *SIGGS* hypotheses, Thompson developed a nomenclature to define system properties, which improved the precision with which *SIGGS* properties could be used (Thompson, 2005). Thompson also identified an initial list of approximately 100 axioms (subject to change, as this work is on-going), and extended the 73 SIGGS general system properties to 136 in *ATIS* (*APT&C* Website, 2005).

This is Getting Pretty Technical—How can It Be Managed?

The busy education professional may wonder, "Do I have to be a mathematician to benefit from these concepts in my work?" The short answer is: No, you don't have to. We don't have to be engineers to drive our cars or use our microwave ovens. We can use devices built on scientific theories without knowing all the details.

ATIS is quite complex and very detailed. It is difficult, even for the present authors, to keep track of all the detail. This is where we believe that computer technology can help us. We are building a software simulation, called *PESO*: Predicting Education System Outcomes. *PESO* will keep track of all the details, allowing us to focus on the predictions.

How *PESO* Makes Logic-based Predictions

Even though there are over 200 axioms and theorems in ATIS as of this writing (APT&C Website, 2005), only 5 axioms apply under the condition: input decreases. Axioms 10, 11 and 13 predict thee outcomes of decreasing input. However, Axiom 11 predicts a decrease in storeput, which triggers Axiom 16. Similarly, Axiom 13 triggers Axiom 28. This kind of chaining illustrates how the inference engine that is built into *PESO* works. *PESO* actualizes the logical implication of transitivity – e.g., if A implies B, and if B implies C, then A implies C.

PESO will carry out the implications, as illustrated in Figures 1-4 above. First, the user must enter the specific conditions that currently exist for a particular school system or district. *PESO* then finds all the relevant axioms and theorems from *ATIS* and uses them to make predictions about this particular system—not other systems, not all systems, but *this* system under these conditions.

How will you know, for example, whether input is increasing, flexibility is decreasing, or filtration is increasing in your particular education system? You will need to *measure* these system properties. This means you will need to observe, collect data, and/or use existing data about your education system. You will be able to use *APT&C* software to assist in the data collection and analysis. This will help you identify the temporal and structural patterns in your education system, and it will do the calculations for you.

SimEd Technologies Will Include *APT&C* Software

Analysis of Patterns in Time and Configuration, *APT&C,* is a different kind of measurement paradigm. *APT&C* is a mixed-mode research methodology and software tool to help create knowledge of education systems that is directly linked to practices and changes in practices. *APT&C* bridges the gap between traditional linear models in quantitative research and qualitative research findings that lack generalizability (Frick, 1990; 2005). *APT&C* builds on work done by Frick (1990) on *APT* and by Thompson (2005).

APT&C is different from the widely used Statistical Package for the Social Sciences. *SPSS* uses the traditional approach to measurement and statistics that requires you to measure things *separately*, and enter numbers for each variable such as a student's test score, age or grade in school. Then you analyze the data by using statistics such as correlation, analysis of variance, regression analysis, etc. This is referred to as a linear models approach by statisticians. Linear models statistically *relate separate measures* of things.

In contrast, *APT&C* directly *measures the relation*. The difference is significant. In the linear models approach, you will get an *r* value or the results of an *F* test, for example, to tell you whether a relation between or among measures is statistically significant. In *APT&C* you will get different kinds of values which are measures of temporal or structural patterns. For example, you could predict student engagement when direct instruction is or is not occurring as Frick (1990) did. He found that students were 13 times more likely to be off-task when direct instruction was not occurring during academic activities. This is a temporal pattern. In his study, students were observed to be engaged about 97 percent of the time during direct instruction, but only 57 percent of the time during non-direct instruction. These percentages are measures of the temporal relation, and are based on probability theory and set theory.

This kind of *APT&C* finding is similar to epidemiological findings in medicine. For example, heavy cigarette smokers are 5-10 times more likely to have lung cancer later in their lives (Kumar, et al., 2005), and, if they quit smoking, the likelihood decreases. While causal conclusions cannot be made in the absence of controlled experiments, nonetheless one can make practical decisions based on such epidemiological evidence. You can do likewise with *APT&C*. The practical conclusion of Frick's study is that direct instruction engages students. If a teacher wants students to learn, direct instruction is more likely to produce student engagement.

In addition to temporal properties, *APT&C* will allow you to measure structural properties of educational systems. Examples of structural properties were listed in Figures 1-4 above, such as *strongness* and *flexibility*. You will enter data into what are called 'affect relation matrices' to indicate the structure or configuration of your educational system. Then the software will "crunch the numbers" and provide the values for properties such as strongness and flexibility. This is how you will determine whether *strongness* or *flexibility* is increasing or decreasing over some period of time.

Once you have measured and analyzed these dynamic and structural patterns in your education system, then you can identify the specific conditions that exist regarding those property values of your educational system. You use the *PESO* program to then make predictions of educational outcomes for your system under these specific conditions. If, for example, strongness of instructional affect relations is *decreasing* in your system, *PESO* will apply different axioms than if it is *increasing*.

Further information on *APT&C* and additional references are found in: http://education.indiana.edu/~aptfrick/.

Next Steps

SimEd Technologies are theories, methodologies and software tools to describe complexity in educational systems. *PESO* will need to be tried out and validated in real educational systems, whether schools or school districts, charter schools, alternative schools, or school to work programs. When it is established that *PESO* adequately describes and predicts educational system outcomes, educators can use *SimEd Technologies* to model the consequences of educational systems changes. *SimEd Technologies* will show educators all the consequences, even the unintended consequences, of changing one part of the complex educational systems they direct. Better changes and better predictions of outcomes will result.

For more current information on the *SimEd* project, please visit the Website at: http://education.indiana.edu/~simed/ .

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From Design *Theory* to Development *Practice*: Developing a Stronger Understanding of Our Field.

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Abstract

How does one develop deep knowledge of our field? Inherent in this quest is a complex field with multiple definitions and research perspectives on our practices. This session will showcase an approach that engages students in generative activities to prompt critical thinking about design and development theory and practices. Resulting instructional design theory databases collaboratively created by classmates and instructional development models with accompanying detailed work plans created by individuals will be showcased and discussed.

Introduction

How does one develop deep knowledge of our field? Inherent in this quest is a complex field with multiple definitions and research perspectives on our practices. This paper showcases an approach that engages students in generative activities to prompt critical thinking about design and development theory and practices.

To become competent practitioners, those new to the instructional design and development (IDD) community must acquire advanced knowledge and skill competencies to develop and research new theories and continually enhance the state of our profession. Lave and Wenger (1991) suggest that newcomers are acculturated through processes beginning with legitimate peripheral participation, or participating on the side line through a process of observational learning and limited participation that eventually leads into in-depth engagement with our core practices. Through processes of production (e.g., training, feedback, involvement, leadership, etc.) newcomers eventually move into a role of full participation as they become recognized as members of a community.

In this paper we describe and showcase two activities and the resulting deliverables designed to engage IDD doctoral students in generative activities (Wittrock, 1990) to expand depth of knowledge of instructional design theory and development practices. As newcomers it is important that each individual be able to discern for him/herself what our field is about, how the community members have defined, practiced, and researched our field, and how each individual will in turn contribute to our profession. Instructional activities facilitating newcomers in building understanding and communicating new knowledge are important to growth in the community.

What is Instructional Design and Development?

What should newcomers 'know' about IDD practices? Members of a community share definitions and ideals about how they will practice (Lave& Wenger, 1991). Practitioners have developed a multiple paradigms and approaches for designing, developing, implementing, and evaluating instruction, each based on different understandings of learning and instruction, and arguably, each having its advantages and challenges. This complexity of theories and practices can be challenging for newcomers. How 'instructional design' and 'instructional development' are defined impacts our actual practice. It is essential to characterize similarities and differences among the multitude of IDD paradigms and unpack the complexity of each to perform well within the community and help to enhance practices.

Reigeluth (1999) suggests that instructional design theories have four basic characteristics. Design theories (i) prescribe how instruction should be organized, (ii) include instructional methods and situations where there use is acceptable, (iii) have methods that can be broken down in to more detail, and (iv) increase the probability that instructional outcomes will be achieved. Instructional design theories provide a framework from which instruction is organized and delivered to prompt learning.

Instructional development is often described as a systematic process for producing instruction. Gustafson and Branch (1997) have described several instructional development models accounting for a variety of perspectives. These models possess common steps yet have professed linear, iterative, or rapid prototyping approaches: (i) objective-based or open-ended in terms of outcomes; and (ii) specific adaptation for teacher, business practitioner, evaluators, or for specific delivery mediums such as classroom, self-study, computer-based, or distributed learning environments. Instructional development models thus provide a framework to identify, organize, produce, deliver, and evaluate instruction.

There exists contradictory usage of the terms instructional design and instructional development within the literature. Recently Gustafson's and Branch's (1997) work on development models was published under the title of "Instructional Development," yet some of Branch's earlier work describes the same ideas using the term "Instructional *Design* Models" (Edmonds, Branch, & Mukherjee, 1994). This contradictory usage of the terms can be challenging.

Educating Our Community Members To Advance Practices

The complexity and discrepancies within the field form important foundations from which practices have emerged and the roots upon which our thinking about how our field should grow and change in the future. In this doctoral seminar, learners are prompted to think critically about, explore, and then describe the themes among our IDD practice literature. A generative and social learning perspective was chosen to engage learners in this thinking and working so that each member of the class contributed his or her own knowledge into a shared understanding.

Wittrock (1990) suggests that learning requires active participation of the mind. Comprehension occurs by formulating connections between perceived information, prior knowledge and other memory components. Learners build deeper knowledge by physically and mentally manipulating models and information while actively seeking to organize and integrate informational relationships between what is seen, heard, felt, read, and mentally processed. Further, engaging in activities collaboratively exposed learners to other member's interpretations to help each better understand the meaning of ideas and concepts within the varied IDD field.

Major Course Projects

The two major activities accompanied by readings and discussions within the course include: social-generative class project and generative practice individual project.

Social-Generative Class Project
Jonassen, Carr, and Yueh (1998) have described databases as mind tools that help breakdown information into smaller categories while allowing for interpretation of information. Learners in this seminar contribute to the creation of an online database of design theories. Learners define instructional design theories and create viable categories for comparison among the theories. Secondly, learners identify and read about multiple theories to decide if they 'fit' within the group's established definitions and if so, populate the data base with pertinent, agreed upon information.

Generative Practice Project
Learners create their own development models and associated work plans. Each includes a visual representation, a brief description of how the model works, and a detailed work plan including a schedule of all tasks. The model is robust so that any type of instruction could be developed using this model.

Each deliverable is showcased with explanations of its formation, how the literature informs ideas, and strengths and weaknesses. The audience is prompted to provide critique, ask questions, share personal experiences, and contribute to the discussion. The following questions provide a beginning framework for the discussion:

1. How do we understand the similarities and differences between the terms instructional design and instructional development?

2. How does developing a database of instructional design theories help us develop depth of knowledge? What challenges did we encounter? How would we change the database now?

3. How does creating an instructional development model and accompanying work plan help us develop depth of knowledge? What challenges did we encounter? How would we change the activity now?

Reflection to the questions

<u>Social-Generative Class Project: Building a Design Database</u>
What is an instructional design theory? How is a design theory different than an instructional development model? What makes a theory an instructional design theory? These are the questions that the class started to try and describe.

Jonassen, Carr, and Yueh (1998) have described the benefits of constructing databases in learning and organizing information. In order for a learner to be able to construct a database, the learner has to be able to i) structure information about their topic, ii) identify and create appropriate and relevant fields, and iii) construct the database based on potential queries that would be helpful and relevant. In order to answer the main questions for this project, the five students in the class worked to work through these exact problems. i) What is the definition of an instructional design theory; how can in instructional design theory be identified? ii) What are the important and relevant fields that should be used in creating the database? iii) What are the potential queries that could be employed with this database and how should that drive the organization and development of the database? In addition to the design of the database, students had to identify and index a total of 50 instructional design theories in the database.

This process provided the ultimate experience for learning about the instructional design models. A working representation of the finished product can be seen at http://web.cortland.edu/frieda/ID/IDdatabase.html. While this represents the finished product in terms of completing the course, this by no means represents a finished product. The initial phases of the project were spent defining and describing design theories. Much of this work was based on the two volumes edited by Charles Reigeluth (1983, 1999). The students created a working definition of instructional design theories such that an instructional design theory: (i) is prescriptive, (ii) describes its acceptable uses, (iii) has detailed methods, and (iv) increases the probability that learning will occur (see also the more detailed definition above).
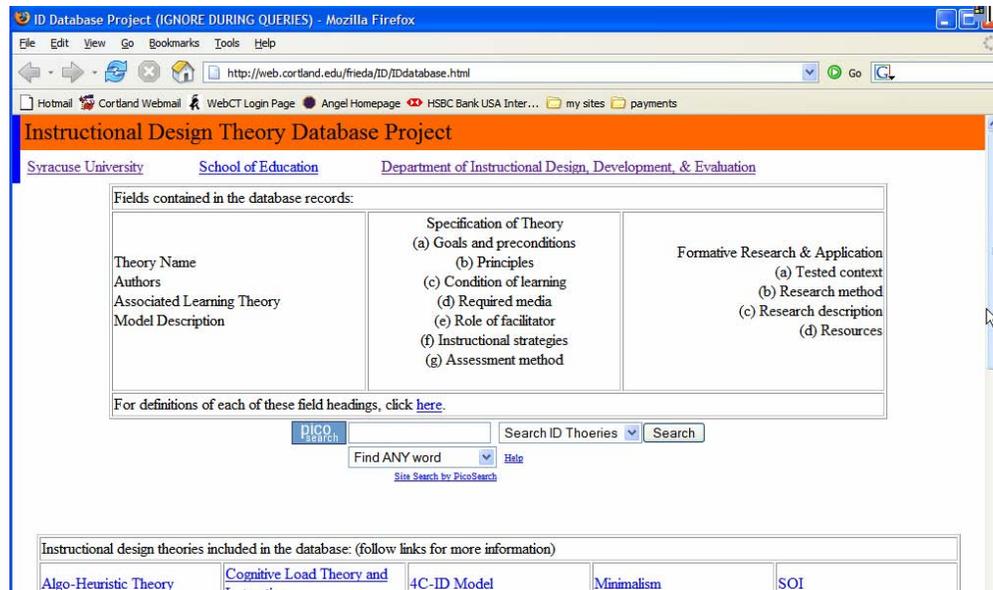
Figure 1 – A screen shot from the Instructional Design Database
(http://web.cortland.edu/frieda/ID/IDdatabase.html).

During the process of reviewing the design theories and models, the students were able to define the fields for the database. The fields that were developed fit into three categories based on the working definition of instructional design theories: 1. theory basics (theory name, author name, associated learning theory, and model description), 2. theory specifics (goals or preconditions, principles, condition of learning, required media, role of facilitator, instructional strategies, assessment method), and 3. formative research and application (tested context, research method, research conditions, resources). This was a difficult process because the class had to define the outcomes (the fields) of their process before they were experts on the information. This work did, however, compel the students to grapple with the content at a much deeper level than if the fields already existed and the students just had to fill them in.

Perhaps the hardest part of the entire project was defining the potential queries of the database. This was the last step undertaken in the design of the database, which is perhaps evident upon trying to query the database. Because the potential queries were saved for last, there was a lack of uniformity in the records which made the database hard to search. Because of this, the nature of the finished product is less like a true database and more like an indexed web search. This, however, informed the students of how to better design the database in a next attempt.

Generative Practice Project: Creating a Generic Development Model
In the beginning of the seminar course, Yongjin Lee started with a fuzzy question: what is constructivist instructional design and development? From literature review and discussion with colleagues, she acknowledged the influence of different epistemological perspectives (i.e, objectivism vs. constructivism) on the formation of instructional design theories. As the epistemological assumptions, constructivism and objectivism should be considered as two alternatives on learning and understanding (Cunningham, 1992;

Hwang, 1996). The two theoretical positions can be complementarily applied in instructional design practices (Hwang, 1996), but the epistemological perspectives can not be mixed in an instructional program (Bednar, Cunningham, Duffy, & Perry, 1995). Instructional designer may select a theoretical position to optimize the learning and instruction situation within each given setting and condition. Although the instructional design theories could provide generic and flexible prescriptions to any learning situation, making of instructional decision depends upon the instructional designer's analysis on the given situation. Instructional design practice is a form of situated activity depending on the specific, concrete, and unique circumstances of the project (Streibel, 1995). Based on the knowledge of instructional design theories, the instructional designer should be able to select instructional strategies to be called upon for the specific conditions of learning (Merrill, 1992).

The constructivist theories assume that our knowledge of the world arises through our construction and generation. Learners construct knowledge and subjectively process it in ways that reflect their needs, prior experiences, and attitudes. For the constructivist, learning is problem solving based on personal discovery and/or socially generated interpretation of experiences. Thus, constructivist instructional designers focus on the instructional methods and strategy that help learners actively explore topics, advanced their thinking, and develop their own interpretation of knowledge (Jonassesn, 1999).

In regard with generating an instructional development model, Lee has developed a functional ID model based on constructivist approach. She conceptualized that Instructional Development (ID) model indicates systematic processes for developing and managing instructional methods, strategies, and media, in order to attain the instructional goal in the given setting. Her functional ID model is designed to articulate generic actions and strategies to develop constructivist learning environments in a variety of educational settings. The model consists of five focal points including Analysis, Design, Evaluation, Development, and Implementation. Each focal point is not regarded as a sequential stage of instructional design activities, but as an aspect of primary action and consideration which instructional designer must focus on to accomplish whole ID process. This non-linear ID approach stems from constructivist ID models (i.e., Crawford, 2004; Willis 1995), which emphasizes real-world focus upon the evolving process of analysis, design, development, and implementation, through formative evaluation and feedback from the end users or students.

For the last two decades, linearity of the Instructional System Design (ISD) models has been debated, as growing interest towards constructivism in ID field (Willis, 1995). Since the ID practice is a complex and dynamic system, the linear ISD approaches have limits to encompass the dynamic processes and changes. Lastly, constructivist instructional development models try to employ non-linear, flexible and authentic view of the ID process (Crawford, 2004; Willis, 1995). The recent constructivist ID models such as Willis' and Crawford's, however, mostly focus on conceptual modeling which intends to describe just taxonomies or components considered in the ID process. There seems a lack of explanation of practical and generic action plan and strategies of the ID process from the constructivist view. Within the magnified flexibility of the new constructivist ID

models, instructional designer should take a huge burden of selecting and elaborating each specific task and specifying action plans. The functional ID model focuses on specifying the recursive and interrelated procedures across five focal points as well as offering conceptual model of the ID process. The model intends to describe what and how instructional designer is doing in the ID process, through the explanation of primary concerns and the interrelationship of the concerns.

Four primary concerns include: problem, task, resource, and communication. The Analysis focus starts with *problem* in the given setting. The problem is related to a gap between the present status and the ideal future scenario of the instructional system. ID process is a sort of problem solving performance to resolve the deficiency in the given system. Instructional designer should identify problem symptoms in the system through inductive analysis of performances and environment analysis (Tessmer, 1990; Wilson, Jonassen, & Cole, 1993). Also, the problem is considered as the questions, the case, or the project that learners attempt to solve or resolve (Jonassen, 1999). This ID model assumes that instructional design must focus on active, constructive, and authentic learning with problem-based tasks across curriculum. Instructional designer must analyze the variety of expert users and their performance in order to select the problems driving learning. Inductive performance analysis such as critical incident analysis (Jonassen, 1987; Jonassen, Tessmer, & Hannum, 1999) can be considered at that point.

Within the Design phase, instructional designer should consider what and how *tasks* are accomplished. The instructional designer must identify the tasks that the variety of expert users do, rather than define isolated unit of content and type of learning with predetermined objectives (Bednar, Cunningham, Duffy, & Perry, 1992). The instructional designer identifies authentic tasks and provides instruction in the context of those tasks (i.e., Sticht & Hickey, 1988). Constructivist learning environment is designed to provide a rich context in which students are exposed to multiple perspectives and can learn to construct multiple perspectives on an issue (Bednar, Cunningham, Duffy, & Perry, 1992). To build such a learning environment, it is essential to design a variety of instructional strategies such as collaborating, coaching, simulating, evaluating, and scaffolding.

Figure 2 – A visual representation of the Constructivist Instructional Development Model (created by Y. Lee).

The development focus is closely related to how to manipulate and adopt relevant *resources* for developing a rich learning environment. Resources may include information, technology, and human, which are required to design and develop instructional materials and tasks that are appropriate for facilitating learners to construct their knowledge. Development team designs and develops instructional materials and tasks based on the selected resources, and makes revisions to them with ongoing formative evaluation. Even though this model depicts Design, Development, and Evaluation as separate focal points, the process of design, development, and evaluation mostly occurs at the same time. This is because formative evaluation and revision would occur from initial design and development phases, and reflection and adjustments in design and development would happen recursively.

In particular, the ID model places the Evaluation focus in the center core of the ID process because evaluation can occur and make changes at any stage of ID process. The ID model emphasizes formative evaluation which provides feedback the ID team can use to improve and enhance the instructional media and tasks. Revision is directly led based on formative evaluation feedbacks across the five focal points. Specifically, students and expert users frequently evaluate any components of the instructional materials at various stages, and give feedback which might be related to primary concerns such as problems, tasks, resources, and communication.

To develop and implement high quality of instructional products, *communication* among stakeholders is one of the most important concerns. ID team may develop instructor guides, self-paced tutorial, interactive computer-based training, participant workbooks, operations manuals, or job aids in order to inform the instructional materials

and tasks developed. Specifically, instructional designer should utilize efficient and multiple channels to inform the design and development of learning environments and to receive feedback from potential users and stakeholders. Besides, communication is a critical component for collaborative development process. Since the CID model encourages the collaborative development environment in which a variety of specialists related to ID and the end-users participate, selection of efficient communication strategies would be considered at every focal point of ID process.

In sum, the functional ID model consists of five focal points involving Analysis, Design, Evaluation, Development, and Implementation, which is a non-linear and recursive process with an emphasis on four concerns: problems, tasks, resources, and communication. Ongoing formative evaluation would review the primary concerns at any stage of ID process and drive the instructional designer to the next step and revision across five focal points. Particularly, the ID model emphasizes inductive analysis process of problems and tasks, and participation of the end-users throughout ID process. At the end of the course, Lee emphasized that this generative project of ID model allowed her to analyze and synthesize moderate principles provided by constructivist instructional design theories in order to develop practical heuristics and work plans for instructional development.

Conclusion

The use of a hands-on and active process engaged the seminar students and compelled them to a deeper understanding of the course content. The differences between instructional design and development are not easily recognizable, especially with the confusion about the terminology used seemingly interchangeably in the literature. During this intensive and deep look at the content, by examining the literature of prominent members of our field, by working in depth through a database project, by creating and justifying an instructional development model, the students in the seminar gained a much deeper understanding of their field.

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Paperless Accreditation:
NCATE is Ready. Are We?

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This report outlines a case of a Upper-Midwestern School of Education's 2-year preparation for an accreditation visit and their efforts to develop a completely electronic document center. The School of Education (SOE) is an NCATE-accredited (National Council for Accreditation of Teacher Education, 2005) university that prepares K-12 and graduate educators for licensure in a Midwestern State. Many concerns, obstacles and basic principles have been made clearer by this endeavor and this report outlines those issues in some detail.

Electronic accreditation review is still a new idea and not yet embraced by the majority of schools. Any management of electronic media beyond one's own files on an individual machine can require a larger infrastructure in support. It is certainly not an easy transition and what is required or how to proceed is not self-evident. This report of one such case will hopefully offer some ideas for improving the process and probably of success for schools considering this option. One day very soon, perhaps, an electronic review will be the accepted norm.

For an accreditation review, of course, the document center ideally provides all of the appropriate documentation to support excellence throughout the program. Considering the number and variety of documents suitable to this challenge, any given document center must certainly be unique to the institution and the time. This report does not address the problems and difficulties or successes that may have arisen in identifying or gathering that documentation. This report will focus more specifically on the electronic issues and nature of the product.

What is an Electronic Document Center?

Similar to an electronic portfolio for teachers (Aschermann, 1999), the document center is the portfolio for the institution. Artifacts are collected and organized to demonstrate and document the performance and achievements of the institution. Standards that govern the program can provide a framework for arranging and presenting the contents of the document center (NCATE, 2002; NCATE, 2003). While ten years ago an electronic accreditation review may have been an experimental novelty (Polis, 1994), today's trend is toward an electronic document center (EDC) (Salzman & Zimmerly, 2002; NCATE 2005) although still not required by NCATE. Essentially, an EDC means that both the artifacts themselves are electronic (word processed documents, PDF documents, graphic files, web site, digitized video clips, etc.) and the delivery mechanism or access system is electronic. Review and examination of materials throughout the document center (DC) is then done via computer.

It can be considered somewhat incidental whether the EDC is in fact on-line (accessible through the Internet) or instead viewable on a local hard disk, CD-ROM or other media, or both. As you'll read below, there are issues affecting the delivery mechanism but these are still peripheral to whether a DC is electronic or not. In an ideal EDC, no paper is used. Many faculty may still see a VHS tape as technology but it is at least an outdated medium and video material should ideally be made available through the same computer interface as other media. Materials are therefore stored in an electronic format either from their original creation or converted by scanning or digitizing the tactile or paper media into an electronic format. These files are then arranged and stored electronically on a computer.

There are, then, numerous obstacles and issues involved in creating a complete EDC. The production of materials in appropriate media formats is only one hurdle. The development and maintenance of the delivery mechanism, a modern-style hyper-media delivery system, as well as the management of both the site and the accreditation project are important concerns. A delivery or access system is necessary for viewing the materials. With hundreds, if not thousands, of files they must be organized in a manner that makes sense to the accreditation review team and are browsed easily and efficiently by most anyone. This might very likely be the Internet and an Internet browser tool (like Netscape or Microsoft's Internet Explorer) but not necessarily. Other tools can of course be developed if a programming staff is on hand to write an appropriate software interface but this is not usually available. So, the most readily available tool for hyper-media is often an Internet browser. Whether the EDC is actually placed on-line can be considered incidental.

EDC Director

In this case, the EDC Director was the technology professor – a one-person department – because no one else was technically literate. With consultation with SOE, the EDC Director developed an Internet-based system to be accessed by the standard browser tools mentioned above. The site was also made available on both Macintosh and Windows platforms. To design and develop an accreditation document center, it has been thought that a specialist may be unnecessary and that there may be many individuals at an institution suitable for the task (Zelazek & Garten, 1999). But, an electronic document center (EDC) involves other issues and a technical specialist may indeed be necessary. More on the role and responsibilities of the EDC Director will be discussed below.

<center>**Technical – The Overall Format**</center>

The dual-platform feature of the EDC was not a difficulty as the Internet is already dual-platform. Making the EDC like a giant website, whether on-line or not, and accessible with a browser tool already allows for both Mac and PC access. Basically, the SOE gathered materials in electronic format and converted materials not already in electronic format by scanning them into a computer, and created a series of web pages with hyperlinks for accessing those artifacts. Use of the EDC can then be just like using virtually any web site.

The cross-platform nature of HTML web pages can solve some problems. But, there are other issues about conflicts between the platforms that will be addressed below.

In this reported case, the SOE used exclusively a PC with Windows XP for developing and managing the EDC. About 50 percent of the faculty personally used Macintosh machines for their own work in developing and submitting documents to the DC.

The old programmer's adage that the program must be "user-proof" is very applicable here as the EDC must allow for reviewers who may not be particularly computer-literate or even competent with technology. It would be beneficial for the user-interface to be designed in a way that allows the simplest operation with maximum visual clarity. The design hopefully promotes meaningfulness for the standards or principles that the DC represents; this must be clear to the accreditation reviewers. This means, among other things, that a simple point-&-click interface must be readily available throughout the EDC pages.

Figure 1 illustrates the style of how documents are presented on the screen in the document center (EDC). Figure 1 shows only a segment, of course, of an elaborate series of Internet pages for the various programs and standards and elements (sub-standard #1) that must be addressed in the EDC. Note the standards that are described (in bold) as distinct from the actual artifact descriptions (a, b, etc.) which inform the reviewers about what the document is and why it is presented in evidence. The document is accessed simply by clicking the "CLICK HERE" hyperlink.

I-A	*PROGRAM AREA*	
	STANDARD – IA: Statement of Standard	
A - #1	**Description of the specific standard being address goes here. Sometimes this is one sentence but may involved two or three.**	
Indicator	**Description**	**LINK**
a	Artifact description stating what the document is.	**CLICK HERE**
b	Description indicating the document's purpose here.	**CLICK HERE**

Figure 1. Sample segment of EDC artifacts accessible via "CLICK HERE" links.

Figure 2 is intended as a slight modification on the EDC layout and design shown in figure 1 above. The primary difference is simply that the hyperlinks are informative and indicate the kind of document being accessed. This can be useful for the accreditation reviewers in addition to the EDC project coordinator so they will know what application will be invoked by clicking. This can not only contribute to some peace of mind (knowing what the computer is trying to do) but can also be helpful in trouble-shooting any failed links.

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Figure 2. Alternative sample showing informative artifact hyperlinks (red arrow).

Regardless of the nature of the hyperlink, the program, standards and elements should be distinguished by color shading and the use of colored text. Color, as a navigational clue, can be as important and useful as text labels, if not more so. Color can establish a theme that, after brief exposure, will help to familiarize the reviewer with the particular area being viewed or assist in finding another.

Figure 3a illustrates this use of color in a black and white medium by shading the rows with and setting the text as black or white in contrast to the shading. The colors throughout a given standard (I, II, III, etc.) should be consistent and differ from colors used in another standard.

Figure 3b illustrates the use of color to distinguish between the various standards and program areas. The colors throughout a given standard (I, II, III, etc.) should be consistent and differ from colors used in another standard.

I-A	PROGRAM AREA	
	STANDARD – IA: Statement of Standard	
A - #1	Description of the specific standard being address goes here. Sometimes this is one sentence but may involved two or three.	

Indicator	Description	LINK
a	Artifact description stating what the document is.	**Word File**
b	Description indicating the document's purpose here.	**PDF File**

Figure 3a. Illustration of color by shading in black and white.

Figure 3b. Illustration of the use of different colors by standard and program area.

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High contrast between text and background shading will improve clarity and make it easier to read. Of course, which colors are used is entirely an arbitrary choice as there are no accepted color themes for educational standards, NCATE or otherwise.

In general, overall display, which includes the text, the colors, the table-layout, etc., can be created using a simple web page composer tool.   This can include something as simple and straight forward as the Netscape Composer tool or the more involved Microsoft FrontPage composer or DreamWeaver. The specific composer tool doesn't really matter and will inevitably require some basic knowledge of HTML so that the underlying code can be occasionally manipulated manually and directly using a simple editor.

The electronic documents should be segregated into separate folders, one for each standard. The hyperlinks will also be individually created once the artifact's Indicator and Description are completed in the EDC and the electronic document is available in the corresponding folder. Figure 4 illustrates, with a very limited scope, the hierarchical relationship among EDC web pages and corresponding folders functioning as containers for the EDC artifacts.
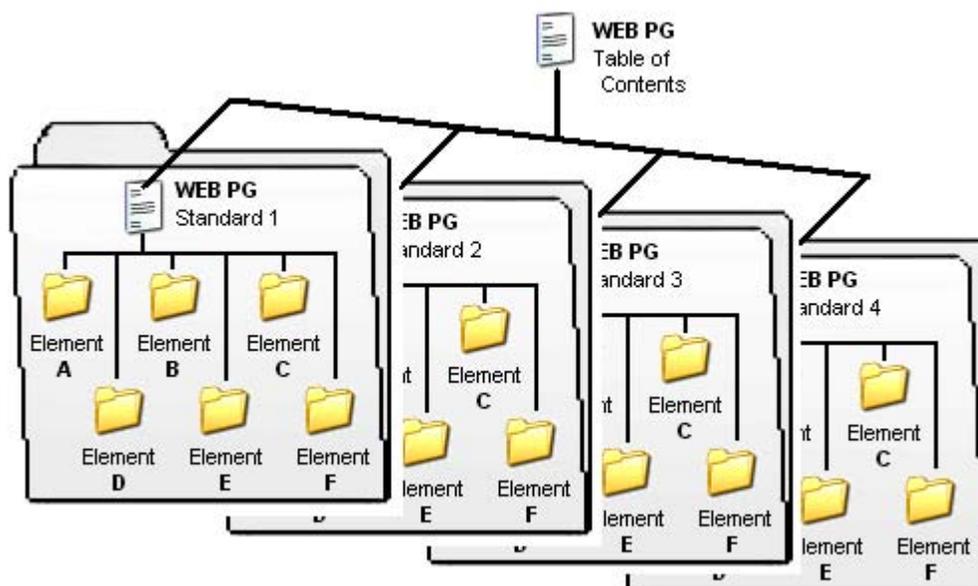
Figure 4. Abbreviated illustration of the hierarchical relationship within the EDC. Artifacts are stored in folders by standard and element.

The artifacts are stored in the various folders and are accessed from the web page for that standard. Also, in figure 4, the entire assembly represents part of only one program area such as a typical undergraduate program or perhaps a Masters Degree program, etc. The same table of contents page shown at the top might also lead to each of the various program areas or, instead, intervening menus might be provided depending on how it is setup.

Once the artifacts are arranged into the folders and the corresponding EDC web page is linked to it, then that HTML file and the artifact file(s) will need to be uploaded ("posted") to the EDC's Internet site. Any freeware FTP program (file-transfer protocol) is sufficient and recommended for this step in the procedure.

It is not recommended that one use an automatic "publishing" from within a composer tool as the means for posting documents to the web. This process tends to hide the details of the transaction from view. Automated publishing, is viewed by many as a convenience but seems to purposefully automate the task for those who do not wish to or are not able to understand well enough to manage it directly. A simple FTP program will expose the process and allow one to view and manage all files and folders clearly and directly at the web site.

Technical – Generating Electronic Documents

While building the EDC web pages and "posting" the artifacts to the Internet is a long and tedious part of the process, the production of electronic artifacts is no less involved. Generally, faculty with the assistance of staff will gather, collect, generate and produce the various artifacts for the DC. They can then be submitted to the persons

involved in developing the EDC. The separation or arrangement of duties and roles for those involved in the development of the EDC will be discussed further below. In any event, support staff will be necessary both to aid faculty in document collection and preparation and also to serve directly in building the EDC.

A variety of file formats will be likely as it was in this case for the SOE.   Obviously, it would be best to select a single word processing format to use in the EDC, consistent with the utility that will be available on the machines used by the visiting accreditation team. The SOE utilized three primary formats: word processed documents, Acrobat Reader documents commonly called PDF documents, and the URL's (addresses) of existing web sites. To a lesser extent, raw graphic files were also included. It is also reasonable to anticipate the use of both plain text and graphic files.

Often, documents, having been created in an electronic medium such as word processing, are still available in that format and can be submitted directly in their original form. Some faculty may use different applications and so documents, even though word processed, may exist in various formats such as Microsoft Word (doc), Word Perfect (wpd), Microsoft Works (wps), or other. It is not really practical to attempt to convert all artifacts into the same format.

Focus and Highlight

Half way through document collection it was determined that more should be done to target or highlight certain material in order to focus the accreditation team to specific areas of artifacts. This is not an easy thing to do in an electronic document system. If the target is a web site then a specific page URL within the site could be used. If that page has an anchor or named location within it then it may be possible to link directly to an internal part of that web page and thus focus on a highly specific area. Otherwise, one must likely accept and use a web site the way one finds it.

For documents generated within the school, there is some control. The SOE decided to use a yellow highlighter to literally highlight sections of paper documents in order to focus attention on that material. Scanning in color then maintained the highlighted color. For documents still in electronic format, the highlighting feature of Microsoft Word allowed some similar highlighting of specific material but not everyone used this feature.

In any event, linking within the EDC to a specific document still does not necessarily place the highlighted area within the initial screen view. Bookmarks within Word documents can function much like anchors or named locations in web pages and thereby allow direct linking to specific sections of material. But, this would be even more time consuming and require specific skills not available for most faculty. So, this option was not used at all and the problem of focusing attention on specific areas of artifacts remained. The easiest solution was to include some direction in the artifact description to better direct the accreditation team.

Technical – Production and Process

A dedicated computer (PC) was used as the primary work station. It is imperative to maintain one primary work site to avoid duplications and gaps between conflicting work stations.   Netscape Composer was used 80% of the time. Less than 5% of updates or changes were done with Microsoft's FrontPage but specialty features of FrontPage were avoided to keep the HTML code clean and constructed simply. The other 15% of the time, the HTML code was manipulated directly using Microsoft WordPad.

Submissions

The EDC Director prepared specific systems to help the SOE submit materials. One method was a dedicated email address so documents could be submitted as attachments to emails. The faculty was basically familiar with how to do this so this proved to be a convenience. The artifact attachments went directly to the project email address and could be accessed at the work station.

A web site was developed that outlined submission procedures in detail. The SOE faculty were acquainted with the page through a number of workshop sessions. In spite of this, throughout the first year and half most did not use and were generally unfamiliar with the prescribed submission process. Overall, the faculty was inexperienced with or not well-versed in the use of technology, how Internet browsers work, and the subtleties of URL's, passwords, bookmarks and more.

All submissions were to include specific information required to complete the artifact posting and for monitoring submission traffic. As mentioned, workshops provided instructions and hardcopy fliers provided procedures. For tracking artifacts through the submission and posting process, the web site provided an on-line document submission form. Another option included cut-n-paste text that could be added to the body of an email submission. Thirdly, one could print a PDF form for submitting the information with any paper submissions.

In spite of this support system, the first year included countless errors and critical omissions that caused errors and generally slowed the process. Submissions in error were returned for correction and posting was slow. As deadlines neared, faculty began to learn the process and postings progressed.

Files

One problem area among many was the submission of artifacts with poor or useless filenames. Filename problems included at least the following:

a. missing filename extensions (using filename stem only)
b. the use of more than one period in the filename
c. the inclusion of spaces within the filename
d. a mix of capital and lowercase letters
e. extra long filenames

The last problem was exemplified by one file submission with more than 70 characters in the filename stem. This extreme was not an oversight and was not viewed as unusual by the person submitting the file.

Another problem was the general over sizing of many files as a result of scanning. A paper document might be placed on a scanner and converted to a graphic image. Scaled to view on the screen the faculty person or their assistant doing the work may not recognize that the file is actually much larger. That is, a "page" may be 20 by 25 inches or so and yet still appear to be only 4 by 5 inches because of the smaller viewing area. The image should be resized so that 4 by 5 inches, for example, is the full 100% size. To be more technical, the file may be 15mb when it only needs to be 800K. Faculty and staff had no notion of file sizes and no knowledge of how to modify such attributes. Continuing this problem across several thousand documents can create a very big problem. This issue will be discussed further in the management section below but in this case the SOE retained the many oversized files. Once the problem had spread throughout the many electronic materials, fixing the problem was no longer a real option.

Overall, the extreme lack of technical literacy on the part of the SOE faculty contributed greatly to the many problems of getting materials submitted and posted efficiently. Having only one educational technology professor (EDC Director), was not a sufficient compensation for a considerable lack of techno-literacy among the other faculty, staff and administration.

Backups

Of course, any electronic file system must include a backup system. As files are uploaded daily to the site, the online site itself functioned as the first level of backup. That is, the so-called original set was maintained on the work station computer, so the online version was essentially a second copy. A third backup included occasionally downloading from the internet version to an office computer for storage there. Lastly, CD's were occasionally burned containing the complete system to date.

One can never have enough backup copies so we recognize that this system included some risk. For example, the only up-to-date file sets were on the work station and online. The second machine and the CD's were not regularly or frequently maintained. If the work station had crashed then the online version would have been immediately downloaded to update the second computer. Nevertheless, this constitutes, from a traditionally conservative point of view, a deficiency during the EDC development. Numerous backups of the final version were prepared on CD-ROM.

No real problems were encountered in this case due to insufficient backups. This was perhaps due as much to the EDC Director's availability and supervision than any technical support mechanism.

Posting Files Online

Of course, files have to be uploaded to the Internet web site. This is typically called publishing or posting. Some composer tools provide an automated publishing feature and allow direct editing of files on the web site. That is, one can grab a file directly off the Internet, modify it and publish directly back to the site – all in one process. Unfortunately, this can confuse or confound the process of maintaining the original files in the departmental worksite. Instead, the SOE's approach was to work directly on the worksite files, simply save the changes to hard disk, and then upload the new files and modifications to the web site. Then, with the use of a dedicated FTP program (file transfer protocol) to upload the files, a greater degree of clarity was maintained. That is, an FTP program allows one to examine each and every folder and file of the web site directly.

Final Format

The primary use of the EDC was directly online. The home page URL was provided to the reviewer and they were able to browse any files or areas as desired. The SOE provided a conference room to the reviewers and therein a range of PC's and Macintosh computers with online access so the group could examine the EDC.

In past accreditation reviews, computer equipment and some materials were provided by the SOE to the review team at their hotel for after-hours work. In this case, the full EDC was made available on CD-ROM disks so the entire EDC could be examined off-line directly on CD.

Due mostly to the oversized nature of many files resulting from oversized scanning (discussed earlier) the complete EDC was larger than would fit on one CD-ROM and DVD-ROM was not available. The EDC was split up and placed on different disks based on NCATE standards.

Platform Conflicts

Either platform, Macintosh or Windows (PC), was able to access the EDC online as the primary presentation medium, HTML Web Pages, is already cross-platform compatible. The individual files consisting mostly of Microsoft Office formats were also cross-platform.

The production of CD's was done on PC's and were therefore consistent with that format. However, burning a CD to be readable by either format was deemed unreliable. That is, a CD burned on a PC might not be completely functional on a Macintosh because of a number of technical reasons not discussed here. So, the entire EDC was transferred to a Macintosh Computer hard disk where CD's could be created specifically for the Macintosh platform. The review team could then select the particular CD-ROM system of their choice.

Management

The planning for the selection of artifacts and who will judge their evidentiary value for accreditation are outside of the scope of this paper. Such programmatic considerations are typically under the direction of the Department Chair or, in this case, the Dean of the SOE. In any event, it is sufficient to note that a school will commit to a process of data selection and collection.

The issue is what to do with the documents as they are collected or designated for the EDC. The document center cannot be a kind of large, public "dipsy-dumpster" that permits anyone to dump their materials into it. Aside from the issues of controlling and directing document selection, which is presumably under the guidance of the program, artifacts must be technically organized and stored in the electronic realm. Getting the materials from the source to final posting is a critical path and managerial issues lie along the entire journey.

A Collection Center

Artifacts were submitted to a central repository for processing. A singular location served as the site for gathering documents and for creating the electronic media. In this case of a web-based EDC, a dedicated email address served as the conduit to a single computer used to store submitted materials. The machine functioned as the primary work center for the development of the HTML web pages.

A guiding principle in the development of the website was to create a mirror image of the site on the workstation computer. Files and folders were posted to the Internet server exactly as arranged on the workstation. The set of files on the workstation was deemed the originals and all backups, copies, and postings stem from there.

It can be important to have a controlled system, a reliable mechanism for tracking submissions. On numerous instances, discrepancies arose between what was reportedly submitted and that which was posted. Ultimately, materials or correction instructions had to be resubmitted.

Director/Coordinator

The one person designated to coordinate and technically build the EDC was the one technology professor in the SOE. The technical responsibilities of such a task demanded the scrutiny and skills of the technology specialist. Nevertheless, there were numerous problems with this role as discussed below.

Assistants

Two students were hired, one year each, to assist the Director throughout the two year development of the EDC. Responsibilities included scanning paper materials, retrieving artifact contributions and posting documents to the EDC. While they were assigned as assistants to the EDC Director, considerable problems arose in this area of management.

The assistants were lightly trained with no prior experience. They were selected more because of their availability than their aptitude by the office manager (an accreditation officer) and the dean. In addition to general EDC development and management, this factor made close contact with the technology director all the more important. However, the assistants instead reported to the office manager rather than the technology director.

Authority

It is critical to have a sound and respected management team with clear authority and a clear management structure accepted by virtually everyone. The office manager was not technically knowledgeable and regularly misunderstood the specific work of the assistants. The assistants performed discrete tasks through memorized procedural rituals. Nevertheless, the office manager seemed to value this role and acted to protect it. There were many problems because of this confusion of authority. For example, on more than one occasion the office manager distributed unofficial, unapproved and erroneous announcements to the department declaring the EDC status and inviting faculty to take various actions with submissions. On other occasions, the office manager redirected the work load of the assistants with serious consequences for EDC development.

Even when this problem of authority and control was questioned and later challenged, the dean failed to enact changes. As the sole university administrator with any enforceable power and authority, the dean really sets the stage for structure or chaos, responsibility versus interference, and of course success or failure. A great deal of good will seems to have been lost in this and other conflicts in management. The technology director and professor, originally assigned as the lead responsibility for EDC design and development, was not empowered to carry out that role without considerable conflict.

With extensive experience dealing with NCATE reviews, the dean naturally served as the leader of document center content. That is, prescribing evidentiary materials that would be necessary and appropriate to support all aspects of the program. There seemed to be no conflict or confusion about that role and that authority.

Foresight and Planning

Lack of training and knowledge in the use of computer technology was a considerable problem among the faculty and staff. Their lack of sound habits, protocols and computing discipline carried over to all electronic material management and production. With only one knowledgeable technology professor, the need for foresight and planning throughout the department is greater.

Protocols, procedures and various tools to facilitate the development and submission of electronic materials were provided and outlined by the EDC director at the beginning. These were reviewed in subsequent workshops and maintained throughout the 2 year process. However, factors combined to undermine the effectiveness of these tools. Faculty ignored the protocols, failed to understand and learn procedures and generally procrastinated creating additional work for the director and causing considerable delay. Additionally, the lack of a supported authority structure seemed to undermine any sense of urgency or legitimacy in the technical director's guidance and leadership.

Foresight and planning can be the critical first step in a successful EDC program. "The first step of providing evidence for the Continuing Accreditation on-line sets the tone for preparing documents and exhibits electronically. " (Harry, Brown, & McCullogh, 2001, p. 9). For the SOE, this seemed to be lacking in spite of an experienced dean and a considerable investment in an independent accreditation consultant. Certainly a greater sense of team identity with clearer roles would have greatly improved the efficiency and quality of the final product. Perhaps, better trust in the technical advice of the technology expert would also have improved both the process and the product.

Final Recommendations

One of the factors missing from the accreditation visit is some concern for the amount of time a given school devotes to preparation for their accreditation visit. If school A passes with near perfect results, they are to be commended. If school B passes with a recognized limitation or two, they may be pleased but plan to spend more time in preparation next time.

But, what if school A spent literally twice as many faculty-hours in preparation as school B? More to the point, school A might spend many thousands of faculty hours (as was done in this case study) gathering documents if not creating documents and, in a sense, living exclusively for the sake of the document center. This is contrary to the real purpose of the institution. That is, the purpose is to deliver a quality educational experience and documenting that is a secondary mission.

The analogy that seems appropriate is how a student might get a very high score on a final exam by memorizing all of the answers but get far less from the overall course experience than another student who more literally embodied what the course intended yet missed a few more answers on the test. The real point in the course is better represented in the latter student who will continue to benefit from the experience in the future.

There are problems in schools focusing on the accreditation process (Adams, 2004). Schools can erroneously place the real delivery of the quality educational experience behind their efforts to document it. The accreditation process should consider the amount of faculty-hours devoted to the preparation for the accreditation visit. This argument is based on the premise that (a) it is possible to compromise the quality of an institution and it's program by an extreme preoccupation with documentation and illustration of how standards are being met; and (b) still conceal or fail to reveal in that demonstration the preoccupation and exclusivity in creating it.

Finally, a competent technology leader should be available to direct the design and production of the EDC and should be given the authority to direct the use of that technology. The entire team structure should be recognized and accepted by everyone and enforced by the dean.

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A Blended Learning Environment as Perceived and Experienced by Course Instructor

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Abstract: Face-to-face (FTF) and online environments require different skills and techniques for an instructor to employ for a lesson, while blended learning requires a harmony. The increased research on the conceptual framework and design considerations of blended learning leads to a need to unfold the experiences of an instructor in the design, development, and implementation processes in a blended learning environment. This study is a preliminary case to understand the context of a blended environment based on instructor experiences. The results indicated that blending FTF and online environments require thoughtful design and implementation since they pursue different features such as student and time management, communication, and guidance.

Key Words: Blended Learning Environments, Instructor Roles, Instructor Experiences.

Introduction

Blended learning has the potential of combining best of two worlds: FTF and online environments. With this feature, it is gaining more attention in higher education. There are lots of issues for the instructor to take into consideration while, developing the course for both in FTF and online environments. Teaching methods, instructional approaches, classroom and time management techniques, communication, motivation, resource allocation, required technical skills, and interpersonal skills are a few to name.

According to Driscoll (2002), blended learning evokes different things to different people. That is, it may be perceived as a mix of pedagogies, Web-based technologies, as well as the combination of any form of instructional technology with face-to-face (FTF) instructor-led training. This is probably due to the lack of a definite conceptual and pedagogical framework for what blended learning serves for (Kerres & De Witt, 2003). There is a need to investigate the experiences and roles of instructors in the entire context for the conceptualization of blended learning. An understanding of what is going on in a blended learning environment and the perceptions of the people affected from it can contribute to a much-needed knowledge for successful learning. It is the aim of the researchers to create an understanding of the design, development and implementation processes in a blended learning environment from the instructor's perspectives and experiences. This study is a preliminary case to understand the context of a sample blended environment from instructor experiences.

Method

Background of the Study

In this study, an undergraduate course, CEIT 209: Computer Aided Instruction, was designed in a blended learning format at fall semester (September-January) in 2005. The course is given to sophomores in Computer Education and Instructional Technology Department (CEIT) in Middle East Technical University, Turkey. It is a must course and was given in FTF format until 2005 fall semester.

Before the design of the course, the researcher analyzed students, content, and context of the course. This process began after the fall semester in 2004, in which the course was offered in a FTF environment. At the end of fall semester in 2004, semi-structured interviews were done with five students and the course instructor to gather data for their experiences and perceptions on FTF environment. The analysis of these data was done with a content analysis process as Miles and Huberman (1994) described. The results of these interviews showed the picture of the course context and provided data for the redesign of the course in blended format. What is meant as blended learning in the context of this study is a mix of FTF environment and online

learning environment. The infrastructure and base of the online environment of the course was created and developed by Ozden (2002), who was using this system in his undergraduate and graduate classes over since 1998. It was revised and improved by taking user reactions during these years. This environment was adapted to the needs of the course.

After designing and developing the blended learning environment, the researcher implemented the course as the instructor. She had diaries during all processes in order to stimulate critical reflection of her experiences. In the diaries, which are the main sources of data in this study, she reflected on important processes that she had experienced. These diaries were analyzed by the researcher with peer debriefing to confirm the credibility of the information which she had interpreted.

Design of the Study

This research is conducted as a case study. As Merriam (1998) indicates, case study design is used to understand context-related phenomenon while anchoring in real-life situations. The case study is an appropriate method of inquiry for this study since the researcher aims to understand a particular phenomenon in its natural setting in an in-depth way. The data were gathered from documents included instructor diaries, learners' portfolios and logs in Web site, and the other course related data like web site content, forum discussions, in-class materials, etc.

The first author of this research was the instructor of this course, and designed, developed, and implemented the course. Being a teaching assistant in the department, the researcher is familiar with the socio-cultural context of the department. Having the instructor role also provided the researcher to be an active participant in the context of the study. This gave a direct insight into a very different set of challenges. That is, it allowed an in-depth analysis of the content of the course, student engagement, and the dynamics of the context of the study. As Bogdan and Biklen (1998) noted, since it is difficult to get away from who you are, and what you believe; the study is affected by researcher's biases. The researcher tried to avoid this threat by expert checking, peer observations, and peer debriefing methods. Two experts from departments of CEIT and Educational Sciences guided the processes during the design, development and implementation of the course. These experts provided feedback on the outcomes of document analyses and analyses of field notes of the instructor. Two peers, who were doctorate students in the same department and familiar to blended learning environments observed the courses in FTF environment, and also tracked and examined the course Web site. The researcher asked these peers about the findings and took feedback on the analyses of field notes and documents.

Results and Discussion

The instructor had different experiences in the two environments of the blended environment while designing, developing and implementing the course: FTF environment and online environment. Even if they were mixed in the course, each had its own characteristics and challenged the instructor from different aspects.

The Design of the Blended Course

The core of the design of the blended environment was based on creating a flexible and rich learning environment, which would support interaction and allow student collaboration and cooperation. Rather than presenting the information only, a two-way communication between learners and the instructor was also aimed. The results of the interviews with students and instructor of the course in Fall 2004 semester indicated that the instructor should be cautious about the activities design, interaction, learner support, and online course integration. Therefore, with the core of the design considerations and the results of the past interviews, the instructor designed the course as in blended format while taking each environment into consideration. The most important challenge that the researcher faced was to make a balance between online activities and FTF activities to make them go hand in hand. Other than this, another challenge was the time required to develop both FTF and online activities.

FTF Environment: The activities were designed to support student learning flexibly and to allow active student participation by incorporating a bunch of variety. Additionally as Arends (1998) suggested, to design a rich learning environment, designers should promote self-regulated learning. The activities that the instructor designed included expert seminars; assignments like book reviews and sample software evaluations; student

presentations; cooperative learning activities in-class; group projects out-of-class; and student presentations of the projects.

For the FTF interactions of the course, the instructor aimed to create a friendly environment which would support all types of interaction as Moore (1989) identified: student-content, student-teacher, and student-student. The group activities, assignments, and expert seminars were designed to serve for student-content interaction. Student presentations and learner-centered approaches to classroom teaching of the instructor were designed to promote student-teacher interaction, while cooperative learning activities, group projects, and student presentations were designed to serve for student-student interaction.

Online Environment: For the design of the online environment, the instructor planned to use a local Learning Management System. As the theoretical framework of the study embraced a student-centered approach by encouraging active learning, the researcher aimed to incorporate the following considerations as Levin et al. (2001) proposed:

1. *Rich student-student interactions* through discussions in forums, instant messaging environment and group work assignments,

2. *Adequate and timely feedback from instructors* through messages in forums, e-mail posts.

3. *Relevant and challenging assignments* with guidelines and relevant resource links,

4. *Flexibility in teaching and learning,* by allowing individual pace in the completion of any given assignment,

5. *Coordinated learning environments* by scheduling tasks at the beginning of the term.

Other than these, according to Falvo and Solloway (2004) course designers need to address the socio-cultural context of the online learning environment, as well as the content or subject matter, which is being addressed in their courses. In order to support socio-cultural context, it is important to integrate the critical elements into the learning environment: collaboration and conversation. Collaboration was supported in both environments. However, conversation was only in FTF environment since the researcher did not see it as a necessity for online environment.

The Development of the Blended Course

The development process began together with the design phase. During the development of the course, content development, resource allocation, and creation of the course web site both in technical and instructional means challenged the researcher. Findings resources from the Internet and print and audiovisual sources took a lot of time. She could not even finish this process before the course began. Instead, she continued this process throughout the term in weekly periods.

FTF Environment: Developing FTF activities challenged the instructor in terms of content and resource allocation. However, it did not require much time. After each week's course, several iterations were done to improve the activities and relate them to students' needs. Since the course was an introductory course and students did not have a conceptual background on the topic, the researcher needed to develop more detailed guidelines for assignments, and allocate more fundamental resources.

Online Environment: The online environment had a non-linear, and dynamic structure. At the beginning of the term, the researcher conducted a usability study with a user test with seven students that are registered the course and expert evaluations with Nielsen's (2005) ten heuristics, and redesigned the course accordingly. The students could have access to web site with user-ids and passwords due to security and personalization reasons. The students were monitored with logs. The web site included the following main categories:

- Course materials
    - o Course Information
    - o Content
    - o Resources links
- Assignment links
    - o Book review
    - o Software evaluation
    - o Homework
- Announcements

- Forum
  - Student and instructor discussions
  - Reflections on projects
  - Reflections on assignments
  - Student diaries

The Implementation of the Blended Course

In this part, the findings are presented together for the two environments. The reason behind this is that when the course began, the experiences for two environments affected each other. Throughout the implementation of the course, the researcher came across to challenges that she could not imagine. Classroom management, time management, interaction and communication, and guidance were the most important of them. For example, several students not volunteering the FTF activities at all or not participating the FTF sessions were actively responding to questions in forums. The students that actively participated in FTF course were not interested in forum or any interactive communication tool. Since the online environment lacks mimics and gestures, the instructor had difficulty to manage those students and communicate with them. This can be a challenge for the instructor since he/she is the guide of that environment. Some students stated that since they know the instructor in FTF environment, they could understand what she meant by her writings in online environment. However, this cannot be true for the instructor, since she may not know how to behave a student in online environment if the student does not participate in FTF courses. Another important thing was time management for the instructor. In addition to weekly FTF meetings and office hours, the instructor needed to spend most of her time reading postings, handling them, tracking students, and updating information in the site. She tried to be available during whole week in front of a computer for the students. In addition, since the number of students was too much for online discussions (N=51), the discussions could be done within groups.

Beside the afore-mentioned challenges, allowing a flexible environment and incorporating practical activities increased the motivation of students, which satisfied the instructor. The instructor believed that with the strengths of the two environments, she provided a flexible and self-regulated learning environment. This enabled students to communicate and interact with each other and instructor; and cooperate and collaborate for creating real world projects both in class and out-of-class environments. She could also coordinate them and provided feedback throughout the week, and allowed self-pacing by providing all materials including presentation documents in both environments.
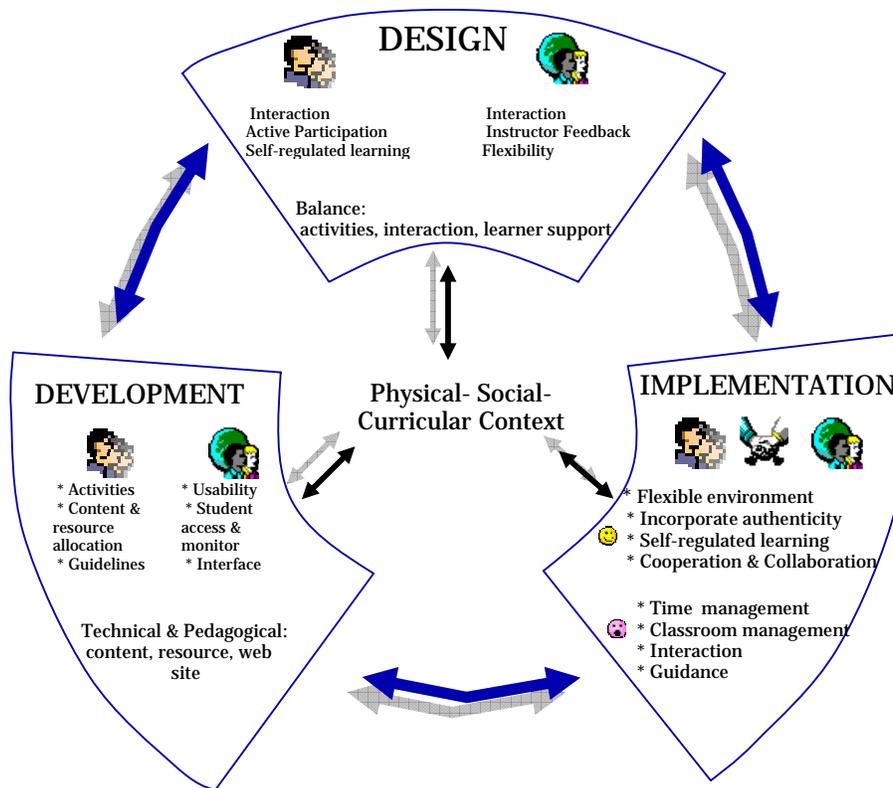
Figure 1. Instructor experiences in the blended learning course development.

The results of the study showed that when blended learning is selected for the course format, the instructor needed to deal and pursue the harmony of two environments as well as dealing with their features within their own contexts as stated in the literature. Blending FTF and online environments require thoughtful design and implementation since they pursue different student and time management, communication, interaction, and guidance features. The results may help researchers and practitioners to be informed of the factors, strategies and challenges that need to be taken into account when utilizing a blended learning environment

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The Perceptions and Experiences of Preservice Students in a Blended Learning Environment

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Abstract: The purpose of this research is to examine and describe the perceptions and experiences of preservice students in a blended learning environment. In this study, data collection, data analysis and inference procedures were handled through qualitative method. The findings indicated that the students perceive blended environment very helpful due to its timeless communication, resource and material supply, and interaction opportunities as well as social negotiations together.

Key Words: Blended Learning, Online Course, Interactive Systems, Technology Integration

Introduction

The advent and exponential growth of the Internet had led to drastic changes in the creation of learning environments in educational settings (Chuang & Wang, 2003; Rosenberg, 2000). However, face-to-face (FTF) communication is still the richest medium with its potential for intensive interpersonal communication and for building social relations. In relation to these, blended learning has piqued the interest of researchers looking for the most effective options for learning in recent years. Singh (2003) argues that with its potential to provide multiple medium rather than single medium, blended learning becomes a better alternative for educators.

Blended learning remains a relatively new concept in the field of Instructional Technology despite its growing popularity. According to Garrison and Kanuka (2004), researchers should explore the impact of blended learning in achieving meaningful learning experiences. This case study aimed at examining and describing students' experiences in and their perceptions on the blended environment in an undergraduate course. It was a preliminary work to understand the context of a sample blended environment. The information provided by the outcome of this study can provide insight into the dynamics of design and implementation of a blended learning environment through the eyes of the students.

Method

A qualitative case study guided the study since the nature of the research required a detailed context-related description of the phenomenon (Yin, 1984). According to Merriam (1998), a case study design is used in order to understand context-related phenomenon while anchoring it in real-life situations. The case study was an appropriate method of inquiry for this study, since the researcher's goal was to understand a particular phenomenon in its natural setting in an in-depth way.

The data were collected through document analyses and semi-structured interviews in CEIT 209 course. This course is offered in fall semesters at the Department of Computer Education and Instructional Technology (CEIT) in Middle East Technical University, Turkey. It is a basic introductory course about Computer Aided Instruction. The format of CEIT 209 course was a FTF instruction until 2005 fall semester. At fall 2005, a total of fifty one students took this course in blended format. What is meant as blended here is a mix of FTF and online environments. The infrastructure and base of the online environment of the course was created and developed by Ozden (2002), who was using this system in his undergraduate and graduate classes over since 1998. It was revised and improved by taking user reactions during these years. This environment was adapted to the needs of the course. The documents were gathered throughout the semester (October-January) from all students' data. Interviews were conducted with ten students (20 %).

The documents , forum messages of the students, were organized as in the form of student diaries. The students wrote their experiences and perceptions of the use of Web site as a support environment for FTF course and experiences about the format of the course. The data from these documents were analyzed according to the data analysis procedure that Bogdan and Biklen (1998) propose: emerging themes were identified by reading data, organizing them, breaking them into manageable units, synthesizing them, searching for patterns, discovering what is important, and deciding what to present and tell.

Two semi-structured interviews were conducted with ten students at the beginning of the term (October 2005), and with fifteen students at the end of the term (January 2006). For all interviews, the researcher

developed interview guides and asked one expert and three peers to evaluate it. As they were semi-structured interviews, the researcher found opportunities to ask further questions appropriate to the flow of the interviews. After completing data gathering part, data were transcribed, coded and analyzed with the content analysis process as Miles and Huberman (1994) described. During data analysis, the researchers asked two doctorate students outside of the study for feedback and maintain intercoder reliability, who were familiar with the nature of the study and have had experience on interviewing.

Findings and Discussion

In the first interviews, researchers collected data about the students' perceptions on having the CEIT 209 course in blended format. The results revealed that the students were eager for the Web site as (a) support for the FTF course. All of the interviewees stated that it would be very helpful and encouraging for them to communicate and interact with peers and with the instructor throughout the semester, not only in the class hours. They also mentioned about the opportunity to have access to the course materials, which would motivate them to study on course content out of the class. All these positive comments showed that the students were enthusiastic about taking the course in blended format.

Throughout the course, the forum messages showed that the students could be able to discuss the topics that they could not discuss in the lesson due to time constraints or other reasons, and they could be able to communicate with the instructor and peers whenever they needed. In addition to these, it was interesting that the students that were not attending or not participating at all in the FTF environment could participate to the course in Web environment. That is, they could make use of the benefits of Web and FTF environment together in the course.

The second interview was about the experiences of the students and their perceptions on the blended learning environment. The results of the interviews indicated that the students could benefit from both FTF and online environment. The major benefits mentioned by the interviewees were the flexibility in time to study course, wide allocation of course resources and materials, interaction opportunities (both with the peers and the instructor), instant feedback from the course instructor and class members in negotiation, opportunity to discuss the topics in online environment that they could not discuss in the class, and opportunity to discuss topics with a FTF interaction and to get immediate feedback.

For the barriers that they had, the students mentioned about some technical problems with the online environment. They could not sometimes connect to the forum environment due to password problems at the beginning of the term, but soon it was solved. Two interviewees also complained about the crowd of the people taking the course together. They expressed that they were sometimes getting difficulty in concentrating FTF discussions, but they could continue these discussions in forum environment comfortably. One interviewee also stressed the importance of the social negotiations within FTF environment. He stated that the opportunity of having a fifteen minutes FTF discussion was worth hours of the forum discussions for him. However, he also noted that accessing course materials and follow announcements online was so effective for him that he would not prefer just the FTF environment.

Table 1. Student perceptions of blended learning

Benefits	Barriers	Suggestions
* Timeless communication-interaction	* Increasing workload	* More guidelines for the process of FTF and online environments
* Wide allocation of course resources and materials	* Technical problems with online environment	* More discussions in online environment within group
* Social interaction both in and out of class * Flexibility in time to study course * Instant feedback from the course instructor and class members in negotiation * Opportunity to discuss the topics in online environment that they could not discuss in the class * Opportunity to discuss topics with a FTF interaction		* More student participation to the design of the course

In line with what literature says about blended learning, this pilot study showed that blended learning environment can offer a flexible environment to the diverse needs of students in higher education. All the features may not catch students' interests or motivate them, but providing multiple opportunities to students can increase the flexibility of the learning environment. It can also be concluded that even if it takes time for students to deal with the courses, having access to course materials, resources and opportunity to interact with instructor and peers support student learning in a blended environment.

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Evaluating the Effectiveness of ICT Related Courses for Preservice Teacher Education in Turkey

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Abstract

This study investigates faculty members', preservice teachers', and K-12 teachers' opinions about effectiveness of ICT related courses in preservice teacher education programs in Turkey. The design of the study is cross-sectional survey method. The data were collected from 111 faculty members, 1330 preservice teachers, and 1429 K-12 teachers with three questionnaires. The findings indicated that majority of participants agreed for the courses providing to the preservice teachers necessary knowledge and skills in using and integrate ICT.

Key Words: Evaluation of ICT Related Courses, Effectiveness of ICT Related Courses, ICT Related Courses, Technology Integration Courses, Preservice Teacher Education, and PT3

Introduction

The rapid developments in information and communication technology (ICT) affected the educational paradigm in the world. Teacher education programs across the countries have been challenged to respond to these developments. Parallel to the international practices in reforming preservice teacher education for the new millennium, in 1998, the Higher Education Council in Turkey reconstructed Faculties of Education' curriculum to train teacher candidates with abilities and skills to use ICT effectively in their subject areas. According to the new curricula, it became compulsory for all faculties of education students to take "Computer" and "Instructional Technologies and Material Development (ITMD)" courses to fulfill the requirements for teaching credential (HEC, 1998).

The new, technology integrated preservice teacher education curriculum has been implemented since 1998. However, there is no evidence on the effectiveness of the new curriculum, and it is not clear that if the new curriculum meets the required needs in ICT training of prospective teachers. Therefore, there is a need for research studies on the effectiveness of the new ICT related courses. Hence, the purpose of this study is to investigate the effectiveness of ICT related courses in Turkey's preservice teacher education programs in regard to faculty members, preservice teachers, and K-12 teachers' perceptions. Consequently, this study addressed the following research questions:

(1) How do faculty members, preservice teachers and K-12 teachers perceive the effectiveness of "Computer" course in terms of ICT integration into preservice teacher education?

(2) How do faculty members, preservice teachers and K-12 teachers perceive the effectiveness of "ITMD" course in terms of ICT integration into preservice teacher education?

Method

The design of the study is cross-sectional survey method. In order to collect relevant data on the stakeholders' perceptions of effectiveness of ICT related courses in preservice teacher education programs, three questionnaires were used. The first questionnaire (Q1) was developed by the researchers to gather data from the faculty members who give ICT related courses in preservice teacher education programs, and consisted of 24 items. The second questionnaire (Q2) was used to collect data from preservice teachers who had taken ICT related courses before spring semester of 2004-2005, and consisted of 42 items. It was developed originally by Tinmaz (2004), and was adapted for this study. The last questionnaire was developed by the researchers to gather data from the K-12 teachers who had taken ICT related courses in their undergrad, and consisted of 16-items. Each questionnaire was examined by the experts, checked by a Turkish Language expert, and piloted.

The data were collected from faculty members (n=111) in 18 universities, preservice teachers (n=1330) in the same 18 universities, and K-12 teachers (n=1429) in 92 schools and 35 provinces within 12 regions of Turkey with a representative and convenience sampling method, who would provide valuable information about the effectiveness of ICT related courses.

The data gathered through questionnaire were analyzed by descriptive statistics, and frequencies, means, percentages and standard deviations were calculated. In this paper, only some parts of the data gathered from the questionnaires were reported.

Results

This study looks at perceptions of the faculty members, prospective teachers and K-12 teachers about the effectiveness of ICT related courses in teacher education programs. There were two ICT related courses, so there are two major categories in this theme. The first category is "Computer" and second is "ITMD". The data were collected from faculty members through surveys consisting of 3-point quantitative scales (1 indicating "Disagree", 2 indicating "Neutral", 3 indicating "Agree"). The data from prospective and K-12 teachers were collected with a five point Likert-type scale (5 indicating "Strongly Agree", 4 indicating "Agree", 3 indicating "Neutral", 2 indicating "Disagree", and 1 indicating "Strongly Disagree"). The means and standard deviations of the quantitative scales for all participants are detailed in Table 1.

Table 1: Means and Standard Deviations of Perceived Effectiveness of ICT Related Courses

	"Computer" Course		"ITMD" Course	
	M	**SD**	**M**	**SD**
Faculty Members (on a 3-point scale)	2.60	.55	2.45	.56
Prospective Teachers (on a 5-point Likert scale)	3.59	1.30	3.85	1.13
K-12 Teachers (on a 5-point Likert scale)	3.02	1.43	3.08	1.33
K-12 teachers who started TES in 1998 or later	3.55	1.30	3.58	1.18
K-12 Teachers (on a 5-point scale)	2.94	1.32	2.98	1.36
K-12 teachers who started TES in 1998 or later	3.46	1.13	3.56	1.10

Computer Courses:

In this section, perceived effectiveness of "Computer" courses of faculty members, prospective teachers, and K-12 teachers were examined in teacher education programs. The following categories have been created for this purpose.

Perceptions of Faculty Members about Computer Courses:

Faculty members were asked about the effectiveness of the course titled "Computer" in terms of ICT integration into preservice teacher education programs. They showed a high degree of overall contentment (M= 2.60) with their ICT related courses and felt well prepared for professional life (see Table 1).

When asked to how improve the course retrospectively, the findings show that, "in whole the course should be offered in a computer laboratory based on applications" (F=13), was ranked first and "the course content should be redesigned to acquire more benefit from ICT based on today needs" (F=11) is second according to the course instructors (see Table 2).

Table 2: Ways to Improve the "Computer" Course According to Faculty Members

	F	**%**
In whole the course should be offered in a computer laboratory based on applications	13	32
The course content should be redesigned to acquire more benefits from ICT based on today needs	11	27
Appropriate inservice training should be provided to the faculty members who offer the course	10	24
More hardware and the other equipments should be allocated to the course	7	17
TOTAL	41	100

Perceptions of Prospective Teachers about Computer Courses:

The prospective teachers were asked about the effectiveness of the course titled "Computer" in terms of ICT integration into preservice teacher education programs. They showed a degree of overall contentment with their "Computer" course and felt well prepared for professional life (M= 3.59; see Table 1).

As shown in Table 3, prospective teachers were also asked some indirect questions about the effectiveness of both ICT related courses. The findings show the overall mean of this group of items were at the agree level, which means the course was beneficial and effective. However, "I was taught to (how to) use

technology in learning-teaching environments by my instructors in undergraduate years" (M=3.26) and "I was taught about the effects of technology use in society by my instructors in undergraduate years" (M=3.12) were at the undecided (neutral) level.

Table 3: Means and Standard Deviations of Indirect Questions to Perceive the Effectiveness of Both (ICT Related) Courses

	M	SD
The technology courses in my undergraduate years helped me to change my attitude toward technology positively	3.75	1.11
I am capable of providing technology-based instruction with the help of technology-based courses that I took in my undergraduate years	3.53	1.12
I am a prospective teachers that is capable of today's technology criteria	3.42	1.17
I was taught to (how to) use technology in learning-teaching environments by my instructors in undergraduate years	3.26	1.22
I was taught about the effects of technology use in society by my instructors in undergraduate years	3.12	1.20
Overall mean	3.41	

Perceptions of K-12 Teachers about Computer Courses:

The K-12 teachers were asked to rate the effectiveness of the course titled "Computer" in terms of ICT integration into preservice teacher education programs. They rated their levels of agreement on the effectiveness of the course with the statements by using two themes.

The first theme examined in this study was the way of acquiring ICT competencies by K-12 teachers. Means and total percentages of teachers who marked "agree or strongly agree" are provided in Table 1. As is presented, "Computer" course taken at their undergraduate education is one factor contributing to their acquisition of competency (47.3%, M=3.02). Other factors contributing to acquiring competency in ICT for K-12 teachers are at a "neutral" level (ranging from M=2.61 to M=3.40). When the researcher focused only on the K-12 teachers with a starting year to the TES as 1998 and above, the mean was calculated at "Agree" levels (M=3.55).

The second theme examined in this study was the effectiveness of "Computer" course in their undergraduate education which increased the knowledge and skills of ICT integration into their teaching profession. K-12 teachers rated their level of agreement related with each contributing factor by using a five-point Likert-type scale (5 indicating "Strongly Agree", 4 indicating "Agree", 3 indicating "Disagree", 2 indicating "Strongly Disagree", and 1 indicating "They do not have idea / had not taken "Computer" courses during their undergraduate study"). K-12 teachers were undecided (neutral level) about the overall contentment with their ICT related courses (M= 2.94). When the researcher focused only on the K-12 teachers with a starting year to the TES as 1998 and above, the mean was calculated at "Agree" levels (M=3.46). K-12 teachers showed a degree of overall contentment with their "Computer" course and felt well prepared for professional life.

Instructional Technologies and Material Development Courses:

In this section, perceived effectiveness of the "ITMD" course by faculty members, prospective teachers and K-12 teachers were examined in teacher education programs. The following categories have been created for this purpose.

Perceptions of Faculty Members about ITMD Courses:

Faculty members were asked about the effectiveness of the course titled "ITMD" in terms of ICT integration into preservice teacher education programs. They showed a high degree of overall contentment with their ICT related courses and felt well prepared for professional life (M= 2.45; see Table 1).

They were also asked about how to improve the course retrospectively. Findings show that, "the course benefits (acquirement) should be implemented in the method courses" (F=26), is the ranked highest and "more electronic classroom and computer laboratories should be allocated to the course" (F=20) is the second choice according to the course instructors.

Table 4: Ways to improve the "ITMD" Course According to Faculty Members

	F	%
The course benefits (acquirement) should be implemented in the method courses	26	34

More electronic classroom and computer laboratories should be allocated to the course	20	26
Appropriate inservice training should be given to the faculty members, who offer the course	19	25
The course content should be redesigned to acquire more benefit from ICT based on today needs	12	15
TOTAL	77	100

Perceptions of Prospective Teachers about ITMD Courses:

The prospective teachers were asked to rate the effectiveness of the course titled "ITMD" in terms of ICT integration into preservice teacher education programs. Prospective teachers showed a degree of overall contentment (M= 3.85) with their "ITMD" course and felt well prepared for professional life (see Table 1).

Perceptions of K-12 Teachers about ITMD Courses:

The K-12 teachers were asked about the effectiveness of the course titled "ITMD" in terms of ICT integration into preservice teacher education programs. They rated their levels of agreement on the effectiveness of the course with the statements by using two themes.

The first theme examined in this study was the way of acquiring ICT competencies by K-12 teachers. Means of teachers who marked "agree or strongly agree" are provided in Table 1. The results indicate that "ITMD" taken during undergraduate education (49.4%, M=3.08), is the highest factor that contributed to acquiring competency in ICT of K-12 teachers; the other factors are at "neutral" levels (ranging from M=2.61 to M=3.40). When the researcher focused only on the K-12 teachers with starting year to the TES as 1998 and above, the mean was calculated at "Agree" levels (M=3.58).

The second theme examined in this study was the effectiveness of the "ITMD" course during the K-12 teachers' undergraduate education if the course increased the knowledge and skills of ICT integration into their teaching profession. They rated their level of agreement related with each contributing factor by using a five-point Likert-type scale (5 indicating "Strongly Agree", 4 indicating "Agree", 3 indicating "Disagree", 2 indicating "Strongly Disagree", and 1 indicating "They do not have idea / had not taken "ITMD" course during their undergraduate study"). K-12 teachers were undecided (neutral) about the overall contentment with their ICT related courses (M= 2.98). When the researcher focused only on the K-12 teachers with starting year to the TES as 1998 and above, the mean was calculated at "Agree" levels (M=3.56). Majority of them showed a degree of overall contentment with their "ITMD" course and felt well prepared for professional life (see Table 1).

Implications

Evidence indicated that the two groups, faculty members and prospective teachers, perceived ICT related courses beneficial and effective in ICT integration into education (see Table 1). K-12 teachers showed a degree of overall unsure (neutral) with their ICT related courses and felt well prepared for professional life. However, majority of K-12 teachers with a starting year to the TES as 1998 or later, indicated agreement with the statements "ICT related courses are effective in providing prospective teachers with the necessary knowledge and skills in ICT" (see Table 1). Thus, the present research results parallel the literature (Tinmaz, 2004) and lend support to HEC's (1998) reform in terms of reconstructed curriculum to train prospective teachers with abilities and skills to use ICT effectively in their subject areas.

The majority of the faculty members strongly agreed with the statements "ICT related courses are effective in providing prospective teachers with the necessary knowledge and skills in ICT" than the prospective teachers and K-12 teachers.

The results of the study also indicated a majority of the prospective teachers and K-12 teachers perceived the "ITMD" course to be more effective than the "Computer" course. On the contrary, faculty members believe that the "Computer" course was more effective than the "ITMD" course to meet the required needs of prospective teachers in ICT training (see Table 1).

For the "ITMD" course, faculty members also thought it could improve their effectiveness and efficiencies, if the course were implemented in the method courses and more electronic classrooms and computer laboratories should be allocated to the course (see Table 4). In response to questionnaire results, they believed the "ITMD" course can be offered in the second year, after the "Computer" course. Also, course content of this course included some problem and project based learning activities in order to teach how prospective teachers integrate ICT into their fields during an ill-structured process (SITE, 2002). They supposed the majority of class activities, assignments, and projects provided more computers and other technological devices rather than posters and 3-D models. K-12 teachers agreed with the faculty member recommendation in terms of exploring ill-structured problems and including more assignments and projects related to the

ICT. Some of the faculty members and K-12 teachers have a high opinion of both courses, felt instructors were knowledgeable about instructional technology, and that instructors should be chosen from the field of instructional technology. Toker (2004) stated similar opinions in his study, schools of education should choose teaching staff for technology courses from the field of education.

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Integration of ICT into Preservice Teacher Education: Main Barriers and Possible Solutions

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Abstract

The purpose of this research is to investigate the main barriers of and the possible solutions for integrating ICT into Turkey's preservice teacher education programs. The data was collected from 53 deans, 111 faculty members, and 1330 students of teacher education schools with both quantitative and qualitative methods. The findings indicated that majority of all stake holders believe "lack of inservice training about ICT", "lack of appropriate software and materials for instruction", and "lack of hardware" are significant barriers for integrating ICT into preservice teacher education programs. Based on these findings, several possible solutions were proposed on behalf of successful ICT integration.

Key Words: ICT Barriers, ICT Obstacles, Technology Integration Problems, ICT Integration Problems, Preservice Teacher Education, ICT Teacher Training, ICT, PT[3]

Introduction

After the 1980s, information and communication technologies (ICT) have become essential for teaching and learning environments day by day. These drastic changes certainly affect today's teacher education context. Initially, technology issues quickly moved from instituting special programs for preparing individuals to become ICT specialists in schools and then to infusing ICT into all aspects of an educator's preparation (Glenn, 2002).

With the above-mentioned consequences, many action plans were adopted at national and international levels, as well as investments for ICT in teacher education. Most of the teacher education programs have been redesigning their curricula in order for preservice teachers to become competent users of new technologies when they become teachers.

In spite of the various action plans for ICT integration into teacher education, many barriers for effective integration still exist in practice. To facilitate these plans, main barriers should be overcome absolutely. While some of the teacher education programs do not face these barriers, some others have certain problems due to those barriers. Therefore, current situation of integrating ICT into teacher education is still a struggle all around the world. In their study, Ertmer et al. (1999) stated for the struggle of using technology effectively, "it may be important to look at what they have (in terms of beliefs and practices) in addition to what they do not have (in terms of equipment)". Despite these two reasons fundamentally form significant obstacles, several barriers can be identified for infusing technology into teacher education programs.

According to Topp et al. (1995) and Baron and Goldman (1994 the barriers for integrating ICT into preservice teacher education are: (1) limited availability of equipment; (2) lack of faculty training; (3) no clear expectation that faculty will incorporate technology in academic activities; (4) lack of funds; (5) lack of time to develop facility in using equipment and software; (6) doubt about the pedagogical validity; (7) lack of technical support; (8) lack of appropriate materials; and (9) absence of clear programmatic goals for the teacher education program as a whole.

Similar to the above barriers, the report of SchoolNetAfrica (2004) identified the these barriers in their reports: (1) lack of ICT experience and skills among teacher educators; (2) lack of access to technology in pre-service training institutions; (3) lack of access to ICT training content; (4) lack of access to good quality research (including content examples) from institutions that are already integrating ICT into pre-service training.

In a similar study, Glazewski et al. (2001) also studied barriers. While findings of the study stated similar barriers; they proposed "preservice teachers did not perceive potential problems such as preparation time and implementation as major barriers to effective integration", but "lack of or limited access to computers in schools", "not enough software available in schools", and "lack of knowledge about technology". On the other hand, "the faculty indicated that lack of preparation time and implementation time was a major reason why technology was not being effectively integrated in many instructional settings" (p.4).

Cuban's et al. (2001) point to the following barriers for the use of technology more innovatively: (1) teachers do not have the time to find and evaluate software; (2) computer and software training was

seldom offered at convenient times; (3) most of the available training was too generic and not specific to the needs of the teachers.

According to Mumtaz (2000), there are three interlocking factors that affect teachers' use of ICT. First is the school as an institution providing insufficient time to teachers to manage and familiarize themselves with ICT. Second is limited resources within schools, which is a great obstacle to the take-up of ICT. Lack of computers and software in the classroom can seriously limit what teachers are able to do with ICT. And the last is teacher factors that involved beliefs about the way the subject should be taught and skills associated with competence in managing classroom activities and computer-handling technical skills, as the most influential in teachers' use of computers.

In the light of above-mentioned literature, it is obvious that technology integration is influenced by many barriers. To prepare preservice teachers better and to overcome these barriers more successful in order for technology integration, possible solutions should be proposed.

According to Scrimshaw (2004), there are two factors, which enable ICT use in education. One of them is individual factors as the availability of high quality resources, high level of technical support, full access to software and hardware at all times, and availability of good quality training. And second is school level enabling factors which include staff programme of ICT training, effective timetabling of rooms and equipment, also access to resources, on-site technical support, and whole school policies on using ICT across curriculum.

According to Sugar (2002), positive attitude of teachers toward ICT integration into the classroom is the most important incentive. By changing their attitudes toward the use of technology in schools, teachers could potentially remove several obstacles to effective ICT integration.

Following items might be also solutions to overcome the significant barriers: adequate equipment and resources in the literature (Becker, 1994; Fabry & Higgs, 1997; Hadley & Sheingold, 1993; OTA, 1995; Topp et al., 1995); allocating specific units or personnel for peer support and to help reduce of the teacher workload (Japonite, 2001; Pricewaterhousecoopers 2001; Ronnkvist, 1998, Becker, 1994; OTA, 1995); staff development (OTA, 1995; Willis, 1993); preparation of technology plans for implementing ICT in faculties and universities (UNESCO, 2002).

The reasons indicated above have emerged a new interest in ICT in education recently. There is a need for more studies on the main barriers and the possible solutions for integrating ICT into preservice teacher education programs. Therefore, the purpose of this study is to reveal the significant barriers faced and the possible solutions for current ICT integration problems in Turkey's preservice teacher education programs according to deans, faculty members, and preservice teachers. Consequently, this study addressed the following research questions:

1. What are the main barriers faced in integrating ICT into preservice teacher education programs according to deans, faculty members, and preservice teachers?

2. What are the possible solutions to current ICT integration problems in preservice teacher education programs according to deans, faculty members, and preservice teachers?

Method

Design of the Study

In this study, the researchers used both quantitative and qualitative research approaches within each stage. For data collection, quantitative measures included data from questionnaires that were used for deans and faculty members. Qualitative measures included data from open-ended questions from questionnaires and semi-structured interviews that were used for deans, faculty members, and preservice teachers to report their perceptions of the main barriers and possible solutions for integrating ICT problems. In addition to data collection, both qualitative and quantitative methods were used in data analysis.

Population and Sample

Some of the important stakeholders in ICT integration into preservice teacher education programs are deans, faculty members, and preservice teachers. In this study, the data were collected from these three stakeholders, who would provide valuable information about the process of ICT integration.

Deans of Education Faculties: There are 63 public and private teacher education schools that train teachers for primary and secondary education in Turkey. In order to collect data on ICT integration into preservice teacher education programs, the entire population (census) was surveyed. However, 52 deans responded the "deans' questionnaire" with the return rate of 82.5 percent in April and May 2005.

Faculty Members: The faculty members included in this study are the ones who give "technology integration" courses to preservice teachers. 18 universities, in all regions of Nomenclature of Units for

Territorial Statistics (NUTS) Level 1 were selected by convenience sampling method. Then, the "faculty members' questionnaire" was distributed to 223 faculty members from these universities requesting their participation in completing the questionnaire in May 2005. 111 faculty members responded the questionnaire with a return rate of 49.8 percent.

Preservice Teacher: The third data sources used in this study is preservice teachers. The 4th year preservice teachers, who had taken "technology integration" courses before spring semester of 2004-2005, were included in this study. Approximately, there are 33035 4th year preservice teachers at teacher education schools in Turkey. The "preservice teachers' questionnaire" was distributed to 2116 preservice teachers from the same 18 universities in May 2005. 1330 of preservice teachers responded to the questionnaire with the return rate of 62.9 percent.

Data Collection Instruments

In this study, the data were collected through five different instruments which are three questionnaires and two interview guides.

Questionnaire 1 (Q1) for Deans of Education Faculties: The first questionnaire (Q1) was developed to collect data from deans of teacher education schools and consisted of 18-items. Q1 included 13 multiple close-ended items, 3 five-point Likert- type items, and 2 open-ended questions. Q1 was developed by the researchers based on the related literature (Roblyer, 1994; Vagle, 1995; Vagle and College, 1995; Queitzsch, 1997; South East and Islands Regional Technology in Education Consortium, 1998; SCRTEC, 1998), and issues investigated in this study.

Four experts (3 deans and one IT expert) examined the questionnaire and based on their suggestions, the questionnaire was revised. Before the last version, Q1 was checked by a Turkish Language expert for the clarity of the language. The items in Q1 were grouped around six major topics as *"personal and institutional information, ICT facilities of education faculties, use of ICT in teaching, major barriers of integrating ICT, possible solutions of major barriers for integrating ICT, and ICT skills of personnel and physical resources for the education faculties."* In this study, only the data gathered from the two parts of the questionnaire *"major barriers of integrating IC, and possible solutions of major barriers for integrating ICT"* were used. The Cronbach alpha coefficient of the questionnaire was calculated as .91 denoting a satisfactory reliability.

Questionnaire 2 (Q2) for the Faculty Member: The second questionnaire (Q2) was developed to gather information from the faculty members who give "technology integration" courses in the teacher education programs in the teacher education schools and consisted of 24-items. Q2 included 13 multiple close-ended items, 7 five-point Likert- type items, and 4 open-ended questions. It was developed by the researchers based on research questions and review of related literature (Topp et al., 1995; Baron and Goldman, 1995; and Imer, 2000).

Four experts examined the questionnaire, and in regard to the feedback gathered from the experts, the instrument was revised. Then, it was checked by a Turkish Language expert for the clarity of the language. After the revision, a pilot test was conducted with 64 faculty members. The Cronbach alpha coefficient was calculated as .87 denoting a satisfactory reliability. Subsequently, a factor analysis was applied to the scale whether the items measure two factors basic ICT competencies (factor 1) and advanced ICT competencies (factor 2). The items were grouped around seven major topics (*personal information, use of ICT in teaching, effectiveness of the technology integration courses, perceptions of ICT integration, major barriers of integrating ICT, possible solutions of major barriers for integrating ICT, and ICT skills and experiences*). In this study, the data gather for the two topics, *"major problems of integrating ICT" and "solutions of major problems for integrating ICT"* were used.

After gathering the data from 111 faculty members, the Cronbach alpha coefficient of the questionnaire was re-calculated and found as .97 denoting a satisfactory reliability. Subsequently, a factor analysis was applied to the scale whether the items measure two factors. The Cronbach alpha of the Factor 1 is .96 and the Cronbach alpha of the Factor 2 is .92.

Questionnaire 3 (Q3) for Preservice Teachers: The third questionnaire (Q3) was used to collect data from preservice teachers and consisted of 42-items. Q3 included 10 multiple close-ended items, 26 five-point Likert- type items, and 6 open-ended questions. The questionnaire was developed originally by Tinmaz (2004), and was adapted for this study. The Cronbach alpha coefficient was calculated as .86 and split-half coefficient was .91 each indicating a pleasing reliability.

For this study the Cronbach alpha coefficient was re-calculated as .91 denoting a satisfactory reliability. Subsequently, a factor analysis was applied to the scale whether the items measure two factors (belief of the positive effect of technology in education, effect of undergraduate program). The Cronbach alpha of the Factor 1 is .93 and the Cronbach alpha of the Factor 2 is .86.

Interview: Semi structured interviews were conducted in this study to collect in-depth data from the faculty members and preservice teachers. The interview schedules were developed by the researchers

based on research questions, topics, review of related literature and format used in previous studies by Smith (2002) and Zayim (2004). The interview guides were examined by four experts for the clarity of the questions and how well they could address the themes. After experts' review, pilot interviews were conducted with 2 preservice teachers and 2 faculty members and necessary revisions were made. Then, a Turkish Language expert revised the interview schedules for the language clarification. The final forms of the each interview schedules included nine main questions. The interviews were conducted with 6 faculty members and 6 preservice teachers in May and June 2005.

Data Analysis

For the quantitative parts, descriptive statistics were used for data analysis to explore significant problems and their solutions for integrating ICT into preservice teacher education programs in Turkey in regard to the deans, faculty members and preservice teachers. For this purpose, means, percentages, and standard deviations of questionnaire items were calculated.

For the qualitative parts, the interviews were transcribed and after the process of reading and re-reading the transcripts, researchers coded and analyzed the open-ended data; then the codes and themes were analyzed. Finally, the categorized data were compared based on the main themes. The major findings of this study are described in results and conclusion parts.

Results

ICT Integration Barriers Perceived by Deans

Mean scores and standard deviations of the barriers perceived by deans were presented in Table 1. As it is shown in the Table, "lack of inservice training about ICT" (M=4.08) was the most significant barrier faced in integrating ICT into preservice teacher education programs. The other leading barriers are "lack of appropriate software and materials for instruction" (M=3.81), "lack of basic knowledge-skills" (M=3.79), "lack of hardware" (M=3.72), "inadequate repertoire of knowledge and skills on the integration of ICT in instruction" (M=3.67), "lack of technical support" (M=3.60), which are above the overall mean (M=3.46). Following items below the mean and deans identified these statements as not representing barriers: "inappropriate course content and instructional programs" (M=3.38), "lack of time for integrating ICT in classroom-lessons" (M=2.60), and the lowest mean score was "inadequate support from upper positions" (2.53).

Table 1: The barriers faced in integrating ICT into teacher education schools according to their deans (n=52)

	M	**SD**
Lack of inservice training about ICT	4.08	.75
Lack of appropriate software and materials for instruction	3.81	.93
Lack of basic knowledge and skills about ICT	3.79	1.06
Lack of hardware (computer, printer etc.)	3.72	1.24
Inadequate repertoire of knowledge and skills on the integration of ICT in instruction	3.67	1.12
Lack of technical support	3.60	1.03
Inappropriate course content and instructional programs	3.38	.97
Lack of time for integrating ICT in classroom	2.60	1.16
Inadequate support from upper positions	2.53	1.10
Overall Mean	**3.46**	

Note: For this and the following tables, 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly Agree)

ICT Integration Barriers Perceived by Faculty Members

Means and standard deviations of barriers for the faculty members were provided in Table 2. The results indicated that faculty members perceived "lack of hardware" (M=4.14) as the most significant barrier in integrating ICT into preservice teacher education programs. The other key barriers are "lack of appropriate software and materials for instruction" (M=4.06), "lack of computer access for students' out-of-class" (M=4), "lack of technical support" (M=3.99), "lack of inservice training about ICT" (M=3.95), "inadequate repertoire of knowledge and skills on the integration of ICT in instruction" (M=3.95), "lack of basic knowledge-skills (M=3.94)", which are above the overall mean (M=3.79). The items below the overall mean include "the constraints related to hardware" (3.77) and "lack of physical environment for integrating ICT in classroom" (M=3.53). Faculty members identified the following statement as not representing barriers:

"inappropriate course content and instructional programs" (M=3.40) and "lack of time for integrating ICT in classroom-lessons" with the lowest mean score observed (M=2.95).

Table 2: The barriers faced in integrating ICT into teacher education schools according to their educators (n=111)

	M	**SD**
Lack of hardware (computer, printer etc.)	4.14	.99
Lack of appropriate software and materials for instruction	4.06	.85
Lack of computer access for students' out-of-class	4.00	1.18
Lack of technical support	3.99	1.03
Lack of inservice training about ICT	3.95	.95
Inadequate repertoire of knowledge and skills on the integration of ICT in instruction	3.95	.97
Lack of basic knowledge and skills about ICT	3.94	1.01
The constraints related to hardware	3.77	1.11
Lack of physical environment for integrating ICT in classroom	3.53	1.11
Inappropriate course content and instructional programs	3.40	1.08
Lack of time for integrating ICT in classroom	2.95	1.17
Overall Mean	**3.79**	

In addition to the quantitative data, the findings from the qualitative data showed that faculty members consider the followings as ICT integration barriers:
- lack of successful models,
- inadequate support from upper position (administrative support) to the faculty member who successfully integrate ICT into her/his courses.
- lack of hardware,
- lack of inservice training about ICT,
- lack of technical support for integration ICT and preparation instructional materials,
- inadequate repertoire of knowledge and skills on the integration of ICT in instruction.

In addition to these barriers, the most important problem for one of the faculty member was students' attitudes. The faculty member indicated that "*We need to change the attitude of students in order to benefit from technology integration courses*". They have negative attitudes like: "*What will I do it*?" "*Where will I use it*?" "*Why will I use it*?" We should change these attitudes. This is the most important problem for me."

ICT Integration Barriers Perceived by Preservice Teachers

The results of the interviews with preservice teachers and the findings from the open-ended questions in the preservice teachers' questionnaire complement each other. The major problems indicated by preservice teachers are:
- lack of hardware,
- lack of basic knowledge and skills of faculty members about ICT,
- inadequate knowledge and skills of faculty members for the integration of ICT in their classes,
- need for a good role model,
- lack of computer access in laboratories for students out of the class,
- crowded classrooms,
- lack of computer and other equipments in class for presentation,
- negative attitudes of faculty members towards using ICT in their classes,
- inadequate number of technology integration courses.

The barriers are grouped in two main themes as "what they do not have" and "what they have" as Ertmer (1999) suggested. Under the first group, the barriers indicated by preservice teachers are "lack of hardware", "lack of computer laboratories for free (out of lecture) time", and "lack of computer and other equipment in class for presentation". In regard to the first group barriers, one of the preservice teachers said, "One month ago, I prepared my homework in CD format, but I could not show it to my teacher in class because we don't have any computers in class. I want to present my homework through computer by using flash animations and using some pictures. So we have to prepare it in traditional methods. I think, at least one computer should be placed in each classroom."

Preservice teachers want to have computer laboratories to use in leisure time, One of the preservice teachers commented that "we do not have any computer labs for using after the lesson. Sometimes, I have to go my home for only checking my email. Every time, there is lesson in computer laboratories has a session in class or closed. We could not use it after the lessons.

The second group perceived barriers (what they have) were related to "lack of basic knowledge and skills of faculty members about ICT", "inadequate knowledge and skills of faculty members for the integration of ICT in their classes", "need for a good role model", and "negative attitudes of faculty members towards using ICT in their classes". One of the preservice teachers regarding faculty members' attitudes mentioned that "they don't have any positive attitude towards computer. If they had, they might be able to learn it. They could not become a good model for use of technology."

Possible Solutions for ICT Integration Barriers Perceived by Deans

Means and standard deviations of possible solutions for the deans were provided in Table 3. The data explored that the most strongly agreed with the possible solutions is "technology plans for implementing ICT in faculties and universities should be prepared" (M=4.42) to integrate ICT into preservice teacher education programs as perceived by deans. The other leading solutions is "the inservice training about ICT should be improved in quantity and quality" (M=4.34), "more budget should be allocated to ICT" (M=4.34), which are above the mean (M=4.25). Following items below the mean are "specific units and personnel should be allocated for peer support and public use of ICT tools and materials to the use of ICT in instruction" (M=4.24), 'the faculty members who integrate ICT in their courses should be supported" (M=4.24), "the course load of the faculty members should be decreased" (M=4.14), and the lowest mean score was observed in "the course content should be redesigned to acquire more benefit from ICT" (M=4.08).

Table 3: The possible solutions to current ICT integration barriers in preservice teacher education programs according to deans (n=52)

	M	**SD**
Technology plans for implementing ICT in faculties and universities should be prepared	4.42	.76
The inservice training about ICT should be improved in quantity and quality	4.34	.69
More budget should be allocated to ICT	4.34	.94
Specific units and personnel should be allocated for peer support and public use of ICT tools and materials to the use of ICT in instruction	4.24	.85
The faculty members who integrate ICT in their courses should be supported (such as incentive payment)	4.24	1.02
The course load of the faculty members should be decreased.	4.14	.96
The course content should be redesigned to acquire more benefit from ICT	4.08	.78
Overall Mean	**4.25**	

Possible Solutions for ICT Integration Barriers Perceived by Faculty Members

Means and standard deviations of possible solutions for the faculty members were provided in Table 4. The data explored that most strongly agreed with the possible solutions "technology plans for implementing ICT in faculties and universities should be prepared" (M=4.54) to integrate ICT into preservice teacher education programs as perceived by faculty members as like deans. The other top solutions, "specific units and personnel should be allocated for peer support and public use of ICT tools and materials to the use of ICT in instruction" (M=4.53), "more budget should be allocated to ICT" (M=4.50), "the faculty members who integrate ICT in their courses should be supported" (M=4.49), "the inservice training about ICT should be improved in quantity and quality" (M=4.44), which are above the mean (M=4.39). Following items below the mean are "the course content should be redesigned to acquire more benefit from ICT" (M=4.17), and the lowest mean score was observed in "the course load of the faculty members should be decreased" (M=4.10).

Table 4: The possible solutions to current ICT integration barriers in preservice teacher education programs according to faculty members (n=111)

	M	SD
Technology plans for implementing ICT in faculties and universities should be prepared	4.54	.64
Specific units and personnel should be allocated for peer support and public use of ICT tools and materials to the use of ICT in instruction	4.53	.62
More budget should be allocated to ICT	4.50	.62
The faculty members who integrate ICT in their courses should be supported (such as incentive payment)	4.49	.65
The inservice training about ICT should be improved in quantity and quality	4.44	.62
The course content should be redesigned to acquire more benefit from ICT	4.17	.89
The course load of the faculty members should be decreased	4.10	.96
Overall Mean	**4.39**	

Analyses of qualitative responses indicated that there are strongly agreements between the quantitative and qualitative results. In addition to the quantitative results, a faculty member suggests that the preservice teachers' motivation should been enhanced. He further offers new technology integration courses for the education faculty. According to him, two technology courses are not providing for needs. Also one of the faculty members commented:

> *Technology integration courses should be integrated to school experience courses. I think, this model would enhance efficiency of integration. Using ICT is important but integration ICT in your class is more important. Also we have to offer to our students a new technology integration course which has to include both ICT and field of study (Math, language, chemistry) after the second method courses.*

Possible Solutions for ICT Integration Barriers Perceived by Preservice Teachers

There are also significant relations between the open-ended questions and interview results of preservice teachers about the possible solutions to current ICT integration problems. The preservice teachers indicated solutions by stating the followings:

- courses should be supported by an appropriate web page
- faculty members should be given inservice training for the integration of ICT
- course content should be improved for the today needs
- more hardware should be allocated to us
- our teacher should be a role model to us as using ICT in their courses
- more technology courses should be offered to us
- every classroom should have at least one computer
- every department (faculty) should have a free lab
- every technology integration courses should be based on application

Interview results of the preservice teachers remarked below solutions to overcome current problems. One of the interviewee suggested that: "teachers should be provided with inservice training for the integration of ICT". On the other hand, another interviewee suggested proficiency exam on ICT for the faculty members. If a faculty member takes this exam, then he/she should be motivated (i.e incentive payment).

Implications

This study identified that a majority of all stakeholders believe "lack of in-service training about ICT", "lack of appropriate software and materials for instruction", and "lack of hardware" are significant barriers for integrating ICT into preservice teacher education programs (see Table 1 and 2). There was also agreement between the stakeholders on the possible solutions ranking "technology plans for implementing ICT in TESs and universities should be prepared" as the highest among the possible solutions.

These barriers are consistent with findings Topp et al. (1995), Baron and Goldman (1994), SchoolNetAfrica (2004), Ertmer (1999), Ertmer, Addison, Lane, Ross, and Woods, (1999), Ertmer, Ottenbreit-Leftwich, and York (2005), and Glazewski, Ku, and Brush (2001) have made. According to Topp et al. (1995)

and Baron and Goldman (1994), barriers for integrating ICT into preservice teacher education are: 1) limited availability of equipment; 2) lack of faculty training; 3) no clear expectation that faculty will incorporate technology in academic activities; 4) lack of funds; 5) lack of time to develop facility in using equipment and software; 6) doubt about the pedagogical validity; 7) lack of technical support; 8) lack of appropriate materials; and 9) absence of clear programmatic goals for the teacher education program as a whole.

Similar to the above barriers from literature and this study, the report of SchoolNetAfrica (2004) identified the following barriers: 1) lack of ICT experience and skills among teacher educators; 2) lack of access to technology in preservice training institutions; 3) lack of access to ICT training content; 4) lack of access to good quality research (including content examples) from institutions that are already integrating ICT into preservice training.

In a similar study, Glazewski, Ku, and Brush (2001) also studied barriers. While findings of that study stated similar barriers; they proposed "preservice teachers did not perceive potential problems such as preparation time and implementation as major barriers to effective integration", but "lack of or limited access to computers in schools", "not enough software available in schools", and "lack of knowledge about technology". On the other hand, "faculty indicated that lack of preparation time and implementation time were major reasons why technology was not being effectively integrated in many instructional settings" (p. 4).

This study also indicated a contradict results to the literature (OTA, 1995; US Department of Education, 2000) that: "inappropriate course content and instructional programs", "lack of time for integrating ICT in classroom-lessons", and "inadequate support from upper positions" were below the mean, and the majority of deans, faculty members, and prospective teachers identified these statements as not representing barriers.

In addition to the aforementioned barriers, open-ended responses and the interview findings showed: "need for a good role model for prospective teachers, lack of technology plans, lack of successful models for TESs, crowded classrooms, negative attitudes and lack of motivation of faculty members, and inadequate number of technology integration courses" are important barriers, which were not identified in the questionnaire.

In the literature parallel to the study results, in addition to ICT related courses, good role models were recommended for prospective teachers to observe appropriate modeling throughout their undergraduate process (SITE, 2002; Franklin, 1999; Huang, 1994; Kariuki, Franklin, & Duran, 2001; Novak and Berger, 1991; O'Bannon, Matthew, & Thomas 1998; Strudler, 1991, Yildirim, 1999, Yildirim, 2000).

There was a general agreement between the deans' and faculty members' questionnaire results on possible solutions for these barriers. All mean scores of two questionnaires were above 4.0. Thus, most of the deans and faculty members strongly agreed on possible solutions to integrate ICT into preservice teacher education programs (see Table 3 and 4). There was also agreement between the two stakeholders on the possible solutions, ranking "technology plans for implementing ICT in TESs and universities should be prepared" as the most strongly agreed possible solutions for both. On the other hand, prospective teachers' solutions generally were similar to what faculty members stated.

Research studies indicate that the implementation levels of technology into teaching and learning remain low (Cuban, 2001; Cuban et al. 2001; Ertmer, 1999; Olsen, 2001). Previous literatures (Anderson et al., 1998; Boe, 1989; Caverly, Peterson, & Mandeville, 1997; Cuban et al. 2001; Vaughan, 2002, Schoep, 2004), as well as the results of this study, demonstrate that providing access to ICT is not enough; faculty members or teachers need leadership and require training in methods for integrating ICT into their classroom. As shown in the Tables 3 and 4, the first major solution is to develop a technology integration plan for the TESs.

According to Willis (2001), "solutions" are local, not universal; however, the findings of this study for possible solutions are also similar to the literature. Scrimshaw (2004), Becker (1994), Ertmer (1999), Ertmer, Addison, Lane, Ross, and Woods, (1999), Ertmer, Ottenbreit-Leftwich, and York (2005), Glazewski, Ku, and Brush (2001), Fabry and Higgs (1997), Hadley and Sheingold (1993), OTA (1995), Topp et al. (1995), Japonite (2001), Pricewaterhousecoopers (2001), Ronnkvist (1998), Willis (1993), UNESCO (2002).

Scrimshaw (2004) stated two factors for possible solutions of major barriers of ICT usage and ICT integration into education. One of them is individual factors such as the availability of high quality resources, high level of technical support, full access to software and hardware at all times, and availability of good quality training. The second is school-level enabling factors which include a staff program of ICT training, effective timetabling of rooms and equipment, access to resources, on-site technical support, and whole-school policies on using ICT across the curriculum.

The following items might also be solutions to help overcome the significant barriers in the literature: provide adequate equipment and resources (Becker, 1994; Fabry & Higgs, 1997; Hadley & Sheingold, 1993; OTA, 1995; Topp et al., 1995); allocate specific units or personnel for peer support and to help reduce the teacher workload (Becker, 1994; Japonite, 2001; OTA, 1995; Pricewaterhousecoopers 2001; Ronnkvist, 1998; Sandholtz, 2004); staff development (Odabasi, 2000; OTA, 1995; Willis, 1993); preparation of technology plans for implementing ICT in TESs and universities (UNESCO, 2002).

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Ancillary Communication as an Intentional Instructional Strategy in Online Learning Environments

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Abstract

This paper presents the findings from the most recent data set of an ongoing naturalistic study designed to study communication, interaction, and learning strategies in an online learning environment. Analysis of past and current data has suggested that the use of ancillary communication techniques provide increased instructional effectiveness and learner satisfaction in online classes. Ancillary communication as an intentional instructional strategy will be introduced. A model is proposed and strategies and recommendations for its use will be presented.

Introduction

Internet-based classes appear to dominate the landscape of distance education today. Online classes are common place in most colleges and universities and are becoming more common in high schools as well. While pioneering courses were offered through techniques using email, Internet Relay Chat (IRC) or bulletin boards, today's courses are almost all managed by portal systems such as WebCT™, or CourseInfo™. These systems share many communication features such as bulletin boards, email, chat, whiteboards and assignment drop boxes. As technology advances and bandwidth improves, we see changes in these environments. Today's systems are beginning to offer audio and video communication tools as well as traditional text based communication. These new tools provide us with a unique opportunity. No longer is an online environment constrained to text for synchronous meetings and packaged media for asynchronous meetings. The environment now affords unique opportunities for communication patterns that are usually reserved for face-to-face classes, mainly the ability to talk and listen.

Moreover, with the addition of audio and video we are able to add new channels of information to the online environment. Historically there has been much research done on multiple-channel communication and cue summation. Moore, Burton, and Myers (2004) provide an exhaustive review of the literature on both. At the risk of oversimplifying this review, we can say that on the positive side multiple-channels of information may provide greater enrichment in learning. On the negative side it may lead to cognitive overload for learners.

In a naturalistic online environment we have studied the use of these communication tools and found that while they may be used to provide redundancy of information and enrichment of material, (in the manner of traditional multiple-channels or cue summation) they can be used another way as well. They may be used as support communication, such as chat supporting audio, or audio supporting whiteboards, or audio supporting chats. When used in a purposeful manner these multiple channels may create increased learner focus and more efficient communication. In traditional positivist learning environments the primary instructional communication occurs between the teacher and the students. In constructivist learning environments the primary instructional communication may occur between the instructor and students or between students and students. In either environment the instructional emphasis of the communication is almost wholly on one or the other. We argue that potential learning benefits may accrue if we place more emphasis on the communications that are occurring in a learning environment simultaneously with, but outside the focus of the primary communications. We call the exchange of information in support of learning that occurs synchronously with, but is physically and semantically separate from, a primary communication mode *ancillary communication*.

Theoretical Perspectives

The design of a course using the ancillary approach is based on the notion of constructivist learning (Jonassen, 1999), situated cognition (Brown, Collins & Duguid, 1989) and anchored instruction (Bransford et al, 1990; Cognition and Technology Group, 1990). In the spring of 2006 we developed and offered a graduate level class about online learning to take advantage of new and emerging theories and practice in the field. The class was

set up to be experiential and to create a learning environment that is driven by the learner (Papert, 1990; Wilson & Ryder, 1996; Greening, 1998). Analysis of prior offerings of the class indicated that students were unprepared for the responsibility of this type of experience initially and typically floundered during the early portion of the semester. To counter this we employ a pedagogical shift approach, from a more positivist perspective and instructor delivered content early in the semester, to a more constructivist perspective with student generated content and instructor guidance later in the semester. This shift allows the students to quickly gain confidence in the online environment and master the fundamental knowledge and skills they will need to succeed later on, while still affording them the benefits usually conferred by a student-centered learning environment (i.e. greater motivation and enhanced transfer) (Land, S. & Hannafin, M., 2001). This is particularly important since motivation has been found to be a key component for successful online learning (Kawachi, 2003).

This work draws heavily upon a taxonomy of web-based instruction developed by Harmon and Jones (1999), research focusing on analyzing learner interaction in online classes (Harmon & Jones, 2001) and discourse patterns in online discussions (Mcklin, Harmon, Jones & Evans, 2002). Additionally it is related to the foundational research in communications theory (Schramm, 1961; Shannon & Weaver, 1964) and multiple-channel communication and cue summation (Moore, Burton, & Myers, 2004).

Ancillary Communication

Historically the class has been offered through a portal system such as WebCT™ or CourseInfo™. Consequently our communication tools were bulletin boards, email, and drop boxes for asynchronous meetings and IRC for synchronous meetings. During 2004 we added a course system called Elluminate™ which provided two way audio communications between students and students and faculty and students, and faculty and faculty. We also added web-based video conferencing tools, which were not originally a part of Elluminate™, for faculty interaction during class and for planning for the class. The system provided space for posting packaged PowerPoint™ presentations and also provided the ability to break students into small groups in the synchronous meetings and provide them with audio tools and whiteboard space for group work during class meetings. As instructors we were able to see all communications in the class, even those that were "private" to the students. Students were given problems during class, such as doing the front end analysis for a web-site for a client, in a small group and then brought back together with the larger class to present their findings. Student interactions and discourse using these tools and strategies were analyzed both at the small group level and the whole class level. Initially we found that these tools were not technically difficult for people to use, but that students were not clear on *why* they should use them and *how* they could be best used. Through the use of recursive data analysis we began to develop strategies to use these new tools. What we found was that they were best used when one communication tool or mode was used to support the other.

During an interaction, a dominant mode might arise. For example, a small group's white board (a visual mode) might be perceived to be the dominant mode. To support this, students may explain it using an ancillary mode, such as the audio functions, (a verbal - audio mode) while taking questions from faculty and other students through another ancillary mode, the chat window (a verbal - text mode). The dominant and ancillary communication modes might change without notice, but participants in the system were able to recognize and adapt to this almost immediately. They were then able to use ancillary communication modes to support the dominant mode. Consequently, audio was used to support whiteboards and vice versa depending on which mode was perceived to be dominant. At no point was one mode stated to be dominant. The class appears to be able to develop a shared understanding of which mode is dominant and which mode is ancillary.

But what we found most interesting was that people were not confused by the tools or by what sounds like a barrage of information. They were actually engaged by the communication and able to make sense out of multiple streams of information coming at them at one time. Evidence of this is found both in their test scores and in the quality and quantity of their interactions. Consequently, data from the study suggests initially that this is more than enrichment or cue summation, especially since the ancillary communications often varied widely from the content being discussed in the primary channel. These communication tools are seen by participants as being interconnected in one sense, but separate in another. Therefore their mutual support of each other makes them unique and allows us to focus on their use as an intentional instructional strategy.

In addition, we find that students in the course interact in a manner consistent with the types of interaction noted by Miltiadou & Savenye (2003). *Learner-content interactions* occur when students in the course work directly with course materials. These types of interactions are perhaps the most common when viewed from the perspective of time on task, both in traditional and online environments. Reading a text book or website, researching a paper, or working through a tutorial would all be examples of learner content interaction. This type of interaction can occur

concurrently with ancillary communications and frequently does so in our classes. However, we have not yet formally considered it as a part of our emerging model.

Learner-instructor interactions occur when the student works directly with the instructor. These types of interactions are also very common in both traditional and online classes, but may frequently be characterized by a greater flow of information in pedagogical approaches that view the instructor as content provider. Interestingly, direct learner-instructor interactions may be less common in the type of eLearning environments that have come to dominate education with the advent of course management systems (CMS). While in traditional CMS learner-instructor interaction typically occurs both on bulletin boards and in chat rooms, there is also a greater prevalence of stand alone instruction in which there is little or no direct learner-instructor interaction.

In the virtual classroom environment which prompted the development of this model however, we found there to be copious and intense learner-instructor interaction. Indeed, we find the level of learner-instructor interaction to frequently exceed that which is found in a face-to-face environment. We have noted four sub-categories of learner-instructor interaction in this environment. In the first sub-category the instructor is communicating with the entire class at once through audio and visual channels. This sub-category interaction may be most easily thought of as an instructor presenting a lecture via PowerPoint. Note though, that while this is the easiest way to characterize the interaction, it is also a bit misleading since pure lecture is a technique we try to employ rarely, preferring instead a more interactive form of discourse. The second sub-category of learner-instructor interaction occurs when the instructor is communicating with the class as a whole through the chat window. This type of interaction is a central component of the ancillary communication model we are proposing. The third sub-category of learner-instructor interaction occurs with the instructor communicating with an individual student or a small group of students privately in the chat window. By privately we mean that the communication is not seen by the class as a whole, only by the intended recipients. The fourth type of sub-category is what we refer to as a pseudo-private communication, in which the instructor communicates with the class as a whole via the chat window, but does so as a private communication. This means that each recipient may think that the communication was intended only for him or her even though in fact the entire class got the same communication.

The third type of interaction noted by Miltiadou & Savenye (2003) is *learner-learner interaction*. This occurs when learners communicate directly with each other. This type of interaction may occur in traditional classrooms, particularly those that are set up along constructivist lines, or may occur perhaps surreptitiously in a classroom set up with a direct instruction format. In a traditional online classroom, this type of interaction may occur more often than in a traditional face to face classroom, particularly with student interaction that might occur on a discussion board, or in a chat room. We observe that like learner-instructor interaction, there are sub-categories for this type of interaction in the virtual classroom. These include, learners communicating with the class as a whole via audio and visual channels; learners communicating with the class as a whole via the chat window; and learners communicating with other individual or small groups of learner's via private chat. Note that in both the learner-instructor, and the learner-learner sub-categories we suppose that there could be an additional category of accidental communications, in which either the learner or the instructor sends a private message that was supposed to the public, or more commonly, a public message that was intended to be private. For the purposes of this paper we will not consider these unintentional communications.

The fourth type of interaction noted by Miltiadou & Savenye (2003) is *learner-interface interaction*. Unlike the other three types of interaction which may have learning as their primary purpose, learner-interface interaction has as its primary purpose the enabling of the other types of interactions. While it may be possible to design online learning environments in which the interface itself is intended as a mechanism to enhance instruction and learning, we know of no course management system or virtual classroom environment in which this is the case.

A Model for Ancillary Communication

We observed ancillary communications occurring naturally in the virtual classroom environment. We see this type of communication as an affordance of virtual environments that may not be so readily available in traditional face-to-face environments. Ancillary communication is the exchange of information in support of learning that occurs synchronously with, but is physically and semantically separate from a primary communication mode. We include an "exchange of information" in the definition to indicate that the communication should, at least to some extent, be two-way. We include "in support of learning" primarily to provide context for our work in this area. We do note that ancillary communication may not necessarily be in support of learning, but that is the only form with which we are concerned. We note that ancillary communication "is physically separate" from a primary communication mode in order to differentiate it from multiple strands of communication occurring simultaneously on the same channel (i.e. several people talking to you at once). We include "semantically separate" to differentiate ancillary communication from multiple channel communication. Specifically, ancillary communication is not

intended to provide the same exact information that is coming through the primary communication mode, not even necessarily to provide redundancy in the primary communication. Instead it is intended to augment the primary communication in ways that enhance learning.

Ancillary communication may be either public, meaning that it is made to and intended for the entire class. Examples of public communication might be a description of a phenomenon such as occurs in a traditional lecture. Ancillary communication may also be private, meaning that it is made to one specific person or to a group of specific people. Teachers may converse privately with each other to plan an activity or to respond to something they see in the learning environment. A teacher may answer a question posed by a student privately because the student needs remediation or because the issue is not intended for the entire class. Students may communicate privately with each other to clarify a point in the class or to discuss an issue that is not germane to the class discussion. Ancillary communication might also be pseudo-private, or sent out to the group at large as if it were meant to be a private message even though everyone in the class might get the message. This strategy can be useful for a teacher if there is a question that has been asked by one or more students but the answer could be germane to the entire class. It may be sent as if it were private so as not to interrupt a current discussion or presentation to the entire class. Any member of the learning community, either a teacher or a student, has the option of using public, private, or pseudo-private messages at any time. A member of the learning environment will make a conscious decision about whether or not message is public, private or pseudo-private depending on the needs of the communication.

With a public, private or pseudo-private message a member of the learning environment may decide to make a message positive or negative. While students may make positive and negative comments about the course, teachers can use positive and negative pieces of ancillary communication for a particular effect. For example teachers may agree with each other privately but disagree with each other publicly in order to create a discussion point or to intentionally create cognitive dissonance. Teachers may send positive comments to students to encourage them or to let them other wise know that they are on the right track. Teachers may send negative communication to a student to correct a mistake in an area such as content, application, or logic. Application of this model for ancillary communication may be made more specific through the use of a variety of methods of ancillary communication.

Methods of Ancillary Communication

Using ancillary communication in an online environment can be made more concrete through the application of one or more method as listed in Table 1 and discussed in the narrative below.

Table 1
Methods of Ancillary Communication

Agree-disagree	Elaborate
Diverge	Scaffolding
Reiterate	Emphasis
Show relevance of	Social Engineering

While there are many potential methods of employing ancillary communication and online learning we will briefly review eight of these we have attempted to use in our own work. We note at the outset that our circumstances may be a bit uncommon in that we are fortunate to have two instructors present in the classroom at the same time. The methods of ancillary communication we employ typically take the form of one instructor being responsible for the primary communication which is occurring in audio and visual channels, and the other instructor responsible for the ancillary communication which occurs in the chat window.

Agree-disagree
In the first method the ancillary instructor either agrees or disagrees with what the primary instructor is saying via the audio channel. The intention is to either affirm the content and thus add weight to it, or to stimulate discussion and more critical thought by disagreeing with the primary instructor. We found that it is often startling for the students to see two instructors disagree with each other in front of the class. The disagreement forces students to think more deeply about the content and to come to some resolution as to their own perspective. We began using this method after we noticed that students frequently view a communication from the instructor as the final word on a subject. We found that, particularly on discussion boards, one of the quickest ways to end a discussion is to have one of the instructor's offer an opinion on the matter. We also found in practice we typically

disagree little with each other. Therefore in order to use this technique it is necessary for one of us to play devil's advocate, but do so in a manner that is convincing to the students.

Elaborate

  In this technique the ancillary instructor elaborates on the primary instructor's point. Consistent with Reigeluth's (Reigeluth, 1983) elaboration theory of instruction (Reigeluth & Stein, 1983), we found it helpful on both a macro and microlevel to use ancillary communication as an elaboration tool. That is to say, the ancillary instructor offers comments that place the primary instructor's point in a broad context, and at times zooms in to focus on a particular aspect of the primary instructor's point.

Diverge

  This technique, drawn from work in creativity theory, (Torrance, 1985) consists of having the ancillary instructor offer comments that may initially not seem related to the primary instructor's comments. We find this technique to be most helpful when we are trying to get students to think about unfamiliar concepts in a new way. It is a difficult technique to employ skillfully since with too much divergence the students may become confused and lose track of the main content object. However, we have achieved good results by having the ancillary instructor begin the divergence and, after sometime for reflection, the primary instructor show the relevance of the divergence to the main content object.

Scaffolding

  In this technique the ancillary instructor assists the class in comprehending conceptually difficult topics by providing both subordinate skills necessary to comprehend the topic, and examples and non examples that may assist in understanding. The ancillary instructor may also answer individual student's questions either publicly or privately depending on how relevant they seem to the class as a whole.

Reiterate

  This brief technique occurs when the ancillary instructor reiterates a point the primary instructor is making. We use it mainly for emphasis and to increase focus on particularly important points. In reiteration, we typically try to use the exact language that was used by the primary instructor.

Emphasis

  Another technique we use frequently is to either emphasize or occasionally de-emphasize points the primary instructor has made. Unlike reiteration emphasis typically does not use the same language as the primary instructor. Instead it may take the form of approbation such as "Good point; that's very important." De-emphasis occurs less frequently but is used when students may have a tendency to place too much importance on a particular point.

Relevance

  We frequently find it helpful for the ancillary instructor to make explicit the relevance of the content. Even more helpful is for the ancillary instructor to guide the class in providing their own examples of the relevance of the content during the primary instruction. We have considered, but not yet attempted, having the ancillary instructor work through all phases of Keller's ARCS (1987) model at appropriate points in a lesson.

Social engineering

  In this category we include any attempt by the ancillary instructor to help set the tone or mood of the class. This might include adding humor to the content, building confidence in the learners, or perhaps creating tension in the class. In other words, social engineering involves modifying the emotional state of the class to best fit the instructional purposes of the lesson.

Conclusion

  We can expect new communications technologies and increases in bandwidth to be upon us quickly. We need to be experimenting with this technology and applying what we already know about teaching and learning to the use of the technology. We propose that purposefully including ancillary communications as an instructional strategy in online courses may enhance retention and transfer of content, and increase student motivation and instructor feedback.

Ancillary communication allows students to explore aspects of the course content not covered in the primary instructional communication mode, and thus potentially enhances their motivation in understanding. In addition, it provides the instructors with "real-time" feedback on course activities, allowing us to respond more effectively to changing conditions for learning. To be sure, it takes some time to become comfortable working in an ancillary communications environment, and the rapid pace and semantically intense nature of ancillary communication may not be for everyone. Yet our initial experience indicates that ancillary communication may be an important affordance of online instruction; one that could do much to take advantage of the inherent power of modern computer mediated communications. As we grow more accustomed to dealing with ever increasing information flows, and as a new generation of learners come to our classrooms, ancillary communication may have an important role to play in the future of online learning.

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Creating a Tenure-Winning Portfolio

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Introduction

Gaining tenure status is one of the hallmarks of achievement for a faculty member. It implies recognition, acknowledgement, and affirmation from one's professional colleagues. However, the process of achieving a tenure rank is a rite-of-passage fraught with pains, challenges, and frustrations. As we reflected upon the process of developing our tenure portfolios three essential questions evolved: 1) How should beginning faculty members prepare for tenure in such a way that minimizes the challenges? 2) What constitutes an effective presentation of one's work that will enhance the evaluation of that work? and 3) Can the process of creating a professional portfolio be a reflective opportunity for professional growth? We suggest it is possible that a quality electronic professional portfolio may enable us to achieve these goals.

Yet, the dilemma is where to begin and how to proceed into this uncharted "tenure-seeking" journey. Each year, university faculty face the arduous task of documenting their accomplishments for annual review, tenure, and promotion. While most higher education institutions provide guidelines for these evaluations, faculty go through the rite-of-passage virtually on their own with minimal support. At best the "tenure-seeking" journey is a twisting road with potholes of uncertainty and frustration, where the travelers wish they had some type of map.

With our tenure journey still fresh in our minds, we decided to write an article to assist those who are seeking tenure. While no one person or one article can guarantee tenure, it is our hope that these guidelines will make pathways clearer and the journey less stressful and more professionally affirming.

Background

In education, portfolios are used at several levels to evaluate learning, competencies, and accomplishments. In public schools, the use of the portfolio is seen as a valid and comprehensive assessment of student's authentic performance. In some teacher education programs, portfolios are used to evaluate the budding teacher's attainment of competencies (Lynch & Purnawarman, 2004). Additionally, many states use professional portfolios to evaluate in-service teachers. At the university level, portfolios have long been used to evaluate faculty for tenure and promotion. Traditionally, tenure portfolios have been notebooks with collections of artifacts with some level of organizing to assist the audience. However, the production of paper portfolios becomes so daunting that the author loses sight of the portfolio's higher purposes (Campbell, Cignetti, Melenyer, Nettles, & Wyman, 2004; Martin-Kniep, 1999).

With technology, the process of documenting professional achievements has become more flexible, even though still labor-intensive. Rather than turning several pages to see supportive evidence of a competency area, hyperlinks take us directly to the artifacts and help to establish an immediate link and reinforce the conceptual connection between the two. As the technology evolves, portfolios have changed and developed into more than just a collection of artifacts, it has become a learning endeavor (Constantino & De Lorenzo, 2002; Easley & Mitchell, 2003).

Teaching professionals, whether at the novice, in-service, or university level, struggle to capture the essence of their teaching. Teaching is both an art and a science, a complex dynamic endeavor that is difficult to describe. In discussing teacher portfolios, Evans (1995) concludes that "a professional portfolio is an evolving collection of carefully selected and composed professional thoughts, goals and experiences that are threaded with reflection and self-assessment. It represents who you are, what you do, and why you do it, where you have been, where you are, and where you want to go, and how you plan on getting there." (p.11). As portfolios become accepted as valid assessment tools in the schools, more teacher educators are advocating that future and current teachers develop professional portfolios as a way to consolidate their learning experiences.(Harris & Aworuwa, 2005a;2005b) We advocate that teacher educators develop and maintain professional portfolios to enhance a deeper understanding of

their own profession. While the use of portfolios to evaluate higher education faculty is not new, the use of electronic portfolios offers new and exciting dimensions to the faculty evaluation process.

Creating a Tenure Portfolio

A tenure portfolio can be likened to what Painter and Wetzel (2005) called an assessment portfolio which presents educational organizations with information about a teacher's effectiveness. Higher educational institutions, in particular, expect faculty members to demonstrate competence in three major categories including teaching, scholarship, and service to the community. Faculty that are deemed competent in those desired areas are likely to achieve tenure status. A faculty member seeking tenure should use their portfolio as an opportunity to demonstrate competencies in all major areas in which they would be judged.

Whether paper or electronic, the challenge is how to represent the depth and breadth of your professional work to your audience. Each of the three essential components, teaching, scholarship, and service, assessed during a tenure review, have inherent complexities that are difficult to completely represent on paper or with lists. With technology, the process of documenting competence in professional activities, even though still labor-intensive, has become more flexible. Creating digital or electronic portfolios remove the constraints of paper-based collections, allowing the author to easily customize their portfolio, and include digital videos, audios, and graphics. Portfolios can also be stored on compact discs, which removes the burden of carrying about heavy paper folios (Barret, 2001). In addition, "electronic portfolios often have a different look than print portfolios because the [audience can] navigate them with hyperlinks" (Painter and Wetzel, 2005) and follow the flow of information in any order. It is the flow of an electronic portfolio that allows the creator to lead the reviewers to a window revealing the thoughts behind the works presented.

Our purpose is to provide a guideline designed to give you both practical and conceptual assistance in constructing a professional tenure portfolio that enables you to highlight your accomplishments; reflect on the congruency of your philosophies, values, and practice; and shape your future directions. From our own tenure seeking experience, we have gleaned six steps that can be used to guide tenure preparation. They include: 1) Prepare for Success; 2) Use Annual Performance Reviews; 3) Select and Support Artifacts; 4) Build the Portfolio; 5) Reflections Highlight Professionalism; and 6) Polish and Package.

Step 1: Prepare for Success

The tried and true advice we have heard over the years "Think positive! Plan ahead! Be prepared!" is applicable for those seeking tenure. Essentially, achieving tenure is an ongoing process that begins with a positive attitude towards the task. Rather than viewing it as another burden, view the process as an opportunity for growth and development. Expect to be successful and plan for it. Begin by developing what we call a "working portfolio." A working portfolio can be a physical or electronic folder where you keep all materials relating to your professional activities. Materials do not necessarily have to be filed in any particular order, but they must be labeled.

Begin to collect materials for your working portfolio in the first year of teaching. Waiting until the year before or even the tenure review year is a recipe for disaster. To begin, use three folders either paper or electronic to organize materials that address teaching, scholarship, and service. For example, keep a table that charts courses taught, number of students by semester and maintain a file of your student evaluations in electronic or paper format. The more materials you are able to accumulate over the course of the five to six years adds to the variety and richness of artifacts that you have at your disposal.

Most institutions have guidelines for tenure review. It is a good practice to review those guidelines as early as possible in your career to ensure that you understand tenure requirements and expectations. The guidelines typically address tenure evaluation process, criteria and required components for teaching scholarship, and service. They may also delineate specific levels of performance that are acceptable in each category.

Create a list of the activities that match each category and get involved in them as a participant and an initiator. Keep a record of your participation, including a short description, date and location of activities. Take pictures preferably in digital format and scan or create PDF files of all documents collected. Make short digital audio or video clips of your teaching or your students' activities. As you gather students' products or images remember to obtain their permission to use these artifacts. Write a short reflection on the significance of materials collected. Keep items your university requires such as annual faculty reviews and student evaluations.

Step 2: Use Annual Performance Reviews

You may work for an institution like ours that requires you to prepare a short documentation of your professional activities through the year as part of your yearly evaluation review. In the process of preparing the document, you would discover areas or categories in which you have been strong and those in which you were weak. While emphasizing your strength, use the review as an opportunity to make plans to address your areas of weakness. If your annual review includes a self rating and a conversation with your dean to discuss his/her ratings of your performance, use this feedback constructively.

Students' perspectives are part of the annual review and often a concern, especially if the students' ratings are a big factor in the final evaluations of your teaching competencies. Even though you may perceive students' rating of your teaching as incorrect and sometimes unfair, use students' feedback constructively to see which teaching strategies worked and which did not. From that analysis you can identify areas which need improvement. After all, isn't that what teaching is all about?

Step 3: Select and Support Artifacts

From your working portfolio select artifacts that represent teaching, scholarship, and service. You do not have to use all artifacts you have collected over the years. Use representative artifacts. Decisions about artifacts selection should begin with a purpose in mind. Each artifact must meet the criteria for inclusion, namely, well-written or well-produced, short (except for publications), and fit the space capacity of your presenting medium. You may select more than one artifact to illustrate a category. For example in the teaching area, you may select a course syllabus for each course you have taught in the period under review or syllabi that demonstrate developmental view of your course planning over time. Other selections are best synthesized into charts, such as lists of courses taught, enrollment, and student evaluations. When using charts as the organizing framework, convert original artifacts into PDF format and hyperlink to the chart. You may select textual and image representations of the same concept, or samples of activities in multimedia format. When addressing publications, each must be briefly described and the full publication, preferably the published copy, should be scanned and hyperlinked to the points where they are referenced. Community service events in which you participated are better represented through pictures or videos. Students' portfolios are better documentation and illustration of the quality of your teaching and students' learning.

Selection of artifacts is the beginning, but the supporting explanation or reflection allows your audience to understand your rationale for selecting a particular artifact, as well as the value of the artifact (Constantino & De Lorenzo, 2002). It is the explanation that links the significance of artifacts in the audiences' mind. For example, one author wanted to highlight her use of graphic organizers, so she selected course graphic maps, lecture material graphic maps, and students' graphic maps of course content. Below is her reflective explanation:

> Graphic mapping is a proven technique to support learning. I use graphic maps to assist A&M-Texarkana students' understanding of the overall organization and goals [hyperlink to course map] of a course, as well as to enhance understanding of content [hyperlink to lecture map]. One extensive project that I used in SPED 410 required that students use Inspiration software to teach a lesson [hyperlink to students' maps] to a small group covering specific course content. The student Journal reflections [hyperlink to students' reflections] addressing the Inspiration project were powerful testimonies to student learning about technology, course content, and pedagogy (Harris, Tenure Portfolio, spring 2005).

It is important to carefully consider the artifacts selected for your portfolio; however it is the explanations that weave the artifacts together and lead the audience to an in depth understanding of your practice.

Step 4: Build the Portfolio

One of the most important components is the portfolio introduction, which sets the tone of the presentation of your work. This preamble should emphasize the purpose and breadth of coverage of the portfolio. The preamble can be part of a cover letter or it can be a separate document. Use the preamble as an opportunity to introduce yourself and emphasize the philosophical or theoretical underpinnings of your professional life. Here is an extract from the preamble of one of the authors' tenure portfolio:

> The initial purpose of this portfolio was to provide evidence that I had met the …..tenure criteria. As I made lists and gathered materials, I found that I wanted to do more than document my accomplishments. Simply put, I wanted to explain and describe "Why I do what I do." For those reasons, I chose to create a reflective professional portfolio in an electronic format to present myself and my work. Capturing the heart

and soul of my teaching has been a complex difficult journey. Along the way I discovered my scholarship, renewed my dedication to service, and affirmed my commitment to teaching. (Harris, Tenure Portfolio, spring 2005).

Following the preamble you need an organizing framework to direct the audience to the main sections namely, Teaching, Scholarship, and Service. A holistic view of all sections may be presented either as site map or table of contents. The advantage of an electronic portfolio is that you can hyperlink artifacts to the site map or table of contents. Figure 1 below is an example of a site map used as an organizing framework.

Figure 1: Site Map (Harris, Tenure Portfolio, spring 2005).

At the beginning of each section write an introductory statement. Use this as an opportunity to highlight the significance of each component.

Demonstrating Teaching Excellence
Begin the presentation of teaching effectiveness section with a philosophy of teaching and learning. What philosophical beliefs shape course development and implementation? How a faculty translates these beliefs into the structure of the course syllabus, development of teaching resources to support learning, the implementation of the course, and facilitation of students' learning, should be documented in the portfolio. In addition, provide hyperlinks to evidence of each for verification.

It is important that faculty realize that a tenure portfolio may be the only place where they can demonstrate evidence of effective teaching on their own terms. A portfolio allows the educator to "represent the complexity and context-dependent judgment that characterizes teaching" (Shulman, 1998, p.31) and contains documentation of teacher performance and student learning (Painter and Wetzel, 2005). "Educators must demonstrate that the hours spent in the classroom are only a part of the real work of teaching. The teaching portfolio can provide professors with a vehicle to document the quality and quantity of their teaching" (Murray, 1997, p.1). Therefore, a detailed explanation of course development process is necessary, rather than just a listing of course syllabus components.

"Much of the portfolio should be devoted to reflection on how your actions are congruent with your beliefs about teaching. Most portfolios would also incorporate a plan for altering behaviors found to be incongruent with the philosophical assumptions about teaching and learning. And the portfolio should incorporate a strategy to assess the appropriateness and success of the new behaviors." (Murray, 1997, p.2).

We had Murray's and others' advice at the back of our minds as we developed the teaching sections of our portfolios. We began with a narrative of our philosophies of teaching and learning. We addressed the philosophical beliefs that shaped our course development and delivery. We made apparent the process whereby we wove our beliefs into the structure of the entire course. Below is an example of introduction to the teaching section of one of the authors' tenure portfolio:

> Teaching has always been my passion…I grew up knowing the value of a good education, and I have strived to be not just a good educator, but a creative one. A creative educator finds several ways of reaching learners. As Lee Shulman once said, if you have 150 students in your class, there are "150 Ways of Knowing." So one size does not fit all, and you must find ways to reach all students. As a result, I never teach the same course the same way twice. For each group of students that I come in contact with every semester, I try to "listen" to their needs and tailor my teaching to meet those needs. In the design of my courses, I have a variety of activities which provide students with several opportunities to succeed. There are projects that enable them to develop learning as well as technology skills. At the same time, there are course notes that enhance their knowledge construction. I strongly believe in the Constructivists view which says that learners are not just empty vessels that you fill with knowledge. Learners actively construct their own knowledge from information available to them. With this in my mind, I try to create learning environments that will increase the opportunity for learners to construct knowledge in ways that are meaningful to them. As you will find in my course outlines, examinations and tests are only a small proportion of my course evaluation. To my thinking, examinations develop ability to recall information from memory, whereas our students would go into a world where practical knowledge and skills in information access and usage are most valued… (Aworuwa, Tenure Portfolio, spring 2005)

These philosophical beliefs about teaching and learning influenced the way we planned learning tasks for our students.

> The assignment samples presented here were created so that one assignment is a precursor to another and then integrated at the final phase. In the first assignment {hyperlink}, students research assistive or adaptive technology for persons with disability from the Internet. This allow the students to learn to use Internet research tools as well as learn about the social and ethical issues of using technology (which is one of the competencies of the TExES) [Texas teacher certification examination] [sic].
>   The second assignment requires students to use their research notes from previous assignment to develop a PowerPoint presentation {hyperlinked evidence} to be delivered to an audience. This allows students to learn to use a technology tool to develop communication skills (another TExES competency) [sic]
>   … Each major assignment is accompanied by a rubric or checklist that informs students about how they will be graded on the assignment and also serves an advance organizer of the quality of work expected from the students. (Aworuwa, Tenure Portfolio, spring 2005).

In cases when teaching actions have unintended consequences, it is important to reflect on why, make corrective actions and analyze the impact on your teaching and students' learning. Such instances provide opportunity for growth by deepening our understanding of who we are as teachers and who our students are as learners. As one of the authors reflected on a course she has taught for several semesters, she discovered several misconceptions both she and her students brought into the course.

> When I first taught this course in the summer of 2002, there were misconceptions on my part and on the part of the students …First, I assumed my students were all education majors, so I used a lot of education concepts and examples in the course. I soon realized that I had students taking the class who were other majors including psychology and criminal justice. Even 'education' students were not familiar with the education concepts and terminologies I was using… [because this course was taken prior to foundational education courses].

The misconception on the part of my students included an assumption that the class was just like any other class in which they have specific chapters to read and they take a test and it is over. They were not prepared for the amount of new and technical concepts and the time commitment. For many of them, the course was the first time they would learn about computers. The situation was not helped by the fact that there was no textbook … How do you select a textbook on computer technologies that will meet the needs of all the majors… [even electronic notes were a source of confusion because students failed to connect to hyperlinked materials].

…, I gradually developed the course notes and tutorials…into a tutorial book (see: As easy as 1-2-3: A tutorial on basic computer skills for teachers) {hyperlinked document}. The course had better students' ratings the semester we first used the tutorial book…

Other improvements that I have made to the course include streamlining assignments so that students can complete a sizeable portion during class through hands-on activities (Aworuwa, Tenure Portfolio, spring 2005).

Throughout the teaching section highlight instructional strategies that you are excited about and which result in profound learning experiences for your students. Facilitate the audience's understanding of your teaching enthusiasm and student's learning through reflective explanations.

Demonstrating Excellence in Scholarship

Within the scholarship section it is important to describe how you have met the criteria specified in your university's guidelines. Here is how one of the authors presented evidence demonstrating how she met the scholarship requirements:

Evidence that I have met and surpassed [university's] tenure criteria for scholarship includes: (a) membership in the Academy for Educator Development; (b) six collaborative grants totally $45,150; (c) 14 presentations at national juried conferences and numerous state, regional, and local presentations and workshops; and (d) two publications, one review of a textbook for Allyn and Bacon publishers, and a journal article submitted to the Journal of Excellence in College Teaching. Most significant for me on a professional level is not the count of scholarship activities but the manner in which scholarship enriches my teaching and vice versa. It is a revelation for me that the scholarship and teaching are so interwoven each shaping and enriching the other (Harris, Tenure Portfolio, spring 2005).

The reflective introductions depend on your style. Here is another approach.

Scholarship is a part of my professional life that I realize I now enjoy as much as I enjoy teaching. Through the Regents' Initiative fund, I was privileged to attend a "Writing for Professional Publication" workshop conducted by ….I learned from the workshop how to link research and teaching so that my research informs my teaching and vice versa. In addition, being a member of the Academy for Educator Development has had a positive impact on my scholarship. It provided me the opportunity to attend several workshops and conferences, form important alliances, and enhance my professional development.

I have listed in my resume several scholarly activities in which I was engaged during the period under review. They included research and publications, grants, conferences, workshops attended for my own professional development, and workshops that I have conducted for others. (Aworuwa, Tenure Portfolio, spring 2005).

Group the different types of scholarly activities such as grants, publications, conference presentations, professional development, research agenda, and professional organizations and hyperlink to artifacts selected for each group. If you find gaps in meeting the university's requirements provide an explanation. See an example:

I have not been able to achieve much in the area of grants in the last two years. I hope to do more when I complete the development of my courses…The grants information presented relate to my activities with the Academy for Educator Development Fellowship grant, MasTAR - an unfunded grant, and previous grant project that I worked on shortly before I joined the faculty…(Aworuwa, Tenure Portfolio, spring 2005).

The significance of the scholarship section is critical tenure component; therefore try to represent as many areas of scholarship as possible.

Demonstrating Excellence in Service

As in your Teaching and Scholarship sections, your Service area also needs a quality introduction. For example:

> According to the College's guidelines for Tenure and Promotion, faculty members are expected to be actively engaged in the academic governance of the University, College, and Department. Faculty members are also expected to actively participate in activities of their profession, as well as provide service to the community. I believe I have met and exceeded expectations in all service categories - namely, university, profession, and the community. Service has always been a part of my life. I believe in giving one hundred percent in all that I do, and service to my fellow human beings is one of the highest callings a person can receive. Even though I may catalog a list of activities in which I had been involved, I still believe that I have not done enough to serve my community. I have always felt that way, and I think I will continue to feel that way. Maybe we all need to feel we have not done enough to keep us on our toes (Aworuwa, Tenure Portfolio, spring 2005)..

Think about the different categories found within the service area and present a reflective summary of your contributions and hyperlink each to the artifacts. Here is an example of how one of the authors presented her service to her profession:

> I affiliate with a number of professional organizations for the purpose of promoting the missions of the organizations, as well as keeping me abreast of developments in my fields and for professional growth. I have been more active in some of the professional organizations and divisions than I have been in others. I had served as a conference proposal reviewer [hyperlink to email assigning reviews] for AECT divisions since 2002, and as a conference session facilitator [hyperlink to email documenting session facilitator assignments] for several sessions at the AECT Conference. I have also been more active with some of the listserv and weblog activities of the Distance Learning division, since its objectives are more in line with what I currently do in my job. I served as an expert panelist for an AECT/PT3 Catalyst project [hyperlink to letter] …. The purpose of the project was to identify technology-based teaching strategies of various education professionals in order to develop certificate programs for them. Expert panelists helped to identify the strategies (Aworuwa, Tenure Portfolio, spring 2005).

For community service often photographs tell the story best. Photographs may be hyperlinked or presented as an electronic album. Sometimes you do not necessarily have to have a leadership role for your service to be significant:

> My part in [name of local children's park] was very small, but as … would say every part counts! My interest was to get the … students involved. For the design day with hundreds of school kids at [location of event], I enlisted… education students as volunteers. I was so inspired by the day I wrote Why Build a Park? [hyperlink to essay]. Much to my surprise and pleasure, [the English professor] thought my essay would inspire [university's] faculty and staff to make donations, so she sent it out (Harris, Tenure Portfolio, spring 2005).

Service is an area in which each faculty member can demonstrate contributions and their individualism. This section may have a completely different tone than Teaching or Scholarship sections which adds depth and breadth to your portfolio.

Other Components and Required Documentations

Within the tenure review process your institution may require specific components such as an application letter, vita, annual evaluations, lists of courses per semester with enrollment, and student evaluations.
The placement of these items in your portfolio depends on your style and the emphasis you want to create. For example, the letter of application may be placed as the first page followed by a table of contents which hyperlinks to your vita, evaluations materials, followed by Teaching, Scholarship, and Service sections. To address evaluation one of the authors created an evaluation section, placed after her vita. She used a table summarizing annual faculty performance evaluations for each year, hyperlinked to a copy of the evaluation documents.
Other materials included were a pre-tenure review report, information about promotion, and student evaluations. The other author, on the other hand, addressed evaluation under two sections. The annual faculty performance

evaluation was treated in a separate section while student evaluation and course were addressed as part of teaching effectiveness section.

Finally, it is important to note that you may create sections to address accomplishments that do not fit in the standard sections. For example one of the authors included an "Other" section in which she presented awards and letters of appreciation.

Step 5: Reflections Highlight Professionalism

Throughout this article we have embedded examples of the reflective explanations that support artifacts. Reflection weaves together each detail of your portfolio and creates a holistic understanding of depth and breadth of your work. The point at which you begin the reflection part of your portfolio is a stylistic choice. You may write the reflections first, last, or even during the middle of the portfolio process. Each approach is valid. What is important is emphasizing how each artifact demonstrates continuous growth and development of your teaching knowledge and practices, and how it demonstrates the philosophy that informs your professional endeavors. One author actually used the reflective introductions to each section, Teaching, Scholarship, and Service as the core of her application letter. The other author concluded the portfolio with a final reflection.

Step 6: Polish and Package

Presentation matters. Polish and package the portfolio before presenting it to the intended audience. The table of content, overview of the portfolio, and conclusion to the portfolio contribute to the flow of the materials. You may construct the table of contents as you develop the portfolio, or complete it after all sections have been constructed. Once again, this is a stylistic choice and both approaches are appropriate. Each section may have a table of contents as well. Hyperlinks from these organizing frameworks allow for multiple points of access to your information. Be cautious about the number of layers you create with your hyperlinks, because some audiences dislike more than three or four layers.

Use color to enhance the visual quality of your portfolio. Soothing and attractive colors prevent your portfolio from becoming boring and monotonous. Colors that are too bright or too dark may discourage your audience rather than engage them. Pages with related information may have the same color scheme, to facilitate ease of transition. Font color and size are also important to enhance your presentation. Finally, there are several options of submitting your electronic portfolio. You may send it electronically or save to a CD or DVD with a cover letter in a presentation binder.

Conclusion

Creating a tenure-winning portfolio starts at the beginning of your teaching career. It can be an arduous task or a rewarding experience, depending on your attitude and level of preparation. To the authors, it was a revealing experience, an opportunity to learn about ourselves and our career. Constructing our portfolios in electronic format provided us the flexibility to show the richness and diversified experiences of our professional lives.

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Podcasting as on Demand Educational Support

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Introduction:

Podcasting in all its various permutations of audio, enhanced and vodcast, represents the newest form of delivery for educational content to students. The number of colleges and universities jumping on the Podcasting bandwagon grows each day with new methods of instructional implementation being rapidly developed. "Podcasting" derives its name from iPod (Apple's seemingly omnipresent mobile media device or MMD for short) and "broadcasting". A podcast is a highly compressed file of pre-recorded material. Podcast can be audio only, or they can include visual elements as well. They are relatively easy to create and extremely easy to disseminate to an audience. They are not live broadcasts, but rather stored files allowing for asynchronous access by an audience. In reality, a podcast is simply a dressed up MP3 file with a new name and a lot of pop culture buzz surrounding it. The thing that makes a podcast stand out from other audio files floating around in cyberspace is the ability to subscribe to the material. Updates and new episodes of podcast material are just a subscribe button away, meaning that audiences can stay up to date without having to constantly check a website for new material. Proponents of using the technology in an educational environment often reference podcasting as if it is some magical elixir, a panacea for educators everywhere. Podcast your courses, that'll fix 'em, students will learn, graduation rates will skyrocket and all will be well with the educational world. Often times, podcasting detractors express feelings ranging from skepticism to near outrage with protestations of "fad" and modern day educational snake oil. Students will quit coming to class, it's a gimmick, a simulacrum of the true classroom experience, the lecture hall's doppleganger. Indeed, both sides of the aisle might have a point with their statements. The simple fact of the matter is that "podcasting" is a relatively new technology with multiple potential applications that are still being explored and studied. While anecdotal information on the effectiveness of podcasting is abundant, few studies have been conducted to quantitatively gauge its impact on the educational process. The School of Communication at the University of Houston has been engaged in such a study since the beginning of the Fall semester of 2005, with initial data collected during the Spring semester of 2006. The findings of the initial study give credence to some of the opinions of the proponents as well as opponents of "podcasting".(University of Houston, 2006) The data collected by the UH study demonstrates some interesting patterns in student utilization of podcast course material and clarifies some of what works and what does not in academic podcasting.

Overall, the study indicates the potential for podcasts to be used very effectively as on demand educational support. This on demand support might take the form of an audio recording of a lecture that a student uses to review for a test, but it can be much more than a mere copy of the class room experience. This paper proposes an argument for the inclusion of podcasting in the college classroom, the pedagogical efficacy of such an implementation, and offer some suggestions towards making the most out of educational podcasting. This argument is supported by research data gathered by the University of Houston Podcasting pilot program.

The Study

The University of Houston Podcasting Pilot program was first implemented in the Spring of 2006. Two courses were involved in the first round of the study. Four sections were involved, three lecturing professors, one online section and one early morning (8 a.m.) section. In total, the survey population included 200 potential participants with 165 actual respondents and a gender breakdown of 60% female to 40% male. The survey instrument consisted of 74 questions spread over seven sections of varying length. The majority (57%) of students were aware of what a podcast was prior to taking the course, but less than a third (31%) had actually listened to a podcast before. That is extremely important to note as an educator. Podcasting is definitely a buzzword in academics right now, but before faculty rush head first into content delivery, they should carefully gauge the student's understanding, ability and willingness to interact with the new technology.

The necessary software for downloading and subscribing to podcasts is available as free downloads. A student does not need to own a MMD to be able to receive content, but 87% of the UH sample population reported owning at least one MMD. The quality of the delivered material with all three types of podcasts (audio only, enhanced with still images and video) received over 75% good or excellent ratings. There was no clear-cut favorite among the

three possible delivery methods. The population from the four survey courses indicated a very slight preference for video podcasts over enhanced and audio only podcasts. (Figure 1)

A multiple regression analysis performed on the UH data determine that students who were "more likely to view the addition of podcasting material as helpful to the improvement of their learning outcome" had the following characteristics:
•They were younger;
•Had better quality of MMD's;
•Had a higher ability to retain information while using MMD to access instructional materials while involved in other activities;
•Had viewed podcasting course materials on a computer;
•Had not experienced technical issues related to the use of MMD's;
•Believed that an e-mail reminder would be useful whenever a new podcast was available.

The analysis also determined that gender, length of time using computers (years of experienced), commute time, type of internet connection, length of time using MMD's to access course material and viewing material on an MMD versus a computer were not statistically significant factors. It is important to note that the University of Houston is located in a sprawling community with a very geographically diverse student population. Over 48% of those surveyed had at least a half hour commute to campus, with nearly a quarter spending over an hour getting to class each day. Although commute times did not apparently play a factor in student's opinion of podcasts, the UH study should serve as a good guide for large urban institutions, but might be slightly out of balance for more traditional "college town" campuses with students residing on or in the nearby vicinity of the institution (University of Houston, 2006)

Podcasting as On Demand Educational Support:

To return to the argument in favor of using podcasts as supplemental and/or more detailed explanatory materials, take for instance the potential applications in Introductory and Survey classes. Such courses often pose a variety of problems for students as well as professors. The classes generally fulfill a core curriculum requirement for universities and will be populated by students with varying degrees of interest in and knowledge of the subject matter. Professors are required to cover vast amounts of material, which may or may not be in their particular area of expertise. Lecture time is limited, as is the time for classroom Q & A. Potential for one-on-one communication with every student is little more than a pipe dream. A history course covering 300 years cannot spend three weeks discussing one eventful year and still hope to cover the remaining 299 years with any degree of success. Students who find themselves falling behind are left to re-read notes, confer with classmates, hire a tutor or possibly catch their professor for a review session. Similarly, students with a great interest in the material are left wanting more.

By carefully identifying the muddiest topics that arise during the course of a semester, an instructor can pre-produce discussions dealing with those difficult those areas. These discussions can take the form of audio or video podcasts and serve as on demand "tutoring" sessions for students who find themselves falling behind in class. The content of the discussions would in part dictate the need for video content as opposed to audio only. Remember that engaging a video podcast requires a different level of interactivity with a MMD. Offering video only versions of course material limits the areas and activities in which a student can engage with the material, requires larger files with longer download times and requires more storage space on servers as well as students' MMDs. Video podcast also reduce the chance for students who drive to school to access the material during a lengthy commute. No one wants students to drive while trying to watch lecture material on a 2.5-inch screen. Muddy areas can result from a variety of reasons and should be easy to identify from student feedback and from test results from prior semesters. Supplemental podcasts can be produced before a semester begins based on prior test results. If there is an area that each semester consistently causes a large number of people difficulty, simply pre-record a podcast before the semester begins. This podcast can then be made available to anyone wishing clarification of subject material. It might be more detailed than the original lecture or it might offer differing examples than in class discussion. Linda Herkenhoff, an assistant professor in the graduate department at St. Mary's College creates two podcast summaries of her lectures. One is designed for students lagging behind and in need of extra explanation for tricky concepts. The

other is for advanced students wanting more detail from the lectures. (Read, 2006) Supplemental material can also be fairly easily created during the semester based on problems cropping up during class.

Students are often performing a delicate balancing act throughout the semester. Classes, jobs and personal life can collide into each other from time to time. A student might be in class taking notes, seeming to pay attention, all the while thinking about another course, a bad day at a part time job or a relationship that is falling apart. These problems do arise, and one inattentive day or a day missed for illness or personal reasons can negatively impact a semester. Providing podcasts of lectures can prove to be valuable for students who might have otherwise fallen behind. Podcast lectures can also be advantageous to students who wish to preview lecture material. A student can listen to course material the night before a lecture or even while driving to class. Having heard the material beforehand, the student can have a different classroom experience, one where their time is not spent struggling to take notes and keep up, but rather one where they are actively engaged in the lecture - listening and absorbing material rather than simply transcribing. The University of Houston implemented podcasts as optional material, and any previewing of lectures before class time was strictly the students' choice. There were no data collected on using podcasts as a required portion of the course materials. Future research could be done to gauge the effectiveness of optional versus required podcasts. (University of Houston, 2006)

Another benefit of offering supplemental on demand material is the ability to clarify and improve on any given lecture. Faculty, like students, can have off days. If a class lecture didn't go as smoothly as desired, an important point wasn't quite as clear as it needed to be, or the lecture just didn't meet with a professor's high standards; it is possible to correct a deficient lecture. A professor can, with the lecture still fresh in their minds, return to their office and record an addendum to the day's work, post it online, let students know it is there with no need to spend the next class period clarifying the previous lecture and losing valuable class time. Questions can also be answered in greater detail than class time would allow. When an "I'll get back to you on that," or "I'll need to check the data" question arises in class, podcasting makes it possible to actually check the data and get back to the class. Again, this can be done without losing time in the next lecture.

The supplemental sessions can also be designed to offer a broader explanation of a topic rather than simple remedial lectures. Students who have a greater interest in a topic and a desire to learn more than the amount required could benefit from these sessions as well. As in the case of Gardner Campbell, Professor of English at the University of Mary Washington, who spent a summer reading a John Donne poem a day. These readings, accompanied by Campbell's own commentary provided five to eight minute chunks of information that "students can use to help them prepare for each day's reading assignment."(Campbell, 2005). By including interviews with other academicians and members of the professional community students will gain an understanding of the material and a broader range of viewpoints than simply that of the lecturer or textbook author. For example: a book publisher could be interviewed to explain how a manuscript makes it to print; a television engineer could explain how light is converted to electrical information; a medieval historian could explain the impact of the printing press. In an ideal world, such topical interviews and mini lectures could be made available on an interdisciplinary scale. An interview with a philosophy professor on the theories of Immanuel Kant could be of benefit in a Communications class discussing Media Ethics or in a History class discussing The Enlightenment. If an institution allows for such interdisciplinary action, a database of podcast offerings could easily be built over the course of a few semesters and shared in a campus wide effort. At the University of Denver, Dr. Don McCubbrey sees even greater potential, "Imagine if a class in Nairobi could listen to podcasts from other countries. Podcasts can democratize learning." (Lum, 2006) For many, simply getting the Chemistry department to talk to the Anthropology department might be a big enough challenge to begin with. Still, the potential is there.

Regardless of the form podcasts take, one thing to always remember is that they should be an educational value added endeavor, offering students something more than has been traditionally available. They do not need to be slick Hollywood quality productions as long as they are somewhat engaging, cleanly recorded and informative. Remember, the audience for an educational podcast is different than the audience for an entertainment podcast.
Based on student perception, podcasts are a valuable tool in the educational process. As shown in Figure 2, 67% of the UH survey population felt that the addition of podcasts was helpful in understanding course content with 59% indicating that podcasts helped them better retain information. (University of Houston, 2006) A similar podcasting study conducted at the University of Michigan School of Dentistry found that 72.7% of respondents felt that including a podcasting feed in the class structure helped their grades. (Brittain, et al., 2006)

Despite the great potential in podcasting, educators must be careful not to overuse the new technology. While it is possible for students to take their school work with them into their everyday lives, there is no guarantee that students will fully utilize the new technology in the manner that educators desire. Podcasting should not be used in place of a traditional classroom experience, but rather a supplement to the classroom. As the UH study indicates, the majority of students (66%) favored a traditional face-to-face lecture experience with a podcast component to a podcast only class format. (Figure 4)

The survey population in the UH study also demonstrated a definite preference for using their MMD to listen to music over course material. In fact, 69% of respondents listed "listening to music as the activity they engaged in most often with their MMD. Only 1% of the population indicated that "reviewing course material" was the primary reason they used their MMD. The mechanism most utilized by students to access course materials was the computer. 63% of students preferred accessing podcast material on the computer as opposed to 31% who preferred to use their MMD for course review. There could be a variety of reasons for students sticking with the computer. Storage space is often an issue, and given the choice of a professor's lecture or an album's worth of songs, the lecture is going to be left out of the mix. There is also the possibility that students are unaware of the freedom of mobility that podcasts give them. Some students immediately see the potential in a mobile classroom experience, but many do not. As the UH study found, students who accessed the course material via a computer were more likely to recognize the value of a podcast than those using only MMD's. (University of Houston, 2006)

Questions of the technology's ability to transfer the information should not be a concern. The UH survey found the delivery mechanism to be solid and reliable. A simple web page of instructions for students can cover the majority of issues that do arise. The survey population ranked the quality of the podcasts very highly both from a technical standpoint and a content offered standpoint. For content creation, the technology to produce high quality podcasts is relatively inexpensive and amounts to an initial investment in basic equipment and software. Note that the entry cost of to podcast is minimal, but the time involved in creating content can be daunting depending on course needs. Determining the course needs should be a careful and deliberate process. The choice of audio only, enhanced podcast or video podcast should be made after considering various questions. Video podcasts will take longer to produce, edit, upload and download. Does the value added by the video justify the added time and effort? When considering that question, an instructor should also take into account student usage and preference of podcast types. 57% of the UH survey population responded that video podcasts most suited their learning style, but only 35% of respondents utilized video podcasts, with 34% favoring audio only and 31% preferring enhanced podcasts. This would hint at students' choosing smaller, more easily downloaded files over files that they felt most suited their learning style. Video podcasts might best suit a student's learning style, but if the video is not adding more value than the audio only or enhanced podcasts, students will opt for something other than video. The podcasting study conducted at the University of Michigan School of Dentistry was initially prompted by the students' desire to have videotaped lectures made available. In order to determine the most effective delivery mode, video, enhanced and audio only podcasts were created. The study found that, "Responding users both preferred (66.1 percent) and used (66.1 percent) audio-only over both the requested format of video and PowerPoint synced with audio." (Brittain, et al., 2006)

It would be a tremendous oversight to ignore one of the biggest concerns lecturers have with this entire process: attendance. The UH study shows that these concerns are sometimes valid. In many ways, the subject matter of the class and the time of the class play the biggest role in determining if students stop showing up for lectures. In the research gathered by UH, one course was held at 8 a.m., and it was not surprising to see a tremendous drop in attendance with the introduction of podcasts. In that particular section, for research purposes, podcasts were not made available until the semester midterm. At that point, the instructor began recording in-class lectures and distributing them as podcasts. Students did stop coming to class, instead relying on the podcasts to get them through. It worked for the students and there was no substantial drop in grades with the drop in attendance. The 8 a.m. lecture period is an extreme example of introducing an alternative information delivery mechanism and having a drop in attendance. Other lecture times may not be as susceptible to mass migrations to podcasts. Students will often enroll in classes because they want the personal face-to-face offered by the traditional lecture model. In the UH study, two sections of a web design course were offered. One was a traditional face to face lecture, the other was an online Distance Ed class. The students in the online class preferred receiving podcasts to attending a traditional lecture. The students that enrolled in the face to face lecture preferred the classroom to the podcast. The subject matter of the course was computer intensive and the students had opted to come to a classroom lecture because the personal interaction was necessary for their understanding of the material. The Michigan study found,

"They [students] primarily reviewed lectures, although a small percentage (9.1 percent) used the online lecture as a replacement for attending class." (Brittain, et al., 2006) The UH study found a slightly higher percentage (14%) of students were using the podcasts to make up for missed lectures. The UH study determined a number of reasons students had for accessing course material via podcasts. All this goes to illustrate that some courses will suffer a greater drop in attendance than others, but data indicates that podcasts can do an adequate job of keeping student grades consistent. (Figure 4)

Not everyone will be satisfied with consistent grades as a balance to lack of attendance, nor should they be. Students miss out on a great deal when they are not in class. From an educator's standpoint, it is incredibly difficult to identify muddy areas if students are not present to ask questions. As Robert Kadel writes in an article in Learning and Leading with Technology, "an MP3's eyes can not light up when it suddenly grasps a difficult concept, and it cannot furrow its brow in confusion. Even the most seasoned professors require such cues in determining if information needs to be repeated." (Kadel, 2006) Kadel also points out that just because a student is in class does not mean they are paying any attention to the lecture at hand. So the question arises, "How do I keep students coming to class if I podcast?" One answer is to only make the podcasts available the week before exams. Some Universities hold podcast material for a month before distributing it to students, the idea being that students will come to class and only use the podcasts for study review. Another method is to offer things during class lectures that are not included on distributed podcasts. This can and often does create a need for editing if an instructor is recording classroom lectures for podcasting. The added time editing should be worth it if students attend classes know that they will be receiving something more than is available to them via podcasts. Another option is to use podcasts as purely supplemental information, but the University of Houston and University of Michigan studies indicate that students do benefit from being able to review entire lectures before exams.

Tips for Implementation

Explain the Technology - Be sure to offer an explanation of "Podcasting", how it affects the course workload, and stress the potential benefits of the technology. Remember, podcasting will work for some, it will not work for others. Take the time at the beginning of the semester to get students interested in the technology, and periodically remind them the technology is out there.

Find what works - Not every class is the same. Different courses require different solutions. Instructor created audio only podcasts of lectures might be all that is required of one course while student created video podcasts might serve another course more effectively. Think about what is best for the course. Ease into production and as things become more comfortable they can become more complicated if need be.

Keep it short. - Time is a precious commodity in the world today. In an article in The Chronicles of Higher Education, Patrick Jackson, an assistant professor at American University, discusses pre-recording lectures with the expectation students will listen to a lecture before attending class and come prepared for discussion. "Think of how much classroom time you would save if you didn't have to lecture anymore . . . You free up all this interactive personal space between you and your students. It changes the classroom experience." (Campbell, 2005) This is an interesting implementation of the technology, but one that has numerous potential hazards. If there is a concern that podcasting lectures will keep students out of the classroom, an equal amount of concern should be given to the pre-class podcasts replacing reading. Many students plan their semesters with an idea of the amount of time each class will occupy outside of lecture periods. If a student is taking 15 hours of traditional face to face classes, they have a certain expectation of the time requirements of those classes. If instructors introduce podcasts to be listened to before each class as required material, in addition to course readings, the result is a doubling of the time expected of the course. The consequences could be frustration, resentment and even hostility to the goals of the professor. The available data indicates that podcasts should be between 20 - 25 minutes or even shorter if possible. From a technological standpoint, longer lectures should be broken into multiple files. This keeps file size manageable, download times reasonable and students can engage with the material in reasonable increments to match a mobile lifestyle and work with the classroom on the go. The pedagogical benefits of delivering entire lectures before classroom discussion is an area worth closer examination and study. There are only so many hours in a day. Society is already suffering from information overload. Just because podcasting provides the ability to go into greater depth than was possible in the past does not mean that students will have the time to digest all the information provided. If a professor wishes to go into a dissertation, go for it, but make it a separate file and indicate that it is there for those

who want the extra information. The students that are truly interested and will benefit the most from the information will find it.

Lay the foundation and allow it to be revisited - The first chapter/lecture of a semester is often the most important and lays the groundwork for the entire semester. The first chapter/lecture can also be the one that is most easily muddied by the class finding itself at the start of a term. A good recap of the groundwork for the course can help all the students to remain focused.

Breaking traditional educational models and introducing new ways of learning does not happen over night - "Give them [students] the option of reviewing [course material] while they are doing laundry or waiting for a bus, and they might just take you up on it." (Read, 2005) They might do that, but the data suggests that the majority are not. The idea of learning on the go is foreign to many students. Instructors introducing podcasting need to take the time to explain the benefits, often more than once.

Servers go down and computers crash, so have a back-up plan ready - A simple glitch in the network can throw an entire semester out of whack. Introduce the technology well before it is needed for class. Don't assume everyone will have a working knowledge of the technology or an ability to access it.

E-mail when new podcasts are available - The information is useless if students aren't getting it. E-mail reminders when new podcasts go online can be very beneficial to students. Podcasts can fall victim to their own efficiency. The subscription feature allows for new podcasts to automatically be made available to students, but if a student is unaware that the new material is there, they might have the information but never even know it.

Conclusion

The data suggests podcasting can be and effective pedagogical tool. Careful implementation should allow for new and diverse uses for the technology in and out of the classroom. The creation of on demand supplements based on careful analysis of problem areas for students can have numerous educational benefits. Students can review material before tests or after lectures to gain extra insight or a better understanding of classroom subjects. The most important factor in the equation is learning outcomes. Will podcasting help students retain information, understand information and maybe even enjoy the educational process along the way? The numbers say yes.

Figure 1 - Students' preferred format of podcasts when using portable media devices to access
instructional materials while involved in other activities
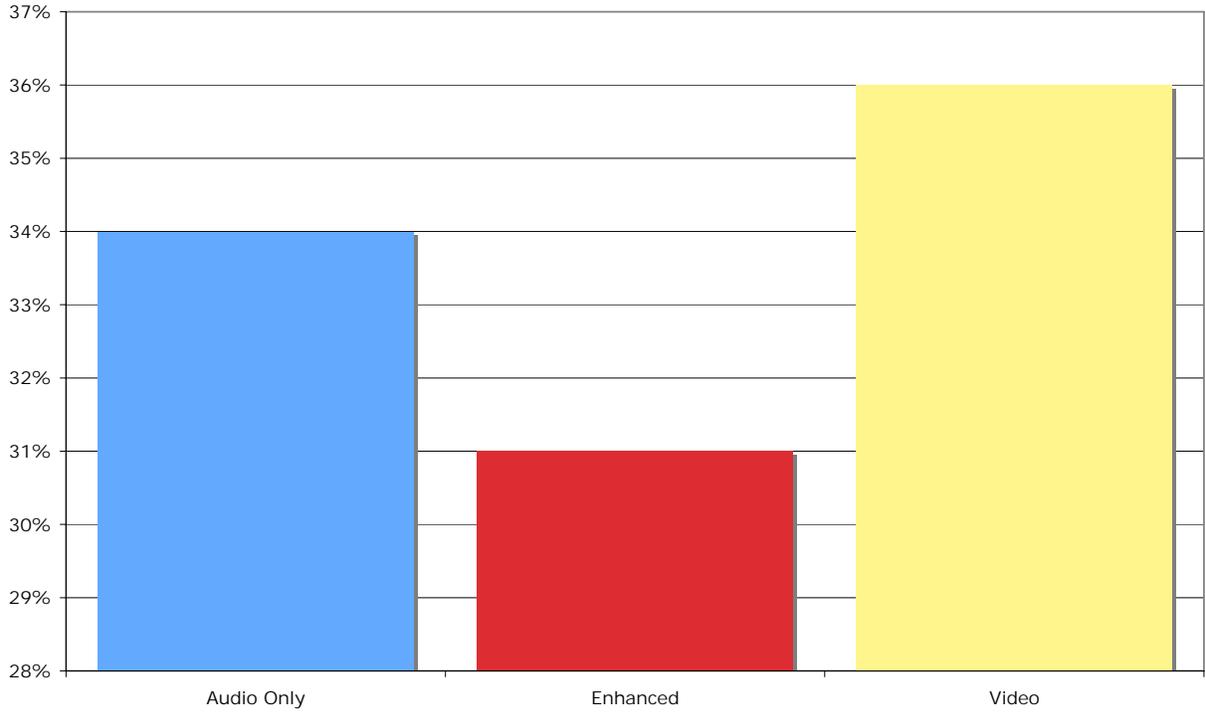
Figure 2 - UH Students' response to the statement "I found the addition of podcasts to be helpful
in understand course content."
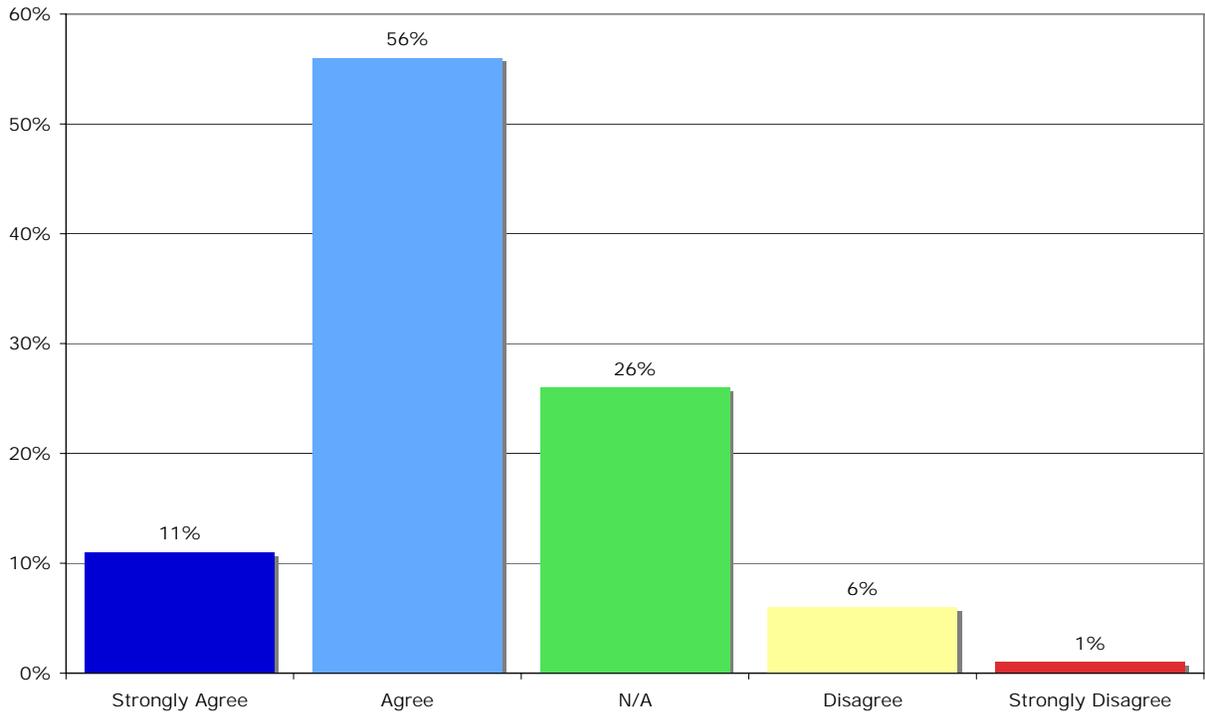
Figure 3 - UH Students' response to the statement "I prefer the combination of iPod/MP3 player course delivery with the face-to-face classroom experience."
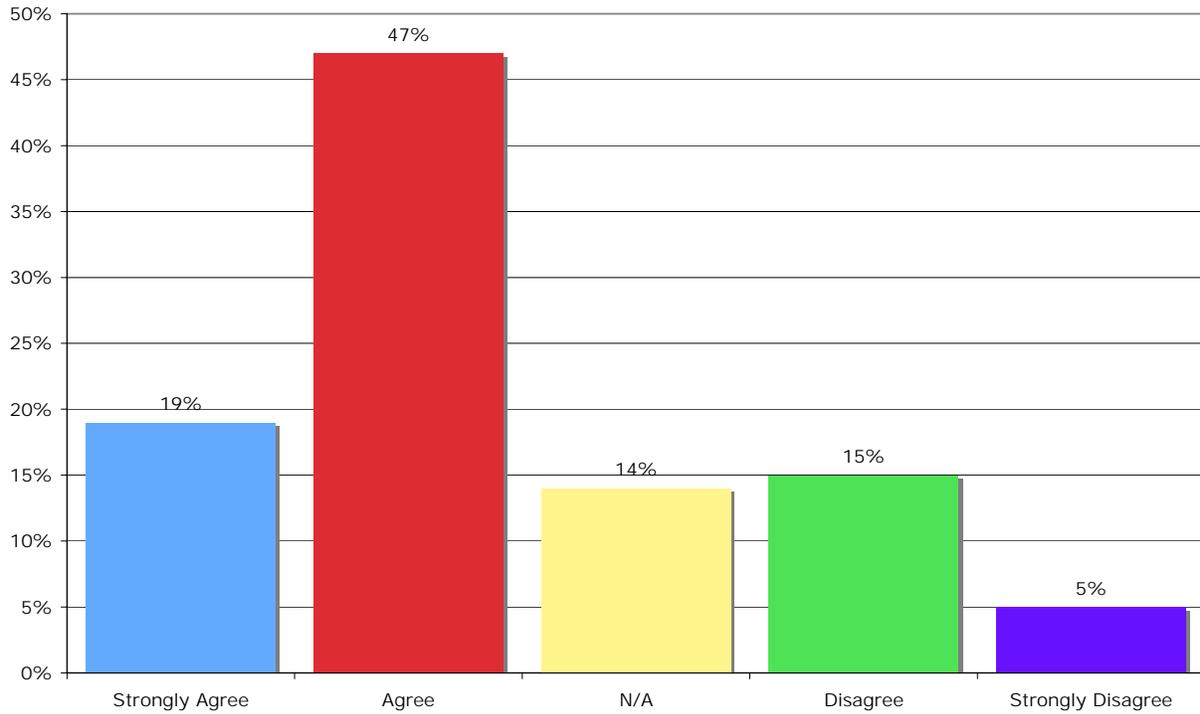
Figure 4 - Reasons given by UH students for accessing podcast material.
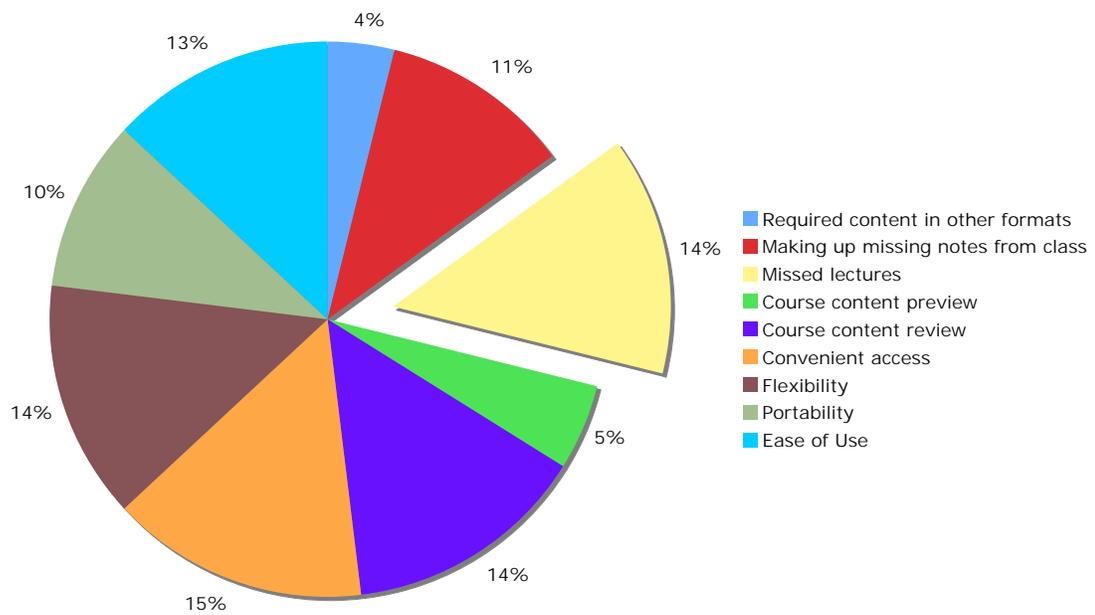
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hihh2pU9MJ:www.iste.org/Content/NavigationMenu/Publications/LL/LLIssues/Volume_33_2006_2005_/N
ovember_No_3_1/33324b.pdf+Podcasting+and+the+long+tail+Glen+Bull&hl=en&gl=us&ct=clnk&cd=1&
client=safari

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Company, Web site: http://www.nsta.org/main/news/stories/college_science.php?news_story_ID=52404

A Game-Based Summer Math Camp: Can Learning Be Fun?

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Abstract: This paper presents findings from a case study which experiments with the use of educational computer games in a summer math program to facilitate 4th-6th graders' math skills and positive attitudes toward math learning. Using observation, interviewing, and think-aloud, this study looks at learners' lived experiences with math game playing and explores how game play, learning task, and instructional support should be integrated in a game-based learning system to support an engaging, effective learning experience.

Introduction and Theoretical Background

Computer games were proposed as a potential learning tool by both educational researchers (e.g., Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Betz, 1996; Gee, 2003; Kafai, 1995; Malone, 1981; Rieber, 1996; Squire, 2003) and game design researchers (e.g., Prensky, 2001; Aldrich, 2005). Frequently-cited arguments for using computer game in education are: (a) computer games can invoke intense engagement in learners; (b) computer games can encourage active learning or learning by doing; and (c) computer games can foster collaboration among learners.

On the other hand, those who are skeptical toward game-based learning contend that the effectiveness of computer games on learning is still a mystery. Several major reviews on educational games (Dempsey, Rasmussen, & Lucassen, 1996; Emes, 1997; Harris, 2001; Randel, Morris, Wetzel, & Whitehill, 1992) indicated no clear causal relationship between academic performance and the use of computer games. A common skepticism on using computer games for learning purpose lies in the lack of empirically-grounded framework for integrating computer game into classrooms. As Squire (2003) discovered, bringing a computer game into classrooms may raise as many issues as it solves. First, playing games doesn't appeal to every student. Then, students may be distracted by game playing and thus, not achieving the learning goals (Miller, Lehman, & Koedinger, 1999). Furthermore, students may fail to extract intended knowledge from a complicated gaming environment, hence fail to learn (Squire, 2003). Finally, game design researchers such as Smith and Mann (2002) are worried that making games where the objective is to facilitate student's learning will risk sacrificing the game part along the way, hence the very argument for using games for learning, that they are fun, vanishes along with the game part. Therefore, the key question still keeps misty: Will computer games really foster an engaging, effective learning experience in classrooms?

Limited studies were conducted to answer the above questions. A recent review of game-based learning research indicated that most gaming studies focus on *learning conceptually*, such as general reasoning, creativity, and decision making, which does not demand special knowledge of subject area (Bateson, 1972). In other words, many current games used for facilitating learning lack connection to curriculum in school. The content in these games are too general and inappropriate for fulfilling existing curriculum (Egenfeldt-Nielsen, 2003).

Certain researchers, such as Barab et al. (2005) and Squire (2003), did start to examine what happens with students and their learning processes in game-based curricula of mathematics, science, and history. They either applied design-based research to understand and improve a game design for instructional use, or customized a commercial game for classroom application. A common thing they shared is: the games used are microworlds or simulation games. As a complement to their works, the present study focused on drill and practice games. Two reasons underlie the selection of drill-and-practice game type: (a) computer games have been used in education primarily as tools for supporting drill and practice, yet little research has been done on the effectiveness of these games; (b) in comparison with simulation games, drill and practice games are easier to be integrated into a traditional curriculum (Squire, 2003).

Therefore, this study intends to investigate the application of drill and practice computer games in a summer school math program, by focusing on these research questions: (1) What are students' lived experiences in game-based learning setting? (2) How is the interaction between students, game, and classroom environment?

Methods

The study is a phenomenological examination of students in a game-based learning setting. Using phenomenology, the study is intended to "construct an animating, evocative description" of participants' game playing experiences and perceptions (Van Manen, 1990, p. 19). Data were collected in multiple forms – in-field observation, document analysis, and think aloud verbal protocol – to achieve a data triangulation. The researcher

subsequently conducted an analysis of themes in order to explore "the deep meaning of individual subject's experiences" (Rossman & Rallis, 1998, p. 72). Based on the core themes, the research generated working hypotheses on the active interaction between participants, the gaming program, and the external learning setting.

Setting Background

ASTRA EAGLE, a series of web-based games developed by the Center for Advanced Technologies of the sampled school district, was used in this study. The games were designed to be drill-and-practice programs to reinforce academic standards for mathematics required by "Pennsylvania System of School Assessment (PSSA)," which is a standards-based criterion-referenced assessment required by all public schools in the Commonwealth of Pennsylvania. The games were developed using Macromedia Flash and will run in any recent major Web browser. In this study, eight mathematics games within the ASTRA EAGLE set that target 4th-5th students were used. These mathematics learning games contain a variety of problems to be solved, such as measurement problems, comparing whole numbers, solving simple equations, and mapping X and Y coordinates. In some games, math problems are concealed and contextualized in stories pertinent to school students. For example, in a game called Cashier, players need to play as a cashier doing math calculation of money. Differently, in other games, math problems are presented in independent screens as puzzles to be solved. For example, a game is a Tic Tac Toe board game where a game player plays against a opponent and wins by answering math questions on the cards correctly. Math questions are multiple-choice items. Each game has multiple levels. To "conquer" the lower-level unit and "bump up" to a higher-level one, students need to answer all questions of that level correctly. The more levels one conquers, the higher score he/she earns.

Wilson Elementary in the sampled school district is an academic outperforming school. The school is located in the rural area of Pennsylvania, with K-6 grades, 47% of students enjoying free or reduced lunch (namely socio-economic disadvantaged in this paper), and 92% of students being white. In the summer of 2005, the school held a math camp for students of 4th – 5th grade. Participation was voluntary. The camp was held from 10am to 12pm every Tuesday and Thursday for five weeks during June and July. In this summer math program, all participants gathered in the school computer lab, each interacting with an Internet-connected desktop and playing ASTRA EAGLE math games during 10 two-hour sessions. The researcher volunteered to be the coordinator of the program, administering and managing the operation.

Study Participants

Fifteen 4th-5th grade students were enrolled in the summer math program and participated in this research project. They were 10-13 years old, with five being socio-economic disadvantaged, 10 being girls, and all being white. Participants' pre-program school grades were collected. Their math abilities were classified into four levels – advanced, proficient, basic, and below basic. Out of the 15 students, four were advanced, six were proficient, and five were basic or below basic in math achievement. Participants were quested on their prior gaming experience and if necessary, trained to know basic computer skills, such as using a mouse to click buttons on the computer screen. At the beginning of the summer math program, all participants took one orientation session where they got familiar with the gaming environment and were trained to do think-aloud.

Data Collection and Analysis

In-field observation, participants' game-playing records analysis, and think-aloud verbal protocol were employed in the study to achieve a triangulation of data. Direct observation of the participants went through every game-playing session. Concurrently, participants were asked to do think-aloud that intends to explore their emotional situation and cognitive processes when interacting with game features, their strategies in handling math problems in the games, and the intentional or incidental knowledge they constructed. Participants' game-playing logs, indicating their on-task time and gaming scores, were archived and analyzed every week.

Observation: The researcher closely observed participants' behaviors, oral and body language, and facial expressions when they interacted with the computer program, peers, and the external environment. A semi-structured observation protocol was developed to guide the attention during observation, though the actual observation was open to any situational changes.

Think aloud: Based on Ericsson and Simon's (1993) talk-aloud method, the researcher developed a very open-ended protocol to prompt participants to report what came to their mind when they playing the computer games. Participants were asked to say whatever they are looking at, thinking, doing, and feeling, as they went about their task. Promoting questions include: What are you thinking now? Why did you do that? How are you feeling? Participants' verbal protocols were recorded by a mini-sized digital recorder. Efforts were taken to enable participants to generate a self-report of on-going actions without being interrupted or biased.

Document analysis: the computer game program recorded participants' on-task time, the numbers of math questions they had tried to solve and questions they had solved correctly, and the gaming scores they earned. These records were collected every week and coded.

Data analysis: By following Van Manen's (1990) proposition on phenomenological research, the researcher did thematic analysis to determine salient themes that stand for the essence or structures of experience. The researcher employed constant comparison of participants' responses and activities with the goal of finding the recurring themes and organizing the data into systematic categories of analysis. The statements or meaning units that emerged as possible commonalities from the data were forwarded as initial themes (Creswell, 1998) and coded using Nvivo software. The researcher then refined these themes by removing overlapping ones, capturing the main thrust of each theme's meaning, and re-examining them through member checking (Guba & Lincoln, 1994) . Through this data coding process, general themes emerged and were synthesized based on the context.

Findings and Discussion

Three general patterns on participants' experiences in game-based learning environment emerged through constant comparison thematic analysis process. These three patterns included multiple salient themes that depicted how participants, cognitively and affectively, interact with the computer educational game, peers, and the external environment.

Learning with Fun or Learning versus Fun?

When asked about their feelings toward certain computer game, participants usually stated, "It's fun" or "I feel bored, it needs too much calculation." They rarely commented about the learning values of the games, unless they were prompted. At the opening day of the math camp, they showed a lot of thrill, "so we will just play game? Cool…" But with time passing by, they realized the games were actually for learning purpose. It was at that time that quite a few participants reported being disappointed and bored:

"Oh… they are learning games." (multiple participants)

"Can we play some other games?" (Amy, 5th-grade, proficient in terms of math competency)
"What kind of games do you want to play?" (Researcher)
"Well, games that are fun." (Amy)
"Don't you think this game is fun?" (Researcher)
"Kind of. But I don't like the questions in it. I had to think hard (about the questions)." (Amy)

"If I passed the first level of this game, can I play other games on the Internet?" (Tom, 4th grade, basic in terms of math competency)

In the participants' minds, the goodness of a game would be spoiled by its learning element. This observation confirms a 2001 survey (ESA, Kirriemuir & McFarlane, 2004) on the main reasons for gameplay, namely: "87% of most frequent computer and video game players said the number one reason they play games is because its fun" (p. 5). It also explains why certain educational gaming researchers recommend "learning by stealth" – learning can only be enjoyable when it is concealed within games and thus unconscious to the learners (Prensky, 2001). In this inquiry, it was found that most of participants contradicted gaming with learning, deeming the former as *play* whereas the latter as *work* (Rieber, 1996). Therefore, when facing certain drill-and-practice math games where learning part is clearly segmented from game dynamics, the participants reacted by deeming learning component as a foe and chose to simply bypass it. As a result, wondering mouse – clicking the screen inconsiderately to move around the problems – was their frequently-observed behavior.

Wondering mouse

The document analysis of participants' gaming record indicated that for most of game players, the ratio of questions solved to questions tried was very low – one out of ten averagely, and the time taken to finish a single question was unreasonably short – usually in seconds. Such a pattern, as confirmed by the in-field observation, was due to that participants simply did wild guessing with math problems. The user response design in the ASTRA EAGLE games – using multiple-choice item – aided this wondering mouse behavior. When asked why and how they did guessing, the participants gave the following reasons:

1. A mismatching between challenge and ability:
   - "It's too difficult. I even don't understand the problem." (Jack, 5th grade, below basic in terms of math competency).

- "(Recited the question) what is the next number in the following sequence? What is the next number in the following sequence? 101, 94, 80, 52…mm…101 minus 94, that will be 7…94 minus 7, that will be 86? Or no, that will be 87…87..mm…oh, it's not 7, so 101 minus 94 is 17? Wait a minute…it is 7. 94 minus 80, is 14…oh…I am confused. It is really confusing. All right, I will just guess. Is it B? " (Ray, 5th grade, proficient in terms of math competency)

This observation is in alignment with Malone's (1981) proposition on *optimized challenge*: the game's difficulty level should be appropriate with respect to players' levels; otherwise the game won't be intrinsically motivating.

2. Guessing is fun, just like gambling

"I like guessing. Guessing is fun and I am good at it." (Mary, 4th grade, basic in terms of math competency)
"You should think about this." (Researcher)
"But it's fun. Calculation is boring."

3. Avoid cognitive-demanding task
- "I am not wildly guessing. I know it should be an answer smaller than 9. So it should be either C or D." (Amy).
- "(Interpreted the question) so it is 9 feet 3 inches minus 6 feet 7 inches. 9 minus 6 is 3. And 3 minus 7, 3 minus 7? Well, the answer should be 3 feet and inches. It should be A or B…I will try B…yeh…I got it." (David, 4th grade, proficient in terms of math competency).
- "(Recited the question) what is the next number in the following sequence, 1, 7, 31, 127? Huh, this one is easy. It is 511, C." (Jeff, 5th grade, advanced in terms of math competency).
  "How did you know?" (Researcher)
  "The ending number. It's 1, 7, 1, 7, so the next number will be ended in 1, too. Huh, I got it right, and I don't need to do calculation."
  "Are you sure this trick will always work?" (Researcher)
  "At least it works now!"

Evidently, participants tried to avoid steps that need effortful calculation and thinking. They picked up easy steps then left more complicated ones to luck. Through the game playing process, they developed some tricks to beat the game. When asked how they were doing, they said, "We are better answering the questions. We know the tricks." As observed, cued guessing helped game players earn gaming scores more easily, but didn't help them learn.

Playing without reflection

It was found that when interacting with ASTRA EAGLE drill-and-practice games, very few participants did reflection of their performance to gain lessons for future problem solving. They would attend to feelings - expressing happiness or disappointment with a failure or success in problem solving, then instantly move on. Both observation and think-aloud protocol indicated that most of participants lacked a reflection process to conduct performance analysis, new knowledge generation, evaluation, and integration, which are essential for trial-and-error learning – the major knowledge-construction format for game-based learning (Gee, 2003). Such a happening was mainly due to two reasons:

1. The games reward the player based on the total number of questions answered correctly, rather than a ratio of questions answered to questions tried. Therefore, to earn a higher gaming score, participants simply handled questions as quickly as possible:
   "(Spent one second viewing the question) oh my god, the problem is really long, too wordy. All right…(wondered the mouse and clicked one choice)…oh, I win, yeh…(clicked the *Continue* button)."
   "Oh, I got it wrong. Whatever…let's see this one (started another question)." (Sam, 4th grade, below basic in math competency)

It can be interpreted that the desire to win has twisted the participant's normal learning speed, pushed his pacing with the task, and thus cutting off the valuable reflective thinking time.

2. The feedback in the games is summative rather than informative. When one solved a problem correctly, the screen would come up with a congratulation message with hands-clapping sound effect; when one failed a problem solving, the screen would present a "you are wrong" message and indicate the right answer. No further information, such as adapted informative feedback for player's trial-and-

error learning, was presented. As a result, participants didn't get enough information to retrospect and chew on. In most times, they could only say, "Oh, what the hell… Why it's C? I don't understand."

When will one learn with fun?

In certain cases, tasks of learning and getting fun did team up. For instance, in a game called Treasure Hunt, participants needed to plot coordinates on an XY graph to locate the treasure spot. Participants' think-aloud protocol did indicate clear cognitive thinking when they searched for the spot:

> X9 Y7, X9, Y7 (repeating the question)… X is here…X1, X2, X3..X9; Y is going here, Y6, Y7. Yah, there…now I had to figure out how to get around the tree to go to Y7…got it (he was able to use the arrow key to move the shuffle around the tree and get it to the right spot) …Y7(he was checking the Y coordinate)…X9(he was checking the X coordinate)…Yeh, I found the treasure! (Sam)

As this example indicated, the participant had employed cognitive thinking steps of question interpretation, principles execution, and self-monitoring with checking.

It was also observed that game players would be more willing to employ effortful cognitive thinking when they considered the problem in hand as manageable (appropriate in difficulty level), or high-stake (solving the problem or not would decide whether they would win a game unit or not). For instance, Mary, the participant who enjoyed doing wild guessing most of the time, was able to "think about" certain questions at certain game unit because she "knew everything" about those questions. In addition, it was found that most game players were most careful in answering the last question of every game unit:

> Great, with one more question I will be able to beat Fuzzy (the fictitious opponent in the game)…(read the question slowly)… "fall down by"…so it is a factor…minus, or no, it should be multiply…15 times 5…it's 60…Um, it's not there (in the multiple choices), so I must be wrong…all these numbers are small…so, it is divide…15 divides 5…it's 3…B! Yeh! I win, I win! (Mark, 5th grade, advanced in terms of math competency)

As this verbal protocol depicted, in certain situation participants were engaged in effortful cognitive thinking, especially when they considered the question in hand as a high stake for their sense of winning.

Play-Based Communication

It was observed that collective game-playing facilitated peer communication. During every two-hour session, game players were very active in exchanging game scores, expressing feelings about the games, and in certain cases, doing social talk that was irrelevant to the learning tasks. It was noted that these communications and peer activities were mostly play-based rather than learning-oriented.

Peer scaffolding is difficult

Both observation and think-aloud protocols indicated that elaborating mental processes in mathematical problem solving was an effortful task for young participants. Without sustained press and prompting for meaning and explanation, one could not enable a 4th- or 5th- grader to give mathematical thinking elaboration:

> "It's B" (David)
> "Why? How did you get this?" (Researcher)
> "I did subtract. Subtract 5 feet 7 inches from 10 feet 2 inches."
> "Why did you do subtract instead of add, or other operations?"
> "Because…because you want to make the number small…"
> "Why? Is there any key word in the sentence telling you that you should use subtract?"
> "In the sentence, it said 'cut'".
> "I see. Then how did you subtract 5 feet 7 inches from 10 feet 2 inches?"
> "10 minus 5… and then 2 minus 7…wait, because 2 is too small, so you have to borrow 1 feet, so it's 12 plus 2, 14; then 14 minus 7 is 7, and then 9 minus 5, is 4 feet. So 4 feet 7 inches."
> "Why it is 12 plus 2?"
> "Because…"

As this conversation indicated, it took the participant quite some time and efforts to elaborate every cognitive step contained in math problem solving. Not every potential student tutor was able to do that; not every potential tutee was able to prompt for such an explanation. In consequence, peer scaffolding was not an easy happening. More often, a participant would throw his/her peers an answer directly, rather than explaining his/her mental model or problem solving process: "Just trust me. Choose A." (Mark).

Boys versus girls

Interestingly, the researcher found that during game playing, boys tended to report information related to the games, such as game scores earned, level of game units conquered, obstacles met, and tricks to handle the problems. Differently, girls spent more time exchanging feelings and attending to social communication that was irrelevant to the games. Sometimes the researcher had to interrupt those game-irrelevant talks and remind them to focus on the games. Such an observation confirmed the finding of an earlier gaming study (Greenfield, 1984) that computer game is a facilitator for social communication, and complemented Tobin's (1998) argument that boys' gaming was not simply a process of 'playing the game' but embedded in social interactions.

Quiet achiever

Among the group of game players, there were several quiet achievers. Brian was one of them. He always chose to sit in one corner and played the games by himself. He rarely talked to others during the game-playing process; neither would he proudly report his progress to the researcher, like some other kids would do. But his game-playing records indicated that he had a surprisingly high attainment. He was advanced in terms of math competency. When prompted, he could give a clear explanation of his mathematical thinking process, yet he rarely offered to help others. The researcher had tried to encourage him to join in peer collaboration, and arranged for him to sit beside the peers who could use his help. But it didn't work as expected: he still chose solitary game playing and would go back to his own corner next time. Maybe for such a quiet achiever, solitary playing is the most comfortable way to game-based learning.

Offline Learning Tools

Another interesting finding from in-field observation was that participants used offline tools to assist computer-game-based online problem solving. Generally there were two offline tool options: pencil with paper, and calculator. As observed, participants used calculator most of the time. A big reason was the limitation of work space: game playing took place in the school computer center where desk space was occupied by computers and keyboards, leaving no room for paper and pencil usage. Due to the preclusion of paper and pencil, participants at game playing missed a necessary tool that would assist math problem solving in terms of mapping multiple componential steps required by a complicated word problem. In spite of the researcher's encouragement ("You can use paper and pencil"), quite a few participants used calculator only. The exceptions were the participants with higher prior knowledge (advanced or proficient in math competency), who actually used paper with pencil more than calculator. Therefore, a question germane to game-based learning is how the management of physical, external classroom environment may assist effective learning activities, either online or offline.

Conclusion

Conclusively, this qualitative inquiry indicated that game-based learning is a systematic process that operates through the interaction between a game player, the computer game program, his/her peers, and external physical environment. Some particular educational game design and application issues, as this study reveals, should be taken care of in order to enable students to achieve an engaging and effective learning experience in a game-based classroom:

1. The connection between the challenges in the game with students' competency level plays an important role in engaging students in effortful thought processes.
2. The design of learning tasks embedded within a computer game should be an integral part of the game dynamics design, thus making learning and fun incorporated rather than conflicted.
3. User response should be designed to hinder wild guessing behavior. For example, multiple-choice items should be avoided.
4. Certain reflection-support features, such as adapted informative feedback, reflection-prompting assignment, and explicit rewards for reflective thinking, should be embedded in a computer educational game to encourage learning reflection.
5. Students should get relative training on cognitive elaboration and peer scaffolding.
6. Classroom or the learning center should be arranged to support game-based online and offline learning activities.

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Online Teaching Strategies Lived and Told: A Narrative Phenomenological Approach

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Abstract:

Granting online instructors' voices can serve as main sources of research data, this interpretive phenomenological study, based on narrative inquiry, discusses how instructors try to provide a sense of "online instructional immediacy" in the process, course design, course presentation, use of technology, and teaching interaction in totally different social, cultural, and pedagogical modes from those of the conventional classroom. The finding of this study details the online teaching strategies with which instructors strived to compensate the removal of verbal and non-verbal cues in their instruction to promote more motivated, interactive, effective learning environments. The following three overarching themes are identified and are used to describe online instructional immediacy strategies found in online instructors' practice: 1) affective interaction, 2) cognitive interaction, 3) technology adoption, and 4) course presentation and organization. The narrative findings hold promise for better online instruction humanized, personalized, caring with their shared empirical approaches. This is the first study conducted with narrative inquiry method in Web-based contexts.

Introduction

We as online educators are seeking to develop a new paradigm of online pedagogy, fitting together the pieces of a puzzle that is yet unknown. Online instructors' ways of teaching, like those of many traditional teachers, are the collections of habits determined by trial and error concerning such topics as time effectiveness, students' responses, and availability in systems. Instructors affirm or reject a segment of their pedagogy depending on whether it works in practice.

Although there has been considerable emphasis in online distance education on foregrounding the online instructors' roles and online teaching guidelines, little attention has been paid to knowledge generated by online teaching practitioners. What is missing from the knowledge base for online teaching are the voices of the online instructors themselves. Granting online instructors' voices to serve as main sources of research data, this study aimed at exploring how online instructors' personal practical knowledge (Clandinin, 1986) is shaped by their experiences in online teaching. With particular interest in social presence in online instruction, this article discusses how instructors try to provide a sense of "online instructional immediacy" in the process, course design, course presentation, use of technology, and interaction in the context of social, cultural, and pedagogical modes totally different from those of the conventional classroom due to the lack of physical presence of both teacher and student. I borrowed the construct of "teacher immediacy" from the research in conventional classroom contexts and reconceptualized this notion as "online instructional immediacy." In this study, "online instructor immediacy" is defined as pedagogical, administrative actions an instructor takes throughout an online course to increase the students' sense of human interaction, instructor presence, caring and connectedness, toward the end of successful online teaching.

A narrative account of online instructors' personal practical knowledge might help to overcome barriers which make online education fail. The ultimate aim of this study was to characterize online instructors' practical knowledge as a set of rules, principles, directions and maxims that could, in turn, inform novices' and even experienced instructors' online teaching (Oakeshott, 1962) in relation to instructional immediacy.

Background of the Study

During my dissertation journey I took a turn from quantitative research method to qualitative method. I had embarked on my quantitative research with the research question of how to compensate for the lack of face-to-face interaction from which most online instruction suffers. Initially the research design was an experimental research study to compare the perceptions and effectiveness of teacher immediacy behaviors for distance-education undergraduate and graduate students who received enhanced teacher immediacy online instruction versus those who received typical online instruction. The treatment was training of online instructors. In the process of organizing the online training materials, I discovered the shortcomings of the training items when interviewing one online practitioner. What the practitioner told me showed a discontinuity between what is recommended in research literature and what is executed in online classrooms. It also showed online instructors' ambivalence about the claims of academic research and a general lack of information about online classroom life (Cochran-Smith & Lytle, S, 1990). Many prescribed guidelines presented in the body of literature would not be feasible for online teaching practitioners. My research shifted gears, therefore, to search for teachers' personal reflective knowledge shaped and reshaped through experiences.

Theoretical Framework

Online teaching and learning is called e-learning because knowledge is electronically delivered. However, a myriad of evidence shows that online interaction needs the human touch to be effective (Boser, 2004; Palloff & Pratt, 1999; Holmberg, 1989). I focused on how online instructors conceptualize social aspects of online teaching by looking through the lens of "instructional immediacy." Two issues appear most relevant and serve as main pillars of this study. One is the importance of experience, story, and narrative inquiry. It is based on the assumption that experienced teachers possess a certain kind of knowledge, knowledge that is practical, experiential, and shaped by a teacher's purposes and values (Elbaz, 1983; Clandinin, 1986). Another pillar of this study was the notion that instructional immediacy, initially proposed by Mehrabian (1967, 1971), Andersen (1979), Gorham (1988), Richmond, Gorham and McCrosky (1987) and defined as a teacher's psychological and physical closeness, affects students' learning, satisfaction and instructional effectiveness.

1. The First Pillar for Theoretical Background:
Experience, Personal Practical Knowledge, and Narrative Inquiry

Based on Dewey's (1938) idea of education, the main focus of this study is to reconstruct online instructors' experiences to "reform knowledge" in theory and practice. Reconstruction of experiences requires meaning making. The meaning making takes place while I thread the stories of the lived experiences of online instructors, and while the online instructor participants distill their experiences via a process of reflection. Online instructors transform their experiences from mere circumstances to lived experiences with their capacity to bestow meaning, to be reflective, and to take action (Britzman, 2003). This study seizes reflections on experiences which give rise to valuable knowledge for both theory and practice.

The term "personal practical knowledge," defined and developed by Clandinin and Connelly (1988), will be used to siginify the empirical knowledge of online instructors generated by their own experiences and reflections. The term is based on the assumption that online instructors hold critical knowledge to inform the world of research and practice. Personal practical knowledge is found in the online instructors' practice.

In this study, following Bruner and Eisner, I use narrative as a means of conducting research, and as a vehicle to "organize online instructors' understanding and memories of events" in their practice (Bruner, 1986; Polkinghorne, 1988). The rationale for the use of narrative is based on the belief that narrative has extended the capacity to encompass more experiences and questions (Bruner,1986). Although experience cannot be recovered, it can be narrated. (Brodkey,1987). For the reasons mentioned above, I adopt Clandinin and Connelly's (2000) narrative inquiry method for exploring online instructors' transformative experience. Narrative inquiry is a way of understanding experience. This study is not about proving hypotheses, inventing new ideas, or writing new theories. It is a process of reconstructing

experiences (Dewey, 1938), legitimating our professional memory, and returning it to experiences as a resource for the education of professionals (Schon, 1983).

2. The Second Pillar of the Theoretical Background: Teacher Immediacy

To explore the possibility of human connection (Palloff & Pratt, 1999), and of emotional involvement and feelings of personal relation between the teaching and learning parties (Holmberg, 1989) in online education environments, the construct of "instructional immediacy" is used in the study. There is a growing body of evidence that instructional immediacy in traditional learning contexts plays a central role in how teachers increase positive learning outcomes including student affective learning (Kearny, Plax, & Wendt-Wasco, 1985), instructional effectiveness (Mehrabian, 1967, 1971; Andersen, 1979), and cognitive learning (Gorham,1988). Furthermore, instructional immediacy has been found to contribute to students' satisfaction and learning in an interactive television class (Hackman and Walker, 1990).

The Conceptual Definition of Immediacy

The immediacy construct has been developed by (Mehrabian,1969) to refer to those communication behaviors that "enhance closeness to and nonverbal interaction with another." Immediacy behaviors are behaviors that reduce the distance between people. The distance reduction can be accomplished by decreasing the actual physical proximity or by reducing psychological distance (Mehrabian, 1971a). Mehrabian (1971a, p.1) bases this conceptual framework on approach and avoidance principles. Simply stated, "people are drawn toward persons and things they like, evaluate highly, and prefer, and they avoid or move away from things they dislike, evaluate negatively, or do not prefer." The immediacy can be enhanced by increasing mutual sensory stimulation (visual, tactile, auditory, and olfactory information) and reduce distance by increasing the number of available and utilized communication channels, since "Communication channels are the means by which one conveys his thoughts and feelings to another" (Mehrabian,1971a, p.70)

A person can convey immediacy or non-immediacy nonverbally (physical proximity, formality of dress, and facial expression) as well as verbally. Nonverbal immediacy behaviors cues include: eye contact, gesture, relaxed body position, directing body position toward students, smiling, vocal expressiveness, movement, and proximity (Andersen, 1979). Particularly significant verbal immediacy cues were: use of humor; praise of student work, actions or comments; frequency of initiating and/ or willingness to become engaged in conversation before, after, or outside of class.

Instructional Immediacy in Online Education

Despite the body of evidence examining instructional immediacy for producing positive student affect and subsequent teacher effectiveness in conventional classrooms, it is important to understand that we can relate instructional immediacy to positive effect on learning and teaching in online courses, since Web-based learning creates a learning climate which is totally different from that of the conventional classroom. Recent work (Melrose & Bergeron, 2006; Baker & Woods, 2004; Arbaugh, 2001; Gunawardena, 1995) highlights instructional immediacy as a valuable means associated with student learning and satisfaction, and as a necessary component to increasing social presence and sense of community in Web-based courses. Research by Freitas, Myers, and Avtgis (1998) sheds light on the possible implementation of verbal immediacy in Web-based courses. They found that students enrolled in conventional, face-to-face classes and those enrolled in a web-based synchronous courses perceived differences in the amount and quality of (instructor) nonverbal immediacy, but not in verbal immediate behaviors.

Method

Narrative inquiry, a type of qualitative research, was used. Online instructors' experiences are a main resource for this study. The major reason to use experiences as a major resource is to seek out missing connection between academic research and professional practice. Such researchers as Schön (1987), Lynton (1984), and Brooks(1967) argue that academic research is not only separate from professional practice but has been increasingly caught up in its own agenda, divergent from the needs and interests of

professional practitioners. To find an answer to the problem of gaps between practice and theory, I adopted Schön's (1987) suggestion for research, which led this study to start not by asking how to make better use of research-based knowledge but by asking what we can learn from a careful examination of the competence by which practitioners such as online instructors actually handle their practice. Following John Dewey (1938a), Schön (1983), and Clandinin and Connelly (2000), I focus on personal practical knowledge of online instructors reflected in their experiences and embedded in their practice, in the hope that it will inform practice and theory.

The primary participants in this study included three online instructors teaching undergraduates and graduates at a large, urban four-year university in Houston, Texas. The secondary participants were volunteer students of the online instructor participants. One instructor, Dr. Parker, was a male Caucasian associate professor who had taught English classes for 33 years and 4 years in online settings. The second instructor, Dr. Raji, was a female Indian associate professor of Accounting in the College of Business. Dr. Raji had been teaching for 25 years and for 4 years in online environments. Dr. Williams was a male Caucasian associate professor of Mathematics with more than 20 years of experience in higher education; he had taught online classes for four semesters. Pseudonyms were used for the sake of participants' anonymity. This study used the interview method combined with conversations and observations. I observed online classrooms of the three instructors for the duration of the project and had occasional face-to-face meetings. This eight-month study was conducted from October 2004 to May 2005.

Result

Four themes emerged from narratives of online instructors and their students. As I was threading and interpreting the narratives in findings, I noticed that themes of narratives from each participant fell into four categories. To find a simple way to present these interwoven themes embedded in practice, I employed the four integral quadrants for instructional immediacy shown below (Figure. 1). These four categories emerged as online instructors negotiated and conceptualized their understanding of instructional immediacy in Web-based contexts. I found that effective teaching practices which enhance instructional immediacy do not only come from interaction and communication but also from integral use of other elements of Web-based instruction such as technology adoption and course presentation/organization. It is also important to see that immediacy behaviors can be derived from not only affective interactions but also cognitive interactions. In the threaded stories of my participants, I found that there are two different kinds of interaction in online communication: affective and cognitive. Affective interaction refers to the interaction that is executed for, and results from, personal attention and caring responses. Cognitive interaction refers to the interaction that is conducted for, and results in, the achievement of the content of subject matter. Affective (social) interaction opens the door to building and maintaining the relationships between students and the instructor; it can affect the level of achievement of students creating a strong and engaging learning community. However, cognitive interaction also contributes to the building of relationship with students. As long as students can feel the instructors are out there listening to them, students feel the presence of the instructor and feel higher satisfaction toward the instructors' attitudes. When students receive prompt, detailed feedback and comments, they consider instructors' actions as caring. Learning and teaching in a Web-based environment is so static on the computer screen that simple feedback from the instructor appeals to students' perceptions of teaching presence, that the instructor is out there listening to students. Although it is difficult to express nonverbal and verbal immediacy cues in a Web-based classroom, the evidence suggests that online students appreciate any form of instructor action presented during course activities, because online students expect less interaction—they anticipate the instructor will be less present than in face-to-face settings. Another phenomenon found in this study is that the immediacy approaches that instructors chose were dependent upon the size and contents of classes. With bigger size courses, instructors opted to choose collective activities rather than individual activities due to the limitation of time.

Figure 1. Integral Quadrants for Instructional Immediacy

I. Affective Interaction Individual-Interior Inter-subjective	II. Cognitive Interaction Individual-Interior Inter-subjective
III. Technology Adoption Collective-Exterior Objective	IV. Course Presentation/Organization Collective-Exterior Objective
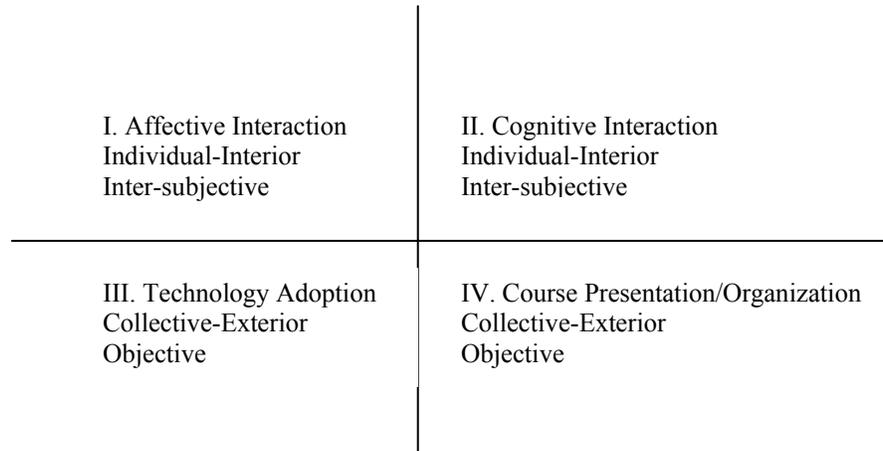
I. *Affective Interaction*

Lived strategy one: *personal attention.* The English professor, Dr. Parker, found a key drive of affective online interaction in personal attention and acts of caring (Noddings, 1984). He found that the students were "right there" with him when he approached students with personal attention.

> DR. PARKER: A woman talked about her baby being home sick for the day and so she is working around it. So I'll just say something like, 'Well I hope your baby gets better and take advantage of the time you are at home,' and things like that. Someone said they got fired from their job so they got more time to devote to the class. You know, I talk about possibilities for new jobs for him and things like that. They talk about their situation……We are just working together.

Dr. Parker expressed his sympathy, comforting students, adding caring, warm comments, and offering advice in his interaction with students. To build his personalized interaction, he started by collecting students' personal information from the beginning of the semester, through asking students to write self-introductions, then by revisiting self-introductions as students approached him with their personal issues. Dr. Parker, understanding that he could not rely on physical presence as in face-to-face classrooms, needed to seek out alternative "ways to make personal connections with students in his class." Dr. Parker's personal attention created a real sense of a virtual instructor for students so his students claimed that " he is real."

Lived strategy two: *facilitating telephone use.* To get students involved in the class and to get them back into good study habits, Dr. Williams sometimes chose the telephone option. He told students in their orientation session that they could call him if they needed to, thus providing a more accessible way to contact him. He mentioned that the telephone conversations provided answers and a certain atmosphere that email was not able to offer. He said students who were in desperate need of assistance called him. His phone conversations with students mostly related to the difficulty of understanding the material and anxiety about failing the course.

II. *Cognitive interaction*

Lived strategy three: *promptly responding to students' needs.* Dr. Parker learned how it was important for students to receive feedback from the instructors promptly. His goal was a turn-around time of 12 hours, since he was concerned that students were waiting for his replies:

> I try to get back to them within twelve hours….I make a religious effort to do that but sometimes, let's say I look at it at five o'clock in the evening and the next time I look at it is nine o'clock in

the morning so that's just not twelve hours. What I'm trying to say is that twice a day…that doesn't mean that at nine o'clock in the evening and then at noon. But twice a day, separated from each other. I try to respond twice a day.

He understood that prompt feedback was a way that he could show his care for students. Because Dr. Parker exchanged emails as his primary mode of interaction with students, he sought to narrow the time it took for him to respond to them. One of Dr. Parker's students mentioned that her teacher always attended to his students' activities, sending emails to remind them of their missed tasks. "If you don't turn in your weekly journal, then he'll email you. Whereas other online classes, they don't care whether you log in or not." Britney felt affinity for the instructor in Dr. Parker's class.

In contrast, giving prompt feedback was a challenge for Dr. Raji, who had 130 students. She felt limited and too overwhelmed to answer all emails promptly. She could not do other responsibilities because she spent too much time replying frequently to students. She decided to manage her work schedule to be more effective. She informed students how long it would take until they got email; she emailed them back every other day, trying not to have students lose a feeling of connection and begin to feel lost in cyberspace.

Lived strategy four: *facilitating chat sessions.* One of Dr. Williams's means to initiate conversation with students was synchronous virtual meetings. Every night at 9 p.m., he logged on to the online chat room and waited for his students to enter, ask questions, and talk to him. He wanted to make sure that if somebody out there needed help, they could approach him without delay. Students knew he would be there. If students needed help, they would know where to go find him. There were always regulars who took advantage of the chat session, as well as those who never used the resources offered by the instructor. Dr. Williams was oftentimes alone, with no one showing up to chat toward the end of semester. At the same time, he retained the chat session space because he wanted his students to get the most from his class.

When I asked one of Dr. Williams' students about the chat sessions, I found some very interesting phenomena. My impression of Dr. Williams's synchronous meeting was that it was not a success story, that students did not find value in it. After interviewing one of his students, I found that was misconception. Interestingly enough, though Maggie attended once in the semester, she found the synchronous chat session informative. She explained that the chat session time did not align with her own schedule with her kids. However, she logged on later when everyone else had left, and checked on what others were talking about—perhaps they were asking the same questions as she. I asked about the value of the chat session, and she suggested its continuance. Maggie, as I understand it, had experienced vicarious immediacy, feelings of closeness by witnessing interactions between one's teacher and other students (LaRose, Gregg, & Eastin, 1999) in chat rooms. In Maggie's report, I found two different kinds of participation: visible participation and invisible participation. Students who missed the chat session participated in the synchronous discussion activity by logging on after the session closed, and reading the transcript of the sessions.

Lived strategy five: *Initiating the contact.* Proactive where communication was concerned, Dr. Williams initiated contact with students, because online students have been found to be reticent in soliciting help. Dr. Williams and I, having had the experience of being an online learner, acknowledge students' reluctance in seeking help. When Dr. Williams discovered a student who was struggling, he did not want to make the student think he perceived him as someone who was doing poorly. The sensitive situation deterred Dr. Williams from attempting repeated contacts. Students are laboring away, yet instructors are hesitant to approach students with problems because of the touchy situation. However, he ensured that students knew he would be available whenever they needed him through emails and orientations. One of his students acknowledged his efforts at initiating contacts with his students. She observed that he kept track of students' works and guided students who were off task in the right direction. It is significant to see an online student crediting her instructor's actions, even when the instructor was helping other students.

III.   *Technology Adoption*

Lived strategy six: *Learning students' learning styles.* Dr. Raji felt inherent limitation in learning through the textual form in terms of understanding the content, and, in turn, she employed the technology to provide better teaching presence with more sensory stimulation. Dr. Raji learned the importance of human elements in online teaching from workshops and conferences, and agreed on the effectiveness of humanized online classes. She tried to enhance technology with the human elements by inserting her voice into her presentation slides. She wanted students to understand better with supplemental materials and to

hear the "feeling" of her instruction. Students without discipline did not take merits from the resources already messaged and predigested. She felt disappointed when she saw that some students never listened to her voice lecture, in which she had invested a great deal of her energy and time in order to promote the better understanding of materials. In addition, students with less advanced technology were prevented from benefiting from her endeavors. It seemed that these online students followed the principle of economy in learning: online students who were task-oriented sought to achieve the best grades with the least effort. There were several assumptions to examine in interpreting this phenomenon. Some students in the course did not find time to sit and listen to the explanations. It was also the question of adjustment in their learning styles. One habit of online students was to download course materials, and read them at their own convenience. She came to understand that the previously developed student learning style with written formats was more comfortable to deal with than watching PowerPoint presentation. Also the written-format tutorials are more convenient to glimpse over in their entirety. Dr. Raji learned that sometimes empowering the traditional way of learning would be superior to the innovative way of instruction. This phenomenon raised the issue of online educators' tendency to rely on the capacity of innovative technology which may not fit in the student developed learning styles.

IV. Course Presentation/Organization

Lived strategy seven: *Visual Channel of Personalization: "Virtual Physical Objects."* Dr. Parker has provided the great number of visual channels—his homepage, his welcoming message page, his pictures, and his introduction letter disclose himself and provide his self-image to student for the provision of socio-emotional materials (Short, Williams, & Christie, 1976) which lack in Web-based learning and, in turn, result in increases of the information available about the instructor's self-image, attitudes, moods, and reactions (Short et al., 1976). He posted a picture of himself mountain climbing, taken when he taught the Semester at Sea in his welcoming page to show students that he was an active man, not a bookworm in university office surrounded by the bookshelves. His picture plays a role to create his "electronic self-image and personality," of being adventurous and active,. To be more personalized, Dr. Parker's adds personal message below the picture.

> *Hi! That is me on the right, Dr. Parker, your professor for this class. I am not actually waving to you but to some other students who reached the summit of the Avacha volcano ahead of me. That was one of my adventures this summer when I taught on Semester at Sea. During the semester, I will add other images to give you a sense of my experience and Semester at Sea in general (*Dr Parker's Welcoming Message).

The style of his greeting creates the feeling of being welcomed; he establishes a warm and inviting presence (Palloff & Pratt, 2003). These visual cues have been ways to form, build, or maintain the relationship between interactants (Short et al., 1976). Through the use of a humorous picture, his homepage invites viewers to navigate more of the pages.

Lived strategy eight: *Written Channel of Personalization: "I," "You," and "Narrative."* It is common that an online presentation style should be a literary style rather than a dialogic one. Dr. Parker, however, explained that online classes should have features of the conventional classroom, where the instructors present their instruction in a conversational way. Instead, he adopts the conversational style in his writings for class Web sites, using "I," "you," and "narrative." The followings are the examples of dialogic style in his "Keeping a Journal Subject" page:

> ……Generally speaking you should write about on-line instruction, participation, and issues relating to reading and studying Shakespeare. You might relate positive aspects such as things you have learned, or what you have discovered as a result of this class. You will probably also have some frustrating experiences with the class and with Shakespeare, and I would like to hear of those as well. Or you may have some general or technical suggestions for the class which I hope you will pass along….

According to Lee (2004), due to the subjective nature of the perception process, people can create the sense of presence based solely on cognitive stimuli for imagination without receiving any direct sensory

stimuli. Dr. Parker provides "written narrative" as an example of cognitive stimuli. He provides information on how to complete assignments within a conversation, possible situations students might undergo when taking an online class, and instruction how not to fail to complete assignments. Another interesting aspect is that he creates "social space" (Palloff & Pratt, 2003), where students can express their frustration and feelings to instructors, saying "You will probably also have some frustrating experiences with the class and with Shakespeare, and I would like to hear of those as well." Furthermore, he lets them know he is ready to receive suggestions from them: "You may have some general or technical suggestions for the class which I hope you will pass along."

Lived strategy nine: *Disciplining students.* Despite limitations, classroom instruction works. Web-based instruction is new, different, and crude (Horton, 2000). To succeed with Web-based instruction, online instructors had to find ways to work with students who have been trained by traditional ways of learning. Dr Parker found that one of the mistakes students repeatedly made was that students miss reading notices posted in multiple places throughout the Web site because they do not have peers to remind them about class procedures, or professors who repeat instructions during the next class. Thus, Dr. Parker encourages his students to be more alert than they are in a traditional classroom, and walks students through the requirements, detailing what is expected. This is a step toward establishing routines of the class, a step toward the structured discipline for students who might get lost in this crude, new environment. He confesses that occasionally he does not repeat himself, instead he asks students to remind him and ask questions if anything is ambiguous. It opens a more informal, mistake-allowed atmosphere. Dr. Parker's weekly message section becomes an announcing board where students gradually establish their habits and visit to pace their learning.

Lived strategy ten: Creating momentum in communication. We learn how to behave in situated contexts and a given culture. When the momentum of interaction is established, the better opportunity is given to the relationship between instructors and students. Online instructors came to know their students through their way of discussion and through their assignments. More frequent interaction framed the learning community to communicate one another specific, personal, and contextual. Dr. Parker developed momentum in communication by supporting a discussion board and journal writing. The discussion board and journal writing developed students' habits to execute the learning events while they were participating in the events on a regular basis. This can be seen as the gradual internalization of processes initially shared between participants of the learning activity (Chang-Wells & Wells, 1993). Keeping journal entries on a weekly basis and responding to the discussion topics on discussion board—these activities function to immerse students in a routine of communication. Students write journal entries of 150 words, and turn them in every Friday. The journaling activity provided insight for Dr. Parker: he knows the students' characteristics better; students improve their writing and thinking; students develop habits of writing; also, students finish the reading assignments in order to complete their journaling.

Dr. Raji also found a relationship between the level of student interaction and their subsequent achievement. She found the link between the frequency of the interaction and student academic achievement. Facilitating the discussion board as a place of forum and problem solving, Dr. Raji had been able to make interaction flow in her online class. With organized monitoring mechanism, a teaching assistant or Dr. Raji responded in a timely manner to posted questions. In doing so, students would know this was the place they could turn to any time they had questions. The instructor could read what material caused problems, which learners needed more explanation, who was active, who was reluctant or absent, what their expectations were, and so on. It made the online classroom more visible, which made effective intervention possible.

Dr. Williams notices that nontraditional students who have not been exposed to online environments or have not taken traditional courses for a while lack the sense of rigor and intensity necessary of online students. Students enrolled in face-to-face classes have more opportunities to feel pressured to finish their work by hearing the instructor repeat reminders aloud, and by observing their peers discuss and prepare assignments. Talking to peers about the assignment and their work process also provides a sense of urgency to traditional students in regular classes. This is the pressure arising from their learning communities. According to Dr. Williams, online students lack the support from instructors' physical messages and the pressure from learning communities.

Dr. Williams mentioned the use of a session in a chat-room, which works as a virtual synchronous classroom. He explained:

Well, one solution is to make them do something at a certain time. For example, make them enter the chat room for a class discussion at a certain time so that it's like being in class. That way they

get involved. And tell them that you're going to notice if they're not there, you know, and it may affect their grade. That way it's more like being responsible for being in class at a certain time, and so they have a little more—there's a little more urgency, I think, for them. That's one way to do it.

Dr. Williams uses the chat session to impress on his students the habit of attendance; he also monitors students to see if they are keeping up with the learning events. He believes these kinds of actions possibly create a sense of urgency about completing assignments.

Discussion

The main findings of this study suggest that online instructor immediacy could and should be enhanced in the areas of instructional design of courses, interaction with students, learning activities, and learning materials. In addition, the methods of creating online instructor immediacy should be adapted to the characteristics of Web-based culture, online students, content area, and students' learning styles. Through the presentation and analysis of the online practitioners' threaded stories, this study illustrates the instructors' approaches to enhance instructional immediacy: synchronous virtual meetings (e.g., chat sessions) and asynchronous virtual meetings (e.g., discussion board), real-time handwriting with voice-over presentation, the images of the instructors, caring interactions, prompt feedback, emails, instructor-lead instruction, and the like. Online instructors tell us that online instructor immediacy in a virtual world is not far from where we are. As he made clear, he is not executing an innovative, cutting-edge way of teaching online, but a more personalized, structured, and caring way of "working together." He found that the online learning communities were smoothly moving toward success when we learned how to "work together."

Web-based environments, where the instruction is delivered electronically, are new to both learning and teaching parties so that Web-based environments call for human adjustment. Dr. Williams, who has been a traditional teacher for more than 20 years, relied on reading and interpreting students' visual and verbal cues. Online, however, he could not receive any of those cues. The lack of physical cues caused Dr. Williams to fail to determine to what extent students understand his instruction. As a result, he felt frustrated and oblivious of the state of their learning. Therefore, he decided to understand students by monitoring the chat session where students synchronously communicate like in a class. His methods of understanding students have since been adjusted. The adjustment was also required for students' learning. However, students' study habits oftentimes do not translate well in the new environment. Even though Dr. Raji offered beneficial voice-over PowerPoint presentations, not many students took advantage of the course resource provided. Students, it appears, do not easily learn how to adjust their learning style and make the transition from a traditional structure to a "free" and self-paced structure (Shih, 2002).

Online educators should recognize that the online environment calls for *more* presence from the instructors. It is easy to fall into the illusion that expensive technology could solve all pedagogical dilemmas and lead us to instructional success. However, for online students who are mostly task-oriented, who are not up-to-date on technology, and who lack the time to attend class on campus, the use of time-consuming technology is not appealing. Well-organized mechanism of classes makes students keep up with the course modules and forces them to learn; they successfully address students' abilities to procrastinate.

Dr. Parker repeatedly emphasizes that the class size is critical to the success of online education. He asserts that if an online instructor has more than 30 students, there is no way he/she can create a personalized online class with prompt feedback, a caring relationship, and knowledge of the students, all of which are key to building a learning community and online instructor immediacy.

I learned that online instructors needed time to reflect on their practice. After finishing my interviews with participants, I asked them how my interview influenced their thinking or beliefs on online teaching. They said my interview questions caused them to think about issues which never occurred to them. Their effective teaching takes shapes when instructors filter their professional development experiences through their reflection on mere, unconscious, and tacit knowledge in practice.

Conclusion

American higher education has long struggled with the "right" model for facilitating this kind of connection between faculty and students. The findings of this study provide online educators with instructive models of the teaching and guidelines for humanizing and enhancing instructor immediacy in a Web-based environment, and, in turn, have helped bridge the gap between the guidelines for online

teaching and the enactment of online teaching, by providing detailed narration of the teaching process. O'Donnell (1998) states that technology can be dehumanizing and distancing, emphasizing on the value of the personal contact that motivates, ignites, and guides learning. Keegan (1986) also claims that distance education has to compensate with non-aural language. Many instructors and learners fear that with Web-based instruction they will lose the human touch of classroom instruction (Horton, 2000). There is a widespread belief that the lack of face-to-face contact means that distance learning is impersonal (Kubala, 1998). To address the concerns related to dehumanization and impersonalization of online education, the findings in this study offer both possibilities to act on and issues that need to be considered in building instructional immediacy in online education. My three online practitioner participants offered us pathways that suggest, but not dictate, better ways to proceed with online education. Now it is time to consider how we, as online educators, can learn from their knowledge derived form their online teaching experiences and how we can address the issues with which they struggled, not only at the individual level, but also at the institutional level.

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Animal Investigator: Designing a Web-based Problem-Solving Environment for Scientific Knowledge Generation

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Abstract

This study proposes a web-based problem-solving environment, *Animal Investigator*, for improving students' knowledge generation in a scientific context and for enhancing students' problem-solving skills in an ill-structure problem context. The design of *Animal Investigator* is based on the two cognitive processes related to the scientific knowledge generation for adolescents: classification and hypothesis generation. Particularly, both processes are considered as important problem-solving skills which students need to solve unfamiliar, real-world problems. The *Animal Investigator* environment allows students to be involved actively in two training sessions and ill-structured problem-based learning as they personalize the learning context. To evaluate the design usability for young adolescents, age twelve, two surveys were conducted on twenty-eight sixth grade students in Korea who had completed the classification of animals units in the spring semester. The students completed two surveys after using the *Animal Investigator*: Constructivist Internet-based Learning Environment Survey for Science (CILES-S) and Intrinsic Motivation Inventory (IMI). Future directions include using the *Animal Investigator* for research on hypothesis generation skill development in ill-structured problem solving and learner's scientific knowledge generation skill development.

Introduction

Over the past decade, we have witnessed a dramatic change in opportunities for computer-based learning in education theory and in school (Crooks, Verdi, & White, 2005). We have developed theoretical foundations to support the development of computer-based learning environments. One of the cruxes in these theories in developing a tool is constructivist perspective toward knowledge construction. Constructivist knowledge is understood as actively being built up by the subject, who uses adaptive cognition in the external world, not the discovery of an objective external reality (von Glasersfeld, 1988); that is, knowledge is made, not acquired (Phillips, 2000). A constructivist view has led to a reconsideration of epistemology for teaching and for learning scientific knowledge acquisition in science education (Lawson, 2003). For example, Staver (1998) stated, "For constructivists, observations, objects, events, data, laws, and theory do not exist independent of observers. The lawful and certain nature of natural phenomena are properties of us, those who describe, not of nature, what is described" (p. 503). From this perspective, knowledge is temporary, developmental, non-objective, internally constructed, and social and culturally mediated (Fosnot, 1996). These features reflect the process of knowledge construction and acquisition. In science education, it is fundamental to progress from specific hypotheses generated during observation and research of an observed phenomenon to informed theories in order to construct scientific knowledge. Given any science curriculum, the hypothesis generation must be introduced as a crucial science-learning activity (Klahr & Dunbar, 1988; Lawson, 1995). The other scientific process needed to generate knowledge is classification, which means to identify patterns to make a decision about a group of correlated features. Classification depends upon the characteristics of its constitutive elements and the various ways in which they interact (Butos & Koppl, 2003). In a classification process to develop knowledge, a critical strategy is a hypothesis generation (Bruner, Goodnow, & Austin, 1956). Both strategies for generating knowledge are also considered as fundamental strategies to solve problems, which students need to use in order to solve unfamiliar and real-world problems. In terms of both strategies that generate knowledge, we may strengthen a learner's problem-solving skills in an ill-structured problem context. To support this research, a computer-based learning environment (CBLE) is considered as an environment in which students can participate in challenging problem-solving. CBLE have the potential to enhance learning about complex topics (Azebedo, 2005; Azebedo, et al, 2005). In order for CBLE to facilitate a student's learning,

Azebedo (2005) asserts that these CBLEs have to have effective self-regulatory skills in order to control the learning phase and time, to access multiple representations of information, and to make choices about non-linear multiple representations (Azebedo & Cromley, 2004). The purpose of this research is to design and implement a CBLE, *Animal Investigator* (AI), and to enhance scientific learning processes across various contexts.

Design of the *Animal Investigator*

Program description

"*Animal Investigator*" is a web-based learning module. The "*Animal Investigator*" provides young-adolescents-level (12-15 years) students a guide for the purpose of supporting learner's knowledge generation activities for enhancing strategies: hypothesis generation and rationalization in classification. *Animal Investigator* also created to encourage students to become independent learners and to develop new learning strategies by their own regulated function, metacognitive strategies.

In the main menu, there are four phases of *Animal Investigator* module: "Functions," "Investigation," "Classification," and "Problem solving."

The *Animal Investigator* starts with a letter as an example in order to understand the goal of the program (Figure 1). Then, the learners go to a short tutorial and manipulate buttons at the bottom, which is a main menu for all of the steps of *Animal Investigator*, including system help, a scaffold for facilitating metacognitive thinking process, a scaffold for supporting their training process as a function of expert support, a notebook to review learners' memos and classification outputs, a scratch pad for writing their thoughts, ideas, and information, and a menu program menu (Figure 2). In the letter, the learner's name is shown on the screen, which will increase their involvement and absorption. Cordova and Lepper (1996) argue that a display of the user's name on the screen can personalize the learning context and increase his or her motivation.

Two of the trainings for the students who participate in the program involve the teaching of metacognitive strategies during locating, analyzing, selecting, evaluating, and integrating information from sources, and include the teaching of strategies to improve hypothesis generation in classification, because both competencies are considered as important problem-solving skills in an ill-structured problem-solving environment. After learning the two main training sessions, students then solve an ill-structured problem in the problem-based learning stage.

Stage 1: Investigation
In the first training, "Investigation," learners begin seeking and using given information through the training situation. Learners acquire information from the text and pigeon photos in order to answer open-ended questions. Learners who follow the functions module select the next phase from the main menu at the top to start their first training. Before starting the main training, the question of describing a bird is given for the learner to activate their prior knowledge. The learner is asked three questions to activate her relevant knowledge. For example, one question may be as "describe a bird precisely you remember." When learners submit their answers by clicking a gray submit and begin button, the main screen of the first training is presented in a linear arrangement, and learners can access each button in a nonlinear manner to find an appropriate explanation towards receiving new questions. There are seven chunks of information about a pigeon family. Learners can click buttons, which are information chunks based on their interests. There are no required numbers of correct answers, but they need to seek and to analyze the appropriateness of the questions in order to rationalize their thoughts (Figure 3). From this training, students begin to use cognitive facilitators, the scratch pad, the notebook, and metacognitive scaffolds and strategic scaffolds buttons at the bottom. In using these facilitators, learners in both training sessions, can utilize their functions to help cognitive processes like memorizing, reviewing, summarizing, comparing, hypothesizing, and making decisions. To overcome young adolescents' limited cognitive capacities such as working memory and prior knowledge, it is necessary to facilitate their learning process by these means.

Stage 2: Classification
In the second training, learners are faced with a more complicated problem environment characterized by uncertainty. There are eight sparrows which are named "bird." There are no clues by which 6th grade students can identify the exact name of the birds. Learners can analyze the given materials according to six parts of information, such as general identification, distribution, measurements, leg features, bill features, and tail features. Eight

sparrows from four species, Calcarius Mccownii (bird 1), Calcarius Pictus (bird 2), Emberiza leucocephalos (bird 3), Emberiza Citrinella (bird 4), Zonotrichia Albicollis (bird 5), Zonotrichia Atricapilla (bird 6), Pipilo Chlorurus (bird 7), and Pipilo Erythrophthalmus (bird 7), have distinctive attributes among the sparrow family (Byers, Curson, & Olsson, 1995; Beadle & Rising, 2002). Before beginning this training, students participate in the tutorial session to glance at processes and facilitators related to the training. In order to classify birds, students must engage in a variety of materials. They should learn about each bird from the materials, and should search them for possible criteria which overlap with the features of birds. Students gather evidence to support their possible criterion by exploring the materials (Figure 6). Finally, when students are ready to allocate birds in terms of their criterion, they will type their criterion (called "rules" for the students) and rationalize their criterion using the location of evidence, which is located at the top of each material (Figure 5). After rationalizing the criterion, students type each attribute in the boxes in the middle such as "read head" or "long hind craw." Students then start to drag and drop each bird according to each attribute. There is no limit to the generation of their criterion and attributes. Students can go back to the analysis phase at anytime to review the target bird's information and to observe their pictures. When students are satisfied with their criterion and allocations of birds for each attribute column, they click on the "add/save" button to generate more classification for the given birds. Whenever students need to review their whole classification outcomes, rules, reasons, and allocated birds, they can click the "review" button to check all at one time using the notebook facilitator, which has two functions: reviewing memos and classifying outcomes. When students complete their classification to their satisfaction, they click on the "complete" button. Students then are awarded an *Animal Investigator* Certificate from a virtual coordinator (Figure 7).

Stage 3: Problem-Based Learning
Finally, students are encouraged to attend a mission as an *Animal Investigator*. Students encounter a list of news articles concerning a virtual country, Atlantis (Figure 8). In order to gain a better understanding and make a decision about a problem, students analyze articles and report their thoughts about what they have to know in the mission. The problem situation as the follows:

> *Animal Investigator*'s country and the Atlantis government have full diplomatic relations. *Animal Investigator'*s country is interested in the future development of oil and gas near Atlantis Bay. Thus, both countries have established an official agreement about oil and gas extraction. An oil spill occurred at Atlantis Bay because an oil tanker hit a reef in Atlantis Bay. *Animal Investigator*'s country has decided to dispatch a special team to help clean the oil spill as well as to help rescue animals harmed by the oil spill. The role of *Animal Investigator* in this mission is to help allocate animals harmed by the oil spill to appropriate local animal shelters.

There is a "message" button to describe the problem statement for the students' mission (Figure 9). Writing the problem statement is encouraged so students will participate in the ill-structured problem. In this step, learners are faced with an ill-structured problem that required them to decide if there is a problem. Jonassen (1997) asserts that the ill-structured problem may not appear directly or may be hidden. The uncertainty of an ill-structured problem causes difficulty for the learner solving the problem. In terms of submitting their response about asking what mission is from their advisor, their mission begins by their advisor informing them, and by the program showing icon bars (Figure 10). From this moment, they play as an investigator who examines harmed animals. As with the previous training, students meet with anonymous animal – a sea turtle, a bottlenose dolphin, and a sea gull - without their names appearing on the screen. These are the animals assumed covered with spilled oil in Atlantis Bay. The *Animal Investigator* starts to search for information using the animal information button (Figure 11). Ultimately their goal is to allocate each animal to local animal shelters according to each animal's conditions and biological features (Figure 12). To analyze the conditions, students examine each status report and features describing each animal. To type final decisions for each animal, students should enter three parts of a response: animal identification and rationale, new information from the investigation activity, and allocation of each animal and rationale based on information. In this stage, students can also use cognitive facilitators like they do in the previous trainings.

In the *Animal Investigator*, there are five animals, pigeons, sparrows (8 species), turtles, dolphins, and gulls. These animals are selected from the Korea sixth grade textbook and two Texas sixth grade science textbooks after analyzing the unit on animal kingdom and classification. The problem context of the oil spill case and the animals' statuses were developed based on three reports including oil spill cases and animal damages due to oil spill incidents.

Figure 1. Introduction and Prompt
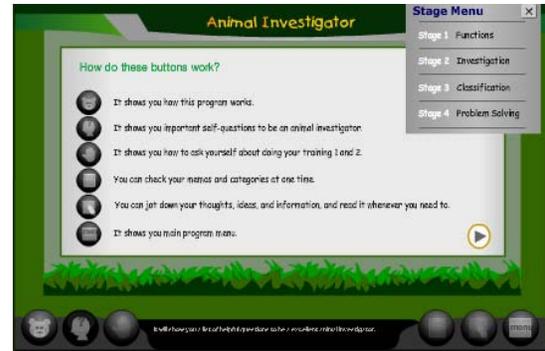
Figure 2. Program Tutorial and Menu

Figure 3. Phase 1: materials
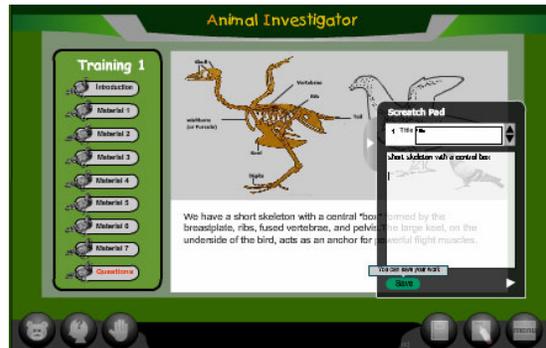
Figure 4. Phase 1: Scratch pad

Figure 5. Phase 2: Room for Classification

Figure 6. Phase 2: Room for Analysis

Figure 7. Phase 2: Certificate

Figure 8. Phase 3: e-News lists

Figure 9. Phase 3: Message

Figure 10. Phase 3: Investigation

Figure 11. Phase 3: Analysis of Animal Shelters

Figure 12. Phase 3: Allocation of Animals

Design Principles of *Animal Investigator*

Animal Investigator (AI) is a web-based problem-solving environment relating to animal classification. Our basic approach to supporting activities that generate scientific knowledge can be summarized by three program design principles: First, we focused on the classification process to enhance classifying animals.
Second, we revolved around the hypothesis generation process as an important strategy of classification in order to design facilitating functions to promote generating hypotheses on "*Animal Investigator.*" Third, we designed the metacognitive scaffold to serve as scaffolding agents. In addition, there are more design features as follows:

- Making scaffolds so learners check the problem solving process:
- Making the most iterative interface for young adolescents: the iterative structure is a design component to be considered in the web-based learning environment in order to decrease cognitive overload in working memory (Kim & Pedersen, 2005), as well as to generate criteria and attributes as much as learners can. Particularly, young adolescents do not have enough working memory capacities to hold much information and use metacognitive strategies at the same time. One of the design considerations, particularly for classification and ill-structured problem-based learning, is structure that easily iterate the learning process.
- Motivating with attractive visuals to motivate learners: In the process of hypothesis generation and classification, learners often show that they just conducted very limited numbers of trials to confirm their activities (Bruner et al., 1956). Young adolescents need more motivation in order to overcome this issue.
- Exposing students to alternative criteria and attributes improves their hypothesis generation process
- Making attendance a meaningful context (i.e. training courses to be an *Animal Investigator*) so that it requires the students to be energetically in the activity, and
- Making them feel as young experts in real-world problem in the Problem solving phase

Most of the above is achieved within *Animal Investigator* modules, but some of design principles might be reconsidered to increase learner's performance according to learner's feedback.

Development of *Animal Investigator*

This program was developed using Adobe Flash professional 8 and Photoshop CS, which also, were used to write the user data on the server by PHP and MySql database. Instead of authoring tools for developing educational software, Adobe Flash was used because it is a flexible, powerful, and integrated development environment that overcomes the limitations of the authoring tool in terms of vector graphics and scripting language like JavaScript, called ActionScript. With regard to the other development tools, learners will generate lots of data while they run the program because of the iteratively designed program environment that supports learners' activities. The data created by learners is shared in the time stamps of a learner, his responses to questions, rules and attributes in the classification stage, and more. Thus the database system and the server-side script employed effectively store these learner's data. As we predicted for the user data, twenty-eight students generated 870 records during sixty minutes in this pilot test. Each piece of data has specific codes on the records in order to recognize the meaning and select easily from database system.

Pilot Evaluation

The *Animal Investigator* was evaluated by sixth grade students in Korea to explored students' preferences about various aspects, such as Interest/Enjoyment, Ease of Use, and Epistemological Awareness. Thus we collected data to evaluate the design of *Animal Investigator* from two surveys - Constructivist Internet-based Learning Environment Survey for Science (CILES-S) and Intrinsic Motivation Inventory - and students' comments.

Constructivist Internet-based Learning Environment Survey for Science (CILES-S). In terms of CILES-S, students' preferences for the constructivist Internet-based learning environment were measured to collect data, with the author's permission. CILES-S developed by Tsai (2005) was developed originally by Chuang and Tsai (2005) and Wen, et al. (2004). A detailed description of the four scales which are appropriate for the *Animal Investigator* environment is presented as the following: Ease of use measuring perceptions to the extent to which students prefer the environment and find easy to use, reflective thinking scales which are measuring perceptions to the extent to which students prefer to have the opportunities to promote critical self-reflective thinking in the environments, critical judgment scales assessing perceptions to the extent to which students prefer to have opportunities to critically evaluate information, and epistemological awareness scale assessing perceptions to the extent to which students prefer to have opportunities to explore the value, source, merit or nature of knowledge (Tsai, 2005). It is administered in order to assess the degree to which the principles of constructivism have been implemented in a program or course. All of these scales were designed to investigate students' preferences towards constructivist Internet-based learning environments. Original CILES-S was modified to the voice for the sixth graders for this study because the questionnaire was designed for use with high school students and then translated into Korean. The overall scale appears to be consistent internally with an alpha coefficient of .92.

Student's mean scores on the four scales of the CILES-S show the twenty-eight students average item scores and standard deviations on the four scales of the CILESI-S, Table 1. Students show high scores across four scales: Ease of use (*M*= 3.36), Reflective thinking (*M*= 3.25) Critical judgment (*M*= 3.50), and Epistemological awareness (*M*= 3.31). Students' scores on the Reflective thinking scale (*M*= 3.26) were relatively lower when compared to those of other scales.

Table 1. Descriptive Statistics for the CILES-S (n = 28)

Scale	No. of items	Item mean	S.D.
Ease of Use	5	3.36	.71
Reflective Thinking	5	3.25	.87
Critical Judgment	4	3.50	.76
Epistemological Awareness	5	3.31	.81

We also compared between male students' (n=11) and female students' (n=17) preferences for *Animal Investigator*. The results of the pilot study do not show significant differences between them on the each scale. As shown in Table 2, the results of the present study show that male students show higher preferences on the Ease of use scale but with no significant difference. On the other hand, the results of the reflective thinking, critical judgment, and epistemological awareness scales show that female students show a slightly higher than male students.

Table 2. Gender comparisons on the scales of the CILES-s (n = 28)

Scale	Gender	Mean	S.D.	t-value
Ease of Use	Male	3.55	.81	1.10 (n.s.)
	Female	3.25	.63	1.34 (n.s.)
Reflective Thinking	Male	3.11	.69	-.68 (n.s.)
	Female	3.34	.97	-.63 (n.s.)
Critical Judgment	Male	3.39	.77	-.63 (n.s.)
	Female	3.57	.77	-.63 (n.s.)
Epistemological Awareness	Male	3.27	.93	-.22 (n.s.)
	Female	3.34	.75	-.21 (n.s.)

Note: n.s.: not significant.
male n = 11, female n = 17.

Intrinsic Motivation Inventory (IMI) Students (n = 13) responded to the Intrinsic Motivation Inventory (IMI) in order to determine the satisfaction of the *Animal Investigator*. Intrinsic interest and satisfaction are emotions assumed to characterize intrinsic motivation (Deci & Ryan, 1985). Originally, the IMI contained 16 items of several headings, including seven subscales of intrinsic motivation: interest/enjoyment, perceived competence, effort/importance, pressure/tension, perceived choice, value/usefulness, and relatedness. The tone of the IMI questions were modified to be the suit the target students, sixth graders, and then translated into Korean. All responses were indicated on a 7-point Likert scale that ranges from not at all true (1) to very true (7). Learners individually completed the web-based IMI for the *Animal Investigator* environment after completing their activity. To examine students' intrinsic motivation for using *Animal Investigator*, we selected three scales from the original seven: interest/enjoyment, perceived competence, and effort/importance. These items on the three scales are considered relative and helpful is improving *Animal Investigator*. Thus, average scores were calculated for the questions in the three subscales. The reason for fewer subjects than CILES-S is the lack of performance time using the *Animal Investigator* for eighty minutes (actual performance time for two training was about sixty minutes because of conducting CILES-S and IMI surveys). The overall scale appears to be consistent internally with an alpha coefficient of .87.

To analyze students' intrinsic motivation toward Animal investigation, students' mean scores on three scales of the IMI were reviewed. Thirteen students' (male n=8, female = 5) average item scores and standard deviations are on the four scales of the IMI, as presented in Table 3. Most of the average scores on the three scales show high scores except perceived competence (M = 3.54). Particularly, an item on the perceived competence scale, "I think I did pretty well at *Animal Investigator* activity, compared to other students," shows a lower average score (mean = 3.38). On the other hand, in the same scale, an item, "I was pretty skilled at this activity" shows a higher average score (M = 4.0).

Table 3. Descriptive Statistics for the IMI (n = 13)

Scale	No. of items	Item mean	S.D.
Interest/Enjoyment	7	3.90	1.02
Perceived Competence	6	3.54	1.23
Effort/Importance	5	4.32	.95

To analyze the reason for lower average scores on the perceived competence scale, we compared male students' (n=8) and female students' (n=5) motivation for playing *Animal Investigator*. Even if the number of the subject is small, total thirteen, there are significant differences between female and male students' responses on the scale. As presented in Table 4, the results of the gender comparisons shows that female students are 1.03 point lower than male students on the scale.

Table 4. Gender comparisons on the scales of the IMI (n = 13)

Scale	Gender	Mean	S.D.	t-value
Interest/Enjoyment	Male	4.23	1.07	1.563 (n.s.)
	Female	3.37	.76	
Perceived Competence	Male	3.90	1.47	1.375 *
	Female	2.97	.30	
Effort/Importance	Male	4.45	1.08	.588 (n.s.)
	Female	4.12	.78	

Note: *p<0.05.
n.s.: not significant.
Male n = 8, female n = 5.

Student Comments   With two surveys, students wrote comments about more detail comments for the next version of *Animal Investigator*. The following comments are summarized with regard to the interface design and contents: 1) many students suggested that providing a more interactive main menu to go back and forth between stages would be helpful, and 2) some students pointed out that the contents in the classification made it somewhat difficult for them to find criteria. In the overall satisfaction, 3) several students are satisfied with the various sources, overall interface, and activities in the *Animal Investigator,* and 3) some of the students commented that this program will be helpful to their learning.

Discussions / Conclusion

In this study, we explore students' preferences toward students' problem-solving environments designed to attain the goal: a tool to enhance learners' knowledge generation using two strategies, classification and hypothesis generation. In terms of the results of students' scores (M = 3.31, n = 28) in the Epistemological beliefs scale on the CILES-S, *Animal Investigator* can play a role as a learning environment to support students' learning activities for knowledge construction. With regard to this relationship between learning environment and knowledge construction, Tsai and Chuang (2005) have asserted that there is an interplay between students' epistemological beliefs and learning preferences for learning environments, as well as a fundamental step for exploring learner's learning processes and outcomes in the environment. However we hold up evaluating whether or not *Animal Investigator* influences students' learning outcomes, especially ill-structured problem-solving contexts, future research is planned. Future research on the topic will expand further our understanding of the process of knowledge generation, strategies to support the process, and the tool, and environments to facilitate the process.

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A Model Program to Teach Animation as an At-Risk and Gang-related Intervention Strategy

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Abstract

The purpose of this paper is to present a model media and animation program for minority students to build stronger connections between theory and practice. New technologies in the animation field enable students to expand their educational goals as they learn reading, writing, math and science around the animation curriculum. Currently, a predominantly Latino community in California is setting up a model program to teach animation as an at-risk and gang-related intervention strategy.

Introduction

"As technology continues to be an important part of children's lives outside of school, it is shaping their expectations of what school will be like. The National Education Plan intends to explore this trend and the implications for creating digital age educational opportunities to match the expectations of digital age students" (Paige, 2003). The purpose of this paper is to present a model animation program for minority students in media to build stronger connections between theory and practice. New animation technologies enable students to expand their educational goals as they understand the relevance of learning reading, writing, math and science around the animation curriculum.

Need for Program

Only 68 percent of students entering high school earn a standard high school diploma. Another 16 percent eventually receive an alternative diploma, such as a GED. (McCabe, 2000) A longitudinal study by the U.S. Department of Education offers information about drop out rates: "African-American and Hispanic students are less likely to be enrolled in a college preparatory track (25.7 % and 22.6% respectively) than either Asian (42.1%) or white (34.1%); in 2000, drop out students were defined as: "24% whites, 21% Asians, 43% Native Americans, 45% African-American, and 47% Hispanics students" (Institute of Education Sciences, 2002). Other students who needed the most extensive remediation (more than two semesters of reading) were six times less likely to earn a BA than those who required no remedial work (Adelman, 1999).

Animation Curriculum

The animation curriculum is a four to six year course of study that is engaging, interactive, diversified, and based on the multiple intelligences model. Each learning module is relevant and supported by state standards, which is easily adaptable for each state in the union as the virtual high school expands its services. The bonus to the model is that the content is designed for an online delivery system, which increases access and equity for minority students and teachers.

The flow of the animation curriculum provides concrete learning outcomes and skill sets at each level of the major concepts overview for 7 -12th grades. Art teachers serve as online mentors, and students focus on real world scenarios in the lesson modules as they build a work portfolio for future employers. Figure 1 shows teachers learning how to use the animation curriculum from drawing skills to computer technology integration at a private workshop. (Lightfoot, 2006)

Figure 1. Teachers at an animation workshop.

School-to-Work Career Path

Application of animation models using digital media will provide motivation for teachers to integrate technology into cross-disciplinary modules matched with supplemental state- approved textbooks. In order to demonstrate mastery of curricular standards, a student will be able to demonstrate critical thinking skills during lessons, engage in community service activities, and present an electronic portfolio for graduation requirements. Animation is integral to leading areas of employment over the next 20 years in these fields:
1. Wireless games, jokes, cartoons, greetings on mobile phones
2. Commercials and advertisements
3. Video Games
4. Entertainment: high production movies
5. Educational software and "edutainment"
6. Web page design
7. Architectural fly-over and walk-through
8. Court re-enactment for criminal cases
9. Insurance claims and accident simulations
10. Flight simulators and pilot training
11. Aircraft construction and planning
12. Military tank training and war games
13. Medical field-virtual surgery for doctors
14. Burn therapy using virtual distraction therapy
15. Corporate presentations and mergers
16. Clothing design with virtual models
17. Pharmaceutical companies-molecular structure
18. Anthropology-recreation of lost species
19. Law enforcement-forensics
20. Bio-med research and development
21. Dentistry and plastic surgery ("A World Class Animation", 2005).

Program Implementation

A federal grant team at National University developed an interest in setting up animation labs as a technology tool for interdisciplinary project-based learning for Title I schools in California: 1) Montgomery Middle School in Cajon Valley School District; 2) Corky McMillin Charter School in East Lake near Bonita; 3) National

University Costa Mesa Learning Center, as a portable lab for our NU graduate students and pre-service teachers enrolled in PT3 grant workshops and related district programs; and 4) at a JCCS court school in San Marcos for incarcerated youth. Currently, a predominantly Latino community in California is setting up a model program to teach animation as an at-risk and gang-related intervention strategy. This community has tried many programs in the past twenty years, but the animation program is the first one that will capture the interest of the students, increase student retention and also lead to a solid career path. During the program, students will set up a business model relationship through Prabble Animation Labs (PAL) with their community to create Public Service Announcements (PSAs) and other commercial products for web, television, film, & private ventures. A PAL Community Builder Model will encourage business and industry to employ these Latino students and teachers during the media and animation program to create advertising, public service announcements, and websites; and to illustrate comic books, graphic novels, and computer video games as shown in Figure 2. (Lightfoot, 2006)
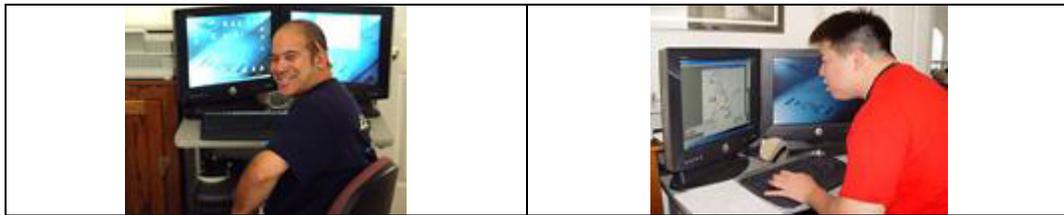
Figure 2. Teachers as animation artists at work.

Animation Industry Growth

Many 3-D animators from the video game industry have new jobs creating special effects in television series and films because of their ability to create scenes that cannot be filmed such as the beheading in The Last Samurai movie (Animation World Network, 2006); the craving for realism; and the issue of safety during stunts (Skweres, 2003).   The 3-D animation companies are forecasted for growth in Los Angeles, California as major studios like DreamWorks, Disney, and Sony are anticipated to add 3-D animation departments. The expansion of major movie studios such as Warner Bros., 20th Century Fox, Viacom and the new DreamWorks SKG studios with investments of $1 billion in their animation departments shows their commitment to this emerging field:

> The best bet is to have art skills and a good knowledge of computers. In the artistic area, various software programs are used to create three-dimensional backgrounds for film, video games, the Internet and many other multimedia uses. Computers are also used to create special effects and graphics, and color or draw animation art. The animators and special effects departments find that they constantly must outdo themselves, as the audience appetite for fresh "eye candy" continues to grow…Films are just one part of the industry, though. Actually, most animation studios make their money through commercials rather than feature films. Animation and special effects professionals can find work in many other forms of visual media (Saludos Hispanos, 2000).

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Instructional Design Principles Applied to the
Development of a Professional Seminar

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Professional seminars are a common, yet under-studied, learning environment. For purposes of this study a professional seminar is defined as a training environment where invited experts present timely information to professionals with the intent that the learners can use that information in their workplace. This definition is general enough to include learning environments of different names, such as symposia, workshops, or conferences. Malcolm Knowles (1970) wrote of conferences: "The full potential of conferences … as formats for learning is far from being realized, largely because the conference planners don't perceive them as formats for learning" (p. 140). We share this sentiment, and believe that applying systematic instructional design procedures to the planning and implementation of seminars can help realize the potential learning value of seminars for professionals in any discipline.

We sought to answer a broad question: How should systematic instructional design be done in the context of a professional seminar? Our goal was to formulate practical recommendations and guidelines for instructional designers and seminar planners. The context in which this study was carried out was a client's pre-existing seminar, the National Security Policy (NSP) seminar, hosted by a government management and leadership training facility. This paper will present a case study of the two phases that comprised this project, namely, a needs assessment and the subsequent seminar redesign.

The methods used to conduct this study combined the processes involved in doing instructional design for an existing instructional environment with systematically researching the development of that project. As Richey (1997, p. 93) explains, this combination of "doing development and studying development" is what is referred to as developmental research. Instructional designers, program planners, training directors, and any others involved with the planning of seminar-style instructional events may find the findings of this study useful.

Unique Characteristics of Seminars

In order that we ground our research about design in this one environment in theory and practice, some generalization is necessary. Therefore, we sought to identify, from the literature, characteristics common to these various learning environments. This review also served to provide useful data for our Phase 1 needs assessment. We identified four unique characteristics of seminars: (1) diverse learn characteristics, (2) focus on complex problem solving, (3) passive learning environment, (4) brief duration of instruction. Each characteristic is briefly described below.

Seminar attendees generally represent a variety of different agencies, organizations, or professional fields. This provides attendees with opportunities exchange ideas with and learn from others (Mundry, Britton, Raizen & Loucks-Horsley, 2000). Seminar content tends to focus more on information that can be adapted for use in the workplace, rather than training on specific job skills. This makes seminars ideal environments for problem solving and decision making activities (Mundry et al., 2000). Instead of being active learning environments, unfortunately some seminars resemble extended exercises in listening to presenter after presenter (Mundry et al., 2000). Bradford and Corey (1970) speak of this in terms of a psychological "gap between the platform and the audience" (p. 68). Professional seminars are often one-time, stand-alone, or annual events. A presenter may have an hour, a morning, an afternoon, or maybe one full day to present. This means that instruction must be of an appropriate scope in order to not merely present information, but also to provide time for practice, feedback, and interaction (Gagné, Briggs & Wager, 1992) and participants may need to prepare prior to attending (Boucouvalas, 1985).

Purpose of This Study

Given that professional seminars are unique learning environments, how should systematic instructional design be done in the context of a professional seminar? Recommendations in the literature provide answers to this

question, but very little empirical research exists to verify these recommendations. In this study we tried to generate empirical data to add to the existing body of research.

The purpose of this study was to document the use of instructional design processes in the redesign and implementation of a professional seminar. The case study resulting from this developmental research study can be divided into two distinct phases of data collection: a front-end needs assessment and the instructional redesign, implementation, and evaluation of an existing seminar for a client. The main research question driving the study was: How can instructional design procedures be used in the planning and production of a face-to-face professional seminar? As part of this main question, we had three working research questions. (1) What attitudes and expectations about learning at seminars do professionals hold? (2) What are the optimal instructional delivery methods for a seminar setting? (3) How can seminar attendees' learning be assessed?

This paper is divided into two main sections. The first section includes the methods, results, and a discussion of those results of Phase 1 of the study, a needs assessment. The second section includes the methods, results and a discussion of those results of Phase 2 of the study, a redesign of the client's National Security Policy (NSP) seminar. Overall conclusions of the study are also provided.

Phase 1: Needs Assessment

Methods Used in the Needs Assessment

A needs assessment was conducted using methods suggested by Rossett (1987). These methods included (1) surveying a sample of the client's target audience regarding their attitudes towards and expectations of seminars, (2) reviewing the literature for recommendations on how seminars can best be designed, and (3) documenting gaps between recommendations for designing seminars and the client's actual procedures for doing so. The needs assessment would lead us to identify optimal instructional delivery methods to consider during Phase 2 of the study.

Survey of Target Audience Attitudes

A needs assessment survey instrument was constructed, field tested, and revised to identify attendees' attitudes and expectations regarding seminars, how relevant they perceive seminars to be, and factors that they feel inhibit and facilitate their learning at seminars. The instrument consisted of 15 items, 13 closed-ended items and 2 open-ended items. The instrument was delivered via a web-based survey site. The client provided a database of e-mail addresses of attendees at their seminars, including past NSP seminars. An e-mail invitation to complete the questionnaire containing a hyperlink to the questionnaire was sent to approximately 2,100 individuals. The survey remained open and active on the site during approximately four weeks, during which 262 complete questionnaires were submitted.

Seventy percent of respondents were male and thirty percent were female. Forty-three percent of the respondents identified themselves as Department of Defense (DOD) employees and another forty-eight percent identified themselves as employees of various other federal agencies. The remaining 9% of the respondents worked for either state or local governments or private organizations. The client verified that this demographic breakdown is representative of the target audience of its seminars.

Literature Search

We conducted a search of online databases containing research in fields including instructional design to identify research conducted in or about seminars, including Education Abstracts and EBSCO. Our goal was to identify recommended instructional design processes for designing seminars. This literature review served to provide theoretical background to the study and also as a data source for our needs assessment. Many of the results of this initial search offered case studies or narrative accounts of seminars, most of which were in higher-education settings. Therefore, the search was widened to include non research-based literature and books. This second search yielded approximately 10 articles and books addressing the design and implementation of seminar-style events, and provided some data regarding best practices. Some of the sources directed their guidelines to the design of conferences or meetings, but were judged appropriate for this study.

Review of the Client's Design Processes

We held bi-weekly phone, email, and face-to-face discussions with the NSP Program Director to discuss how he and his staff plan and implement the seminar. We used this data to compare against the recommended processes found in the literature and identify how the client might improve its seminar design processes.

The client produces and hosts numerous different seminar programs for federal supervisors, managers, and executives each year. The NSP seminar belongs to a series of seminars focused on policy issues, as has been conducted annually at the center for approximately 30 years. The seminar generally lasts for nine days, each day devoted to a different topic and featuring a single presenter. A presenter speaks for three to four hours in the morning before breaking for lunch, after which the presentation continues. Presenters have discretion over the use of instructional materials and the types of interaction they employ. Their presentations are rarely critiqued or revised by the client. Presenters are invited subject-matter experts in a field related to theme of the seminar, frequently academics, retired government or military personnel.

We compiled a list of common instructional design guidelines based on several sources (Allen, 1996; Branch, 1994; Dick, Carey and Carey, 2001; Martin, 1990; Smith & Ragan, 1999; Wedman & Tessmer, 1993) with which we could compare the processes that the client used with commonly accepted ID processes. The list was referenced as we reflected on our discussions with the client, but was not shared with the client. Table 1 displays the list of common instructional design guidelines we compiled.

Table 1

Common Instructional Design Guidelines

Conduct a needs assessment	Develop instructional materials
Analyze learning environment	Conduct formative evaluation of materials
Conduct learner analysis	Revise instructional materials
Define learning goals and objectives	Evaluate outcomes of instruction
Develop evaluation instruments	Conduct summative evaluation of instruction
Design delivery strategies	

Results of the Needs Assessment

Survey of Target Audience Attitudes

Table 2 displays frequency responses to two different items on the needs assessment survey. The first item asked respondents to indicate their agreement with three statements: "I enjoy the seminars I attend," "The seminars I attend benefit me professionally," and "I create benefits for my organization by attending seminars." The second item asked "How would you rate the importance of the following factors for helping you learn while at a seminar?"

Table 2

General Attitudes Towards Seminars

Statement	SA	A	SA/SD	D	SD
I enjoy the seminars I attend.	98	146	32	1	0
The seminars I attend benefit me professionally.	95	147	34	1	0
I create benefits for my organization by attending seminars.	24	72	89	63	29

Importance of Factors That May Influence Learning at Seminars

Factor	VH	H	M	L	VL
Covering topics relevant to my job or interests	164	86	18	2	1
Having a variety of session formats, more than just lectures	105	114	38	8	2
Discussing topics thoroughly with attendees and presenters	91	122	49	9	0
Being able to attend every session I want to attend	77	128	54	10	1
Actively participating and interacting, more than just listening	103	100	51	11	2
Having additional resources about topics, beyond just the presenter slides	84	115	56	11	1
Having ample informal socializing or networking opportunities	61	94	80	31	4

Note: SA=Strongly Agree, A=Agree, SA/SD=Somewhat Agree/Somewhat Disagree, D=Disagree, SD=Strongly Disagree. VH=Very High, H=High, M=Medium, L=Low, VL=Very Low.

Respondents seemed to enjoy and see professional benefit in seminar attendance. However, their responses are more varied regarding the benefits that seminar attendance creates for their organizations. In response to the second item, respondents seemed to feel that several factors were important for helping them learn at a seminar. Chief among these was the relevance of the topics to their job or interests. However, having a variety of session formats, thorough discussion, and active participation also ranked high. These four factors are noteworthy because each is mentioned in the literature as being important for seminar design.

Table 3 displays the results from two additional closed-ended items on the questionnaire. The first was "Why do you attend, or have you attended, seminars?' Seven options were then given and respondents could select all options that applied to them. The second item was "From your experience, which of the following things keep you from feeling like you have learned all you could at a seminar?" 9 options were provided and respondents could select all options that applied to them.

Table 3

Reasons for Attending Seminars

Reason	n	%
To stay current with the most up-to-date issues in my field	216	78
To be exposed to a broader, more general range of issues related to my field	212	77
To engage in discussions about issues and solutions with others	202	73
To analyze and improve upon current practice in my field	179	65
To acquire a skill I will use in my job	163	59
To network	161	58
Other reason(s)	32	12

Factors That May Inhibit Learning at Seminars	n	%
Too many presentation topics being irrelevant or inapplicable to my job or interests	144	53
Too much sitting and listening and not enough participation	128	47
Not being able to attend sessions I thought would be interesting or applicable	127	47
Too few opportunities to discuss topics thoroughly with attendees and presenters	118	44
Too few resources or materials to take away or access	78	29
Not enough variety in the format of the sessions	69	25
Too few informal socializing or networking opportunities	39	14
Other factor(s), please specify	36	13
I always feel like I have learned all I could	27	10

Note: Total *n*=271-276

Table 3 displays the response frequencies for each option in the two items described previously. More than three-quarters of respondents indicated that one of the reasons they attend seminars is to stay current with or to be exposed to issues in or related to their field. These were the most frequently cited responses. The next most frequent response was to engage in discussions about issues and solutions. Networking and acquiring job skills were less-frequently cited responses.

The second item in Table 3 deals with factors that may inhibit learning at seminars. The most frequently cited factor dealt with the irrelevance of the topics (n=144). The second most frequently cited factor was insufficient participation (n=128). Also of note is that having too few opportunities to discussion topics thoroughly was the fourth most frequently cited factor that may inhibit learning (n=118).

Literature Search

In the literature we identified several optimal practices in designing instruction for professional seminars. Mundry et al. (2000) list several suggested practices for designing and implementing effective seminar-style events, including "Establish and share clear outcomes" (p. 2). Briziarelli and Tice (1996), Benne and Demorest (1970), and Bradford and Corey (1970) also speak of the importance of communicating learning objectives to seminar attendees. These and other authors also suggest strategies such as including potential attendees in the planning and design of the seminar (Ilsley, 1985; Benne & Demorest,) and using subject-matter experts to facilitate discussions (Benne & Demorest; Mundry et al.).

Several sources also speak to the importance of engaging all attendees in problem-solving discussions and activities (Mundry et al., 2000; Bradford & Corey, 1970; Benne & Demorest, 1970). Several interactive instructional delivery methods have been shown to produce beneficial outcomes, and may be appropriate for these kinds of activities. These include small group learning (Springer, Stanne & Donovan, 1999; Flynn & Klein, 2001), collaborative learning (Uribe, Klein & Sullivan, 2003), cooperative learning (Johnson, Johnson, Stanne & Garibaldi, 1990; Qin, Johnson & Johnson, 1995; Susman, 1998), and problem-based learning (Dochy, Segers, Van den Bossche & Gijbels, 2003). While none of these methods appear to have been examined in a seminar environment, it is reasonable to hypothesize that similar results could be achieved.

Review of Client's Design Process

From our conversations with the client, we identified incomplete use of several instructional design processes during the planning and implementation of the client's seminars. Examples of incomplete processes used by the client include learner analysis, designing delivery strategies, evaluating instructional materials and evaluating the outcomes of the instruction.

The NSP seminar program director usually began the planning process by identifying a general theme and selecting more specific topics for the presenters. A learner analysis was not conducted beyond the collection of demographic information on each registered attendee. However, this information was not used to inform later processes such as selecting or sequencing content, the designing delivery strategies, or for evaluation.

Each of the client's seminars identified "Key Results" resembling instructional objectives, although they sometimes resembled statements of activity or were not well written (Sullivan & Higgins, 1983). Formal content analyses were not conducted; however, the client did regularly update the topics of a seminar to reflect current issues or trends. For example, since 9/11, the NSP Seminar has had a greater emphasis on terrorism and terrorist groups that threaten U.S. national security. It was not clear to us how decisions about delivery strategies were made based on the Key Results. In most instances, instructional delivery resembled a lecture, with some interaction and discussion. Variations to this standard were the result of a presenter's planning, not the client's. A formative evaluation of the presenters' instruction did not occur.

Evaluations of seminar outcomes were conducted by an end-of-course evaluation sheet. Formal measures of learning were not used, but the client did conduct seminars that included activities requiring attendees to write or discuss ideas and workplace application goals. Again, in many cases, if there was an interactive or application-oriented activity it was because an individual presenter, not the client, initiated the activity. The outcomes of these activities, however, were generally used for personal attendee reflection and not to establish a measure of learning.

Discussion of the Needs Assessment

The results of the needs assessment suggested four tasks that could be used to improve the client's current planning and design processes. These four tasks would be used in the redesign of the client's National Security

Policy seminar. These four tasks do not represent a comprehensive use of instructional design in the planning and implementation of a seminar; that was not the goal of this study, and nor would it have been practical.

The four tasks are (1) conduct a learner analysis to understand attendees' prior knowledge and select relevant topics, (2) define and communicate instructional objectives, (3) determine interactive instructional strategies that maximize attendee participation, and (4) employ measures to evaluate attendee learning. The brief rationale behind each of these four tasks is explained below, together with an explanation of how they were to be conducted in the second phase of the study.

A learner analysis may help indicate the relevance of topics to potential attendees. Relevance refers to attendees' perception of how the seminar will contribute value to their professional practice and to their organization, the perception of the credibility of the information presented, and their expectation of the utility of the information in their job (Huang 2006; Richey 1998; Keller 1987[a]; Keller 1987[b]). Determining the relevance of seminar topics could be accomplished by including representatives of the target audience in the planning of the seminar or by surveying a sample of the target audience.

Systematic instructional design requires that objectives be specified during the design of the instruction. However, when individual presenters select content and delivery methods, defining and adhering to pre-determined objectives may seem more difficult. If the presenters understand the intended outcomes of the seminar, they can be guided to select the content and delivery methods that will meet those outcomes. This may require more oversight on the part of seminar planners to formatively evaluate the presenters' development work.

Responses to the survey data indicated that seminar attendees expect to interact and participate actively in seminar sessions. Instead of relying exclusively on a lecture-based delivery format, seminar planners should incorporate more interactive delivery methods into the seminar agenda. Doing so would likely require careful coordination between the planners and the presenters in order to prepare necessary materials and train presenters in the chosen delivery method techniques, if necessary.

Seminars, as defined in this study, do not focus on specific job skills. Thus, measuring learning gains with tests may be less appropriate. However, measuring learning is an important component of systematic instructional design. Additionally, measures of learning could be a valuable too to justify the value of seminar training to employers. Some group-based instructional activities such as cooperative learning or problem-based learning could lead to groups or individuals producing a learning product (a case analysis, for example) that could be submitted and scored. At the same time, the learning product could be an acceptable indicator of learning of problem-solving ability.

Phase 2: Seminar Redesign

The purpose of Phase 2 of this study was to apply the conclusions of our needs assessment to the redesign of a professional seminar. In this section of the paper, we describe the methods and the results of the redesign and implementation of the National Security Policy seminar using the four tasks derived from Phase 1.

Methods Used in the Seminar Redesign

The methods used during Phase 2 of the study included (1) conducting a learner analysis that emphasized the relevancy of the seminar topics, (2) redesigning the seminar agenda to include more interactive delivery methods, (3) observing the redesigned seminar, and (4) evaluating learning and attitudinal outcomes.

Learner Analysis

Since the seminar topics had already been selected prior to this study, we could not include representatives of the target audience in the selection of relevant topics. Instead, we administered a brief pre-seminar attitude questionnaire to the registrants of the seminar to gauge the relevance of the chosen topics and the registrants' expectations of the seminar. The questionnaire was comprised of seven items, six closed-ended and one open-ended.

The questionnaire was delivered via a web-based survey site. The client provided the email addresses of the registered participants, and an email invitation containing a hyperlink to the instrument was sent to each of the 21 registrants. About half of the registrants completed the pre-seminar questionnaire (n=12) in part due to some attendees registering for the seminar at the last minute.

Redesign of the Seminar Agenda

We collaborated with the client to modify the general format of the National Security Policy seminar from a format dominated by lecture-style presentations to one that included more interactive delivery methods. We communicated regularly with the client via phone, email, and face-to-face meetings to propose variations of interactive sessions and discussed how the sessions would be conducted.

The outcomes of this collaboration were two instructional objectives and an interactive delivery strategy that could help assess the new objectives. Since our literature search indicated that seminars can be excellent venues for problem solving, the two objectives were based on problem-solving outcomes: "Learners will define the nature of a current problem in counterterrorism" and "Learners will develop a solution for a current problem in counterterrorism."

The statement of the new instructional objectives helped guide the development of an interactive delivery strategy. A discussion-based strategy was selected to create more interaction in the NSP sessions. This strategy consisted of two formats of group discussion: small- and full-group discussions. Small groups would be comprised of five to seven individuals. The focus of both the small- and the full-group discussions would be open-ended discussion questions related to the lecture presentations.

Observations of Seminar Sessions

The primary researcher observed all the seminar activities during the first four days of the seminar. During this time, four different presenters spoke on four different topics: China; Ethics and National Security; India, Pakistan and South Asia; and Economics and National Security. A total of 19 people attended the seminar.

A timed-interval classroom observation protocol was developed to record, at 5-minute intervals, several related variables that describe the classroom interaction. The observation protocol was based on a version used by Atkinson (2004), which was originally developed from WestEd (n.d.) & Horizon Research Inc (2005). Using the protocol, an observer can record how five different variables are implemented in a classroom: "Type of Instruction," "Student Engagement," "Problem Solving Activities," and "Problem Solving Facilitation Techniques." The data recorded on the protocol would allow us to paint a detailed moment-by-moment picture of the time spent on various instructional activities, presenters' delivery strategies, and discussion group processes.

Post-seminar Attitude Questionnaire

At the conclusion of the four days observed by the primary researcher, the seminar attendees were asked to complete a brief questionnaire about their experience at the seminar. The purpose of the post-seminar questionnaire was to determine the attendees' perception of the effectiveness of the various delivery methods, in particular, the two new discussion formats that had been implemented. We also sought to determine the attendees' post-seminar perception of relevancy of the topics. The questionnaire instrument consisted of eight items, three of which were open-ended and five of which were closed-ended. The questionnaire was delivered on paper. Attendees completed the questionnaire at the end of the fourth day observed by the primary researcher.

Results of the Seminar Redesign

Learner Analysis

One question on the re-seminar attitude questionnaire asked "Why did you decide to attend the National Security Policy Seminar?" Seven options were provided, and respondents could select all the options that applied to them. The two most frequent responses were "To stay current with the most up-to-date issues in my field" (n=10) and "To be exposed to a broader, more general range of issues outside my field" (n=9). A similar question was asked on the Needs Assessment Questionnaire about why respondents attend seminars in general, and these same two responses were the most frequent responses.

Table 4 displays results for two questions regarding attendees' expectations of the seminar and the expected relevance of the seminar topics. The first of these items asked respondents to indicate their level of agreement with the four given statements. The second of these items asked respondents to indicate how relevant they anticipated each of the topics being to their job.

Table 4

Registrants' Expectations for the NSP Seminar

Statement	SA	A	SA/SD	D	SD
I anticipate the knowledge and skills I gain at the NSP seminar being applicable to my job.	8	3	1	0	0
I expect to be given the opportunity to actively participate in the seminar sessions.	7	5	0	0	0
Given the opportunity, I am likely to actively participate in the seminar sessions.	7	5	0	0	0
If other attendees like myself actively participate in the seminar sessions, I stand to learn from their insights and experience.	8	4	0	0	0

Registrants' Expectations for the Relevance of Seminar Topics

Topic	VH	H	M	L	VL
China	2	2	3	1	2
Ethics and National Security	4	6	2	0	0
Indian, Pakistan and South Asia	2	4	5	0	0
Economics and National Security	4	5	2	0	0

Note: SA=Strongly Agree, A=Agree, SA/SD=Somewhat Agree/Somewhat Disagree, D=Disagree, SD=Strongly Disagree. VH=Very High, H=High, M=Medium, L=Low, VL=Very Low.

The data in Table 4 suggest that registrants anticipated that the seminar, overall, would provide opportunities for active participation. The questionnaire data also suggested that the registrants felt that the seminar would be applicable to their jobs and would expand their knowledge of issues related to their field. Their opinions regarding the relevance of particular topics varied, however.

Redesign of the Seminar Agenda

In the revised agenda, presentations were limited to the morning, while afternoons were dedicated to the two discussion formats. The presenters each wrote three to four problem-solving discussion questions (12 in all) that were related to their morning presentation. The small groups discussed one or two questions at a time, for approximately 30 minutes, and, afterwards, attendees typed their individual responses to the questions. The groups were not required to reach a consensus on their answers.

Each attendee was provided with a USB thumb drive on which was loaded a simple program that displayed the discussion questions for the topic and an area to type responses. A sample screen-shot of the program, showing a discussion question and one attendee's typed response to the question, is seen below in Figure 1.

Figure 1
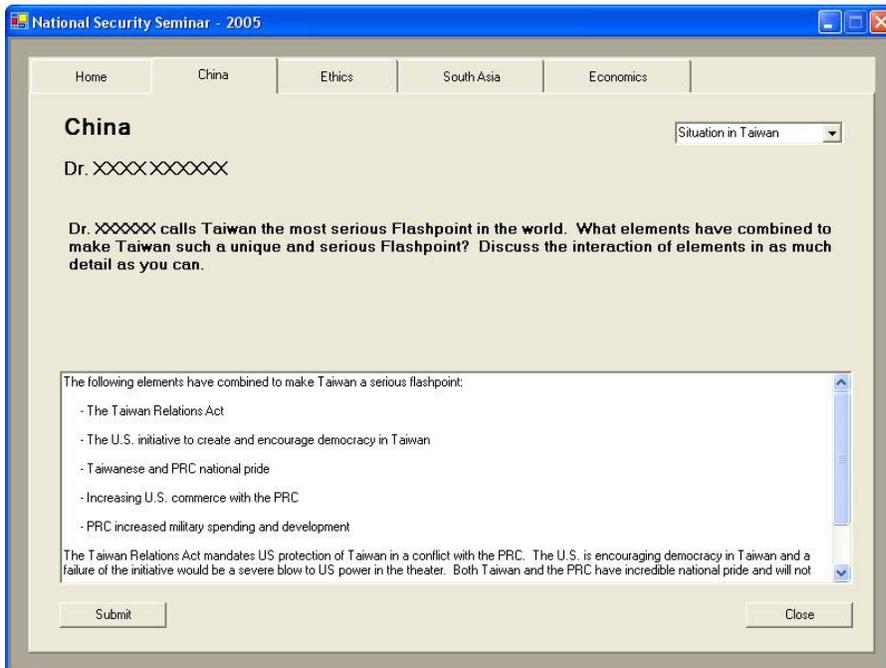
The program automatically created a text file containing the question response. The thumb drives were collected after each discussion session. The responses were downloaded to a file and scored by the primary researcher. The results of the scoring of the discussion questions are not provided because the authors feel the scores are unreliable measures of the attendees' learning at the seminar. Two factors contributed to this. First, we had requested that presenters prepare the questions prior to the seminar so that we could evaluate and revise them and ensure that they conformed to an ill-structured problem-solving model (Jonassen, 1997; Ge & Land, 2004). However, none of the presenters provided the questions prior to the seminar, and most had not written them at all prior to arriving. Second, we had requested that the presenters serve as a second scorer of the responses, in addition to the lead researcher. However, only one presenter scored the question responses.

The full seminar group reconvened after individuals typed their question responses. The presenter facilitated the full-group discussion in which individuals were asked to share the results of their discussions and also asked questions of the presenter.

Observations of Seminar Instruction

Over the course of the four days observed, just over 75% of the seminar was taken up in instructional activities (22.3 hours total, or about 5.5 hours per day). Instructional activities included presentations (34.2%, 10.1 hours), full-group discussions (20.8%, 6.2 hours), small-group discussions (16.4%, 4.8 hours), and individual work time spent completing the discussion questions (3.9%, 1.2 hours). The small- and full-group discussions occupied slightly more than 40% of the total instructional time of the seminar (approximately six hours).

The four presenters varied in the delivery techniques they used in their presentations. One of the four exhibited what is typical of a lecture style. There were very few questions asked or comments made. A second presenter, in contrast, gladly abandoned his prepared presentation after only 30 minutes in order to respond to the many comments and questions being posed. The remaining two presenters exhibited a blend of lecture and interactive styles. One presenter commented to the primary researcher, without being prompted: "This is by far the best discussion I've had with a group in the 30 years I've been coming to this program."

We observed three trends in the small discussion groups. First, on-task time spent discussing the questions appeared to decrease as the seminar progressed. Instead of discussing the questions in depth, some groups would superficially answer the questions and break to type individual responses. Second, more attendees participated in the small-group discussions than in the full-group discussions, meaning they voluntarily made comments or asked questions. On average, about 50% of the attendees participated in the full-group discussions while we observed 80 –

100% of the attendees voluntarily participating in their small group discussions. Third, some groups appeared to have difficulty synthesizing information from the presentation in order to answer the discussion questions. Group members frequently posed questions to each other that nobody else in the group knew how to answer.

Post-seminar Attitude Questionnaire

Table 5 displays respondents' post-seminar perceptions of the relevance of the topics and the benefit of the discussion-based delivery strategy.

Table 5

Attendees' Perception of Seminar Topics and Discussions

Statement	SA	A	SA/SD	D	SD
Overall, the topics were relevant to my interests or job.	9	2	4	0	0
The topics presented met my expectations for the seminar.	7	4	3	1	0
The discussion questions were helpful for analyzing the topics.	1	7	7	0	0
Combining small-group and full-group discussions was helpful for analyzing topics.	4	4	6	0	0
Overall, the small-group discussions were helpful for understanding the topics.	1	6	6	1	0

Note: SA=Strongly Agree, A=Agree, SA/SD=Somewhat Agree/Somewhat Disagree, D=Disagree, SD=Strongly Disagree.

In general, it appears that attendees at the NSP seminar felt that the topics were relevant and met their expectations. However, they appear to have mixed reactions to the discussion strategy. Although most respondents seem to have had positive views of this format, many also thought it was only somewhat helpful.

The following comments may help understand the data regarding the discussion strategy in Table 5. Respondents were asked "What was your impression of the small-group discussions as a means to discuss and analyze the topics? The first comment suggests that the morning presentations were insufficient to prepare attendees to discuss and analyze topics. "The limited data presented and the broad backgrounds of the partipants (*sic*) left many of the breakout groups limited to a discussion between two or three partipants (*sic*) with the others simply watching." Other comments contradict this feeling, mentioning that it was helpful to have diverse viewpoints on topics. A second response to this question suggests that the purpose of the small-group discussions may not have been made clear enough to all attendees. "I didn't get it—basically a rehash of the presentations. Not sure of the learning objective."

Discussion of the Seminar Redesign

We attempted to measure the perceived relevance of the selected seminar topics to the attendees. Prior to the seminar they seemed to feel that the topics would be relevant to them, and felt similarly after the seminar. However, because the topics had been selected prior to this study, this outcome cannot be attributed to the use of strong analyses of the learners and content. We feel that these front-end analyses should be used when planning and designing future professional seminars.

We had difficulty measuring learning outcomes during the seminar. This exemplifies one potential difficulty in practicing systematic instructional design for some professional seminars. When presenters are invited guests it may be difficult to coordinate the needs of the client and instructional designers with the presenters long before the seminar. The presenter may not be able to prepare ahead of time, and may rely more on his or her expertise than on instructionally sound materials. This was certainly the case for the National Security Policy seminar.

Another issue we encountered during Phase 2 was the lack of perceived benefit of the discussion-based strategy. Our needs assessment suggested that this format could be very beneficial. However, our observations and the post-seminar questionnaire indicated that this potential may not have been achieved. Many studies support the premise that interactive instructional delivery methods can benefit learning, therefore we believe that our lack of results may be a result of poor support for the discussions. We could have provided the small groups with additional

structure about how to answer the discussion questions, how to work together collaboratively, or how to solve ill-structured problems. Some form of problem-solving scaffold may have been beneficial. Once again, providing this kind of instructional support and guidance could be potentially difficult to implement in a professional seminar if instructional designers do not carefully coordinate with presenters.

Overall Conclusions

In this study, we sought to answer questions about seminar attendees' attitudes and expectations, optimal instructional delivery methods, and evaluation methods. We briefly provide a summary of how we answered these questions, together with ideas for future studies.

Seminar attendees appear to have high expectations that the seminars they attend will be relevant and beneficial. This fact suggests that analyses of seminar attendees, current issues, and relevant topics are important when planning a seminar. It is possible that the relevance of topics is a facilitator of learning at seminars. We were unable to effectively measure learning, but future research projects could investigate whether there is a relationship between perceived relevance and learning by using more sensitive measurement of the factors that comprise relevance.

While typical seminar instruction is predominantly teacher-centered, our findings suggest that attendees expect and could benefit from more student-centered, participatory, and interactive delivery methods. Seminar attendees indicated that they feel they benefit from active participation and discussion in our needs assessment survey. However, the development and implementation of interactive and participatory instruction may require considerable effort in order to coordinate instructional designers with seminar presenters.

Learning outcomes related to problem solving may be appropriate for seminars. We successfully produced learning objects in the form of individual responses to discussion questions, while also using an interactive delivery strategy. Future studies should further refine the development and implementation of different interactive delivery and evaluation methods.

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Storytelling:
A Practical Method for Facilitating
Knowledge Management

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Abstract

Knowledge management serves to capture, store, and organize knowledge and experiences within corporations so it is available for future reference. Perhaps the most difficult part of knowledge management is identifying the tacit knowledge within an organization. Storytelling possesses great potential as a tool to uncover tacit knowledge within an organization, yet little has been done to synthesize literature related to storytelling in knowledge management. Research questions to be answered include: What is knowledge management? Why would knowledge management benefit from the use of storytelling? And how can storytelling be implemented into knowledge management to uncover tacit knowledge? Examples of success stories of storytelling in knowledge management will be presented and recommendations for future research will be provided.

Introduction

Could the application of storytelling be a useful component of knowledge management? If so, *why* would storytelling be a good tool in knowledge management? *How* can storytelling be used in knowledge management? Knowledge management is essentially a teaching-learning interaction. Storytelling can be broadly defined as orally communicating ideas, beliefs, personal histories, and life-lessons (Groce, 2004). It is one of the most prevalent forms of communication and it possesses great potential as a teaching-learning tool. It is no wonder that it is currently being used in some companies as a knowledge management tool.

According to Arlene Dohm, a writer for the U.S. Department of Labor's *Monthly Labor Review,* there are some 64 million baby boomers (over 40 percent of the U.S. work force) who will likely retire in large numbers within the next decade. One-half of companies interviewed by *The Conference Board,* a business membership and research organization, "feel that the departure of mature workers presents potential knowledge vulnerabilities. About one-third have conducted workforce-planning studies and identified potential knowledge areas where they could be vulnerable. One-half of those interviewed have some form of mentoring program in place to share and transfer knowledge" ("America's," 2005).

The following is a review of literature relating to the *what, why,* and *how* of storytelling in the management and transference of knowledge within organizations. Examples are provided of the success of the use of story at NASA, EduTech, Bristol-Myers Squibb, GE, Disney, Nike, Wendy's, FedEx and English Nature to promote knowledge transfer. The literature reviewed was analyzed and compared according to relevance, quality, reliability of sources, validity of information, trends and issues, and credibility of author's research/information.

There are some trends regarding the use of story in knowledge management to foster the sharing and transfer of tacit knowledge. Besides fostering inter-generational communication, knowledge management can be used to improve the meaning of information in business. According to recent theories, backed up by relatively new medical technologies, storytelling is a natural way of learning, and more specifically a more natural way for the brain to process information. Of course, there are some skeptics who question the real value of stories in the workplace, but the literature shows that companies who are using stories are finding it very valuable for the management and transfer of knowledge.

What: Storytelling and Knowledge Management

There has been an ongoing interest in storytelling as a component in knowledge management over the last few years, but it has never really become a major focus. Storytelling has been touted as the best way to make the

leap from information to knowledge, and as the best way to capture and transfer tacit knowledge (Reamy, 2002). "Storytelling is the skilled delivery of stories used to present anecdotal evidence, clarify a point, support a point of view and crystallize ideas. A story can present material that research data can not. Stories use verbal pictures to spark interest, add variety, and change the pace of a discussion. Stories make dull speeches sparkle. Storytelling is the connecting device between data and reality. Stories can share a "truth" that data cannot. Knowledge managers use storytelling as a device and tool for sharing knowledge" (Stuhlman, n.d.).

To say that there are several definitions of knowledge management would be an understatement. Denning (2000) says, "there is no agreed upon definition of knowledge management, even among practitioners." In a CIO Magazine article on the ABC's of knowledge management (KM) Meridith Levinson writes, "Succinctly put, KM is the process through which organizations generate value from their intellectual and knowledge-based assets. Most often, generating value from such assets involves codifying what employees, partners and customers know, and sharing that information among employees, departments and even with other companies in an effort to devise best practices." Upon "Googling" the term, three pages worth of definitions return, Vicki Powers (2004) used a definition that in a *KM World* article, "[K]nowledge management is – because of people's experiences – a variety of things that fall under that broad umbrella of KM, including knowledge capture, knowledge stories, communities, Knowledge Desktop and codifying documents." This review will synthesize several resources to describe how the experiences of people that, according to Powers (2004), can be called "knowledge stories" that can be used within an organization as knowledge management tools.

"To some people – people in business, people in management, people running public sector organizations – storytelling might seem like an odd subject to be talking about at all. The thought that narrative and storytelling might be important ideas in organizational thinking in the coming century might seem even odder" (Brown et al., 2004). It may come as no surprise, therefore, that there is some controversy surrounding storytelling as a method of transferring knowledge in business. The idea of storytelling being used in business "causes some disquiet among practical businesspeople, information specialists, and even many in knowledge management" (Reamy, 2002). The images of groups of businesspeople squatting around a campfire swapping stories and wasting time as executives tell bad stories and unload their fears and anxieties does not appeal to some knowledge managers (Reamy, 2002). This criticism is likely a result of a misunderstanding of what storytelling can do for knowledge management in companies, and more importantly, the techniques involved in implementing storytelling as a tool. For example, Seth Kahan uses a technique called "jumpstart storytelling," which "harnesses diverse ideas and fosters discussion about what's important – constructive conversations" (Dysart, 2004).

"… [T]he potential of storytelling as a viable teaching-learning tool can be recognized only if its inherent nature is clearly understood" (Roney, 1996). There is some research that supports this "inherent nature" of storytelling. This research suggests that people learn best with stories because "organization of information in story form is a natural brain process" (Caine and Caine, 1991). As educators then, knowledge managers who use storytelling are, as Bruce Perry (2000) puts it, practically neuroscientists because the brain is more receptive to information in story form. Storytelling is a useful tool for knowledge management because people learn things easier via stories – they convey meaning, convey tacit knowledge, and are a natural way of learning and interpreting information.

Why: Benefits of Storytelling in Knowledge Management

Stories put *meaning* into information, stories *convey tacit knowledge* more easily, and stories are a more *natural* way of learning than the usual charts and facts that are presented in knowledge management. There are a number of benefits in using storytelling in knowledge management. Several leading companies are "turning to mature workers to ensure future growth and productivity. These companies recognize that a maturing workforce can positively impact customer satisfaction and profitability, but not without effective initiatives designed to make it easier for different generations of workers to work better together," (America's," 2005). This inter-generational cooperation can be accommodated with the use of story to foster communication and knowledge transfer.

To answer the question of why knowledge management should incorporate storytelling Reamy (2002) says, "Humans have been telling stories as not only a form of entertainment, but as a way to make sense of the world for a very long time–probably almost as long as they have had language. So it is not a surprise that we continue to use this powerful medium in the corporate environment." Stories are used in three ways, according to Reamy, (2002): (1) in informal education and training where stories provide guidance and lessons in the advanced or more sophisticated

application of basics, (2) the foundation for many formal and informal communities that form within an enterprise, and (3) what Stephen Denning calls "springboard stories," which are used to create a new paradigm by not only introducing new ideas, but getting people to actively promote the new idea.

Meaningful Information: Facts vs. Stories

Stories have been told since the beginning of time–from the walls of cave men and the tombs of Egypt to modern-day dinner table and campfire stories. "People primarily think narratively rather than analytically or argumentatively" (Stone, n.d.). When people tell a story it is because it means something to them (the teller) and they think that it might mean something to the audience (the listeners). Stories as metaphors are intrinsic to the construction of new knowledge and at the heart of the acquisition of felt meaning (Caine and Caine, 1991). Although some skepticism surrounds the idea of stories in business, it should not be discounted altogether; and neither should executives discourage people from telling stories in the workplace. Stone (n.d.) says that in order to understand storytelling as a tool, one must recognize that people are "already telling stories all the time" at work.

Stories make information–especially large amounts of information–easy to understand. Storytelling as a means of knowledge management creates experience in context and nurtures creativity (Schwartz, 2004). In 2004 West et al. cite Pennington and Hastie (1991) and Schank (1990) as saying that past research demonstrates that one of the aspects that make stories effective is that they are easily stored in memory. "…[N]arrative communicates a more meaningful sense of reality than the abstract and summative formations of most business plans" (Stone, n.d.). When it comes to purely listed, factual information, Swap et al. (2001) say that stories promote elaborations and connections to the listener's personal experience, evoke clear visual images, are more memorable and, hence, "more effective carriers of knowledge than less vivid, purely listed information." Reamy (2002) also says that if information is put into stories as clusters or chunks, it is easier to pay attention to the information being given.

On his website, Steve Denning says the origin of his interest in organizational storytelling "was simple: nothing else worked." As a manager in the World Bank in 1996, he "had been trying to communicate the idea of knowledge management and to get people to understand and to implement it. At that time in that organization, knowledge management was a strange and generally incomprehensible idea. I used the traditional methods of communicating with no success. I gave people reasons why the idea was important but they didn't listen. I showed them charts and they just looked dazed. In my desperation, I was willing to try anything and eventually I stumbled on the power of a story" ("Steve Denning," n.d.) Denning continues on the success of story at World Bank, "In 1996 in the World Bank, story had helped galvanize staff and managers to imagine a different kind of future for the organization and to set about implementing it. Denning continued to use stories to reinforce and continue the change. The efforts were successful: by 2000, the World Bank was benchmarked as a world leader in knowledge management."

According to Kathleen Melymuka (2004), "Stephen Denning discovered a powerful leadership tool: storytelling" that he found "often succeeded in inspiring and motivating people when cold, hard logic failed." Escalas and Bettman and McGregor and Holmes note that "memories are more easily stored and retrieved in story form, particularly when they encompass a goal, action, and some kind of resolution (qtd. in West et al., 2004). Storytelling has great potential for making knowledge meaningful in business. Swap et al. explain three ways in which stories can be used:

- the availability heuristic,
    - According to Tversky and Kahneman (qtd. in Swap, et al., 2001), "…when an event is made more available from memory, there is a strong tendency to believe it is more likely to occur or to be true elaboration,…
- elaboration,
    - [to]…the extent that people reflect upon and integrate information with what they already know, they will remember it better."
- episodic memory,
    - "Stories are clearly episodic in nature." Episodic memories come from memorable experiences.

In summary, availability heuristic, elaboration, and episodic memory are good ways to use stories in knowledge management to turn factual information into something that is memorable; stories can be attached to something people already know; and they can create an experience that is easy to remember.

Storytelling and Tacit Knowledge

Tacit knowledge is "knowledge that we do not know that we know" (Hughes, 2002). According to Nonaka and Takeuchi, "…knowledge of greatest value to an organization–expert knowledge–is often tacit" (qtd. in Hughes, 2002). Tacit knowledge can be difficult both to convey, and to acquire in most organizations. It is important to acquire tacit knowledge from those people who have seniority and who have been with the company or in the business for some time. Storytelling is an effective way of getting tacit knowledge out so others can use it and refer to it. Acquisition of knowledge involves experience—which storytelling has always existed to provide (Schwartz, 2004). Stories of experiences or trials and errors, for example, would likely benefit those who have not had much opportunity to acquire such experiences or the knowledge that results from those experiences. "Storytelling is a way of capturing what's unique, and what's unique per individual is tacit knowledge" (Post, 2002). It is possible that using storytelling to convey tacit knowledge can improve an organization because "one aspect of knowledge management is about sharing experiences so others can learn from them, and then using that learning to improve the organization" (Sumner, 2005). According to Harold Rosen, "…once set loose, the storytelling impulse enables the most unlikely people to deploy unsuspected linguistic resources and strategies" (qtd. in Rooks, 1998). Expert, tacit knowledge within an organization can easily be conveyed through storytelling.

Storytelling: Natural Way to Learn

The intent of knowledge management is to educate people for the greater good of the organization and, when educating people, it is important to understand how they learn. Research says the brain works by detecting patterns in information, which is why stories are so useful in the teaching-learning interaction. "One of the brain's best tricks is to extract meaningful patterns from confusion" and storytelling is an "excellent way of accomplishing this task" (Liston, 1994). Learning is a brain-based activity and factual information causes the brain to fatigue more quickly because it is not the brain's most "natural" way of learning (Perry, 2000). Stories give meaning to information (as mentioned before) because, as Roger C. Schank says, the "human memory is story-based" (qtd. in West, Huber, and Sam Min, 2004). If the question is why stories work so well in knowledge management, then the answer–simply–is that "our brains seem to be wired to easily and almost automatically organize information into stories" (Reamy, 2002). Liston (1994) relates brain function to learning. She says when we attempt to educate people "we extract the 'facts' from the plethora of information, in an effort to clarify the 'important' information; conversely, it seems, that an understanding of brain functioning indicates we would better enable students to learn if we presented masses of information and allowed the learner to detect patterns."

How: Tips for Success

Stories serve as metaphors because they make information more meaningful and understandable and transfer the difficult-to-uncover tacit knowledge within organizations by appealing to the natural learning process of the brain. "Metaphors allow an entry point into an issue that might seem too intimidating to confront head on" (Post, 2002). The final question is *how* to implement storytelling as a knowledge management tool.

On his website, Stephen Denning (2000) summarizes his technique called "the Springboard Story," which is a story that "enables a leap in understanding by the audience so as to grasp how an organization or community, or complex system may change." This technique has been called a "powerful communication tool" by the readers of his book, *The Springboard*. Reamy (2002) recommends organizing a central group to administrate the storytelling and to create a reward system for employees who submit stories. Different kinds of stories can be used for different situations and Melymuka (2004) provides a chart for creating stories to match situations in the information technology world, which could very easily be applied to knowledge management. The chart explains that for certain purposes, stories can be used to invoke specific kinds of responses. Larry Todd Wilson was cited as having identified four situations where storytelling could be helpful: new unexpected situations, situations that require feelings as well as thoughts, complex situations, and situations in which you need to help people understand 'why' ("Storytelling," n.d.). Support for the effectiveness of applying storytelling to these situations is provided by McDaniel (2004), "…stories are vessels for storing and communicating complex ideas" and "…can be very efficient in helping one to learn unfamiliar material."

There is some word of caution when using stories in knowledge management, "artificially constructed stories ultimately will be less effective than true ones" (Swap, et al., 2001). In other words, stories should not be made up to teach a lesson or strategy–they should be real stories from real experiences. Storytelling can be counter-productive when the story told is not true (Denning, 2000). Denning also cautions that use of the Springboard is not for all audiences. In his book, Denning explains that "not all stories have the 'springboard effect'" and it only "worked well with particular audiences."

Perry offers a technique for incorporating story into curriculum (or knowledge management) called the bob-and-weave technique. "Engage [the audience] with a story to provide the context. Make sure this vignette can touch the emotional parts of their brains. This will activate and prepare the cognitive parts of the brain for storing information. Information is easiest to digest when there is emotional 'seasoning' — humor, empathy, sadness, and fear all make "dry" facts easier to swallow. Give a fact or two; link these facts into related concepts. Move back to the narrative to help them make the connection between this concept and the story. Go back to another fact. Reinforce the concepts. Reconnect with the original story. In and out, bob and weave, among facts, concept, and narrative." This technique of moving back and forth through these interrelated neural systems, weaving the information together is, according to Perry, the most effective way to present information.

The website for i.d.e.a.s. Learning, an Integrity Arts and Technology company who's core competency is storytelling, says, "Educators and trainers have always known that you have to start with what a learner knows, and use that to build a bridge to the new knowledge or skill you want them to acquire. Turns out, that whether you tell them the story or they think it up on their own, there is a story at the core of that new learning! The point is to give the learner the story that will carry them toward the objectives rather than leaving it up to chance. The story has to provide both the context for the new learning, as well as the vehicle to get them there" ("i.d.e.a.s. Learning," n.d.).

Success Stories

Internal magazines have been effective in eliciting tacit knowledge for NASA and EduTech. The employees at EduTech have "written stories about their experience and hope that future teams will learn from their mistakes about 'what not to do' by reading these stories" (Post, 2002). "Certain industries are more concerned with the impending "brain drain" stemming from the withdrawal of some mature workers from the workforce. The technology and pharmaceuticals industries generally express worries about the development of new products and services and anticipate a drain in experienced engineers, key account sales representatives, and senior managers" ("America's," 2005).

Bristol-Myers Squibb adapted the successful practice of storytelling "from NASA's Jet Propulsion Laboratory to provide time for senior or tenured people in the organization to share tacit knowledge with others through storytelling." (Powers, 2004). Melinda Bickerstaff of Bristol-Myers Squibb says, "We are really focusing on tacit knowledge–the stuff underneath that is really difficult to get at. A company that can figure out how to do that and begin to share with others in the organization will be the company that's really ahead." (qtd. in Powers, 2004).

A growing number of companies are using storytelling to increase employee's morale, get mission statements across the workforce, recruit new staff members, and praise existing ones. One Nightime Pediatrics Clinic hired Rick Stone, president of StoryWork Institute (Orlando, FL), to identify stories that reflect the core value of the company. StoryWork is a national company that has developed training programs dealing with storytelling for teambuilding and leadership. The partnership resulted in the development of "Nightime Stories," a book of yarns told by staff and patients of the hospital (Holden, 1999).

This highlights that storytelling has a place in the corporate world, and the CEO of GE, Jack Welsh, could best exemplify this. He is a great storyteller and he has encouraged his managers to hone their storytelling skills. Storytelling is an effective tool that could be used to direct and inspire subordinates. This is because it evokes both visual imagery and emotions among the listener. It is a fun way of communicating concepts and ideas within an organization (Dennehy, 1999).

Another company that utilizes storytelling is The Walt Disney Company. Bran Ferran, executive vice president for Walt Disney Imagineering, believes that the web is a great medium for storytelling and he also believes that each job is primarily a storytelling job. He asserts that chief information officers (CIOs) could accomplish their jobs more easily and efficiently if only they could become more effective storytellers. He believes that IT departments could serve as a storage space for memories; information technology should be used to convey the

company's sense of community, history and accomplishments. Companies should also realize that the Internet could bring numerous benefits and building an intranet would allow a company to extend these benefits within the organization (Jahnke, 1998).

At 3M, strategic narratives and storytelling are a better alternative to using bullet points in strategic planning. Planning by narratives is a lot like storytelling. The plan must tell how the company can overcome obstacles and win. The conclusion requires a logical, concise argument that is specific to the situation and leads to desired outcomes. The story should include the industry's economic factors, its key success factors, and the force that drives the change. The story should introduce a dramatic conflict and should reach a solution that ends the story in a satisfying manor (Shaw, Brown, and Bromiley, 1998).

At an express carrier company in Great Britain, Parcelforce Worldwide, senior executives have developed a corporate story that is designed to communicate the business plan and motivate its personnel to meet the firm's objectives. The storytelling approach would humanize the strategy, make the business plan easy to remember, and help generate practical ideas that would help improve productivity (Jackson and Esse, 2006). Organizations use words to define themselves to the market and also to their own organization. In 2006, Blair noted a few companies that do so. FedEx has a long mission statement that is conveyed through words and storytelling. Wendy's and Nike use words and storytelling as a way to convey their mission statements. If you are convinced that you would like to use stories in your company, Blair notes a few elements to keep in mind:

- Be clear about what you want to explore through story
- Make sure that everyone's story can be told
- Decide how you will elicit the stories
- Consider how some of the stories can be told to the whole group
- Take time to process the stories
- Consider the types of stories you want
- Believe in the power of the stories

Storytelling improved the ability of English Nature to share and reuse knowledge from its constituents through the use of reverse-storytelling and listening skills when working with farmers, landowners and partner organizations. English Nature armed with an ever-growing arsenal of teaching and springboard stories understands the power of the story (Donaldson, 2005). Harris and Barnes (2005) say stories can entertain, teach, delight, frighten, or inspire. They are tools of leadership. Stories can reach across boundaries of culture, profession, and age. Storytelling is effective in leadership. If a company is trying to improve conditions, to inspire employees to work harder and longer, or to communicate a complex idea in a clear and powerful way, the solution is to tell stories.

Strategic management also uses storytelling as a tool to enhance communication. Applied correctly, storytelling can do more than inform employees about an initiative; it can add context and encourage acceptance. According to Snowden (2001) story is a very powerful tool; it's the most sustainable of communication techniques. It's not just about communication, it's about understanding a corporate culture and providing a means whereby real learning and innovation takes place.

The Verdict

Could the application of storytelling be a useful component of knowledge management? Yes, storytelling could be very useful in knowledge management, and for some companies has proven to be a very worthwhile investment. *Why* would storytelling be a good tool in knowledge management? Storytelling could be useful in knowledge management because it makes information meaningful, makes tacit knowledge more explicit, and puts information into more natural learnable chunks. *How* can storytelling be used in knowledge management? Committees can be assembled in organizations with the objective of getting the tacit knowledge and making it more explicit. Storytelling techniques can be used to convey the usual facts and figures to make them more meaningful and easier to learn.

Current research says that storytelling could potentially have a very valuable impact on business, but more companies need to try using it and report on their successes and/or difficulties with it. Although there were no reports of unsuccessful attempts at implementing stories into knowledge management, it cannot be assumed that there were no unsuccessful attempts. Storytelling as a means to understand the world and to spread information has a

long and rich history, it is and it is highly likely we will see this trend in learning and teaching making headlines as the latest and greatest tool in knowledge management.

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Cross Cultural Considerations for Online Teaching and Learning

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Introduction

From a social constructivist perspective, learning and culture are interdependent. Cultural contexts influence how students perceive, understand, and interpret knowledge. Thus, learning in different countries requires different intellectual capabilities and different cultural approaches (Hofstede, 1986).

In general, an online environment is designed to open to students who are physically located in different sites or countries. An online environment requires group learning with which students communicate each other to build collective knowledge. The impact of multi-national cultures can be a big variable to determine the success of online teaching and learning. Language barriers, different communication styles, or interactions with peer students from different countries would be a significant challenge for students (Gunawardena, Nolla, Wilson, Lopez-Islas, Ramirez-Angel, & Megchun-Alpizar, 2001). Further, cultural backgrounds of students may enable or hinder building their learning experiences in an online environment.

With consideration of culture factors as student characteristics, the more knowledge on cultural diversity associated with learning instructors have, the more appropriate support would be available for building meaningful learning experiences for culturally diverse students. Thus, instructors and online educational practitioners need to be prepared to understand cultural differences of students and address how cultural differences might impact on online teaching and learning (Cifuentes & Shih, 2001). In this sense, the focus of this study is to review cultural differences from pedagogical and technological perspectives.

Frameworks for understanding cultural differences

Culture is defined as "a set of learned values, attitudes, and approaches shared by a group of people" (Duarte & Snyder, 1999, pp. 54). Over the learning process, students expose their cultural orientations which have been embedded in their ways of thinking, behaviors with or without intention. They develop the processes of influencing the cultural perspectives and being influenced by their cultural values interchangeably. Thus, it is said that teaching and learning is essentially the transmission of cultures and culture acquisition from a perspective of instructors and students (Wolcott, 1999). Accordingly, it can be said that "culture and learning are interwoven and inseparable" (McLoughlin, 1999, p. 232).

Why does the cultural issue matter in an online environment? An online environment presents the nature of complex dynamics. There are ambiguity of presences in virtual spaces and restricted contextual clues in online dialogues and communication behaviors which little happen in face-to-face classroom setting. With cultural diversity added, online teaching and learning would be more challenging than those of face-to-face classrooms. McLoughlin and Oliver (1999) point out that instructors and online educational practitioners should consider norm, values, learning behavior styles, and cognitive preferences of students in designing tasks and activities in order to make an online environment real-world contextual. Simultaneously, they should be aware that certain educational values in one culture are culturally inappropriate to anther. Admittedly, culturally appropriate approaches are required for better teaching (McLoughlin & Oliver, 1999).

Two theoretical frameworks from Hofstede (1986) and Hall (1976) explain about cultural orientation of people from different nations. Hofstede's framework suggests several dimensions that determine cultural differences: power distance, collectivism vs. individualism, femininity vs. masculinity, uncertainty avoidance, long term vs. short term. On the other hand, Hall determines cultures into two different categories by high contextual culture vs. low contextual culture.

The cross-cultural frameworks of Hofstede and Hall benefit to instructors and online educational practitioners to draw a comprehensive picture of understanding cultural differences of international students.

Based on this, it might need to clarify what implications and challenges cultural factors give to those who are willing to understand how multi-cultural students act, react, or behave in an online environment.

Considerations for online cross-cultures

Bigg (1999, cited in Bamford, Marr, Pheiffer, & Weber-Newth, 2002) points out that social-cultural adjustment, language, and specific learning and teaching problems are the major problem areas of students with different cultural orientations. An online learning environment is not exceptional and it can face even more complex problems. Here this study suggests understanding how cultural differences influence student learning, and understanding the relationship of cultural differences with technology preferences.

Understanding cultural differences in student learning: It is mandatory that instructors and online educational practitioners should reflect instructional values and beliefs into their instructional design of online teaching and learning (Bentley, Tinney, & Chia, 2005). At the same time, instructors should clarify students' cultural diversity and further understand how they communicate and engage in online learning. For instance, Massey, Montoya-Weiss, Hung, and Ramesh (2001) pointed out that students in collectivistic cultures rely upon high context communications. They usually spend enough time on making casual conversations and interactions to create a feeling of comfort before addressing task-oriented discussions. In this case, warming-up socializing activities (e.g., coffee house activity, team building activities, etc.) assist students to get to know each other as a way of stimulating task-related dialogues. Students in high contextual cultures tend to avoid high uncertainty and prefer to know whether others understand them and whether they can understand others under the same communication circumstance. They tend to reach decisions through indirect communication with bearable degree of vagueness to avoid conflicts.

As Palloff and Praff (2005) indicate, what is important from a pedagogical perspective, is to recognize the differences of cultures, understand different communication styles and attitude toward online teaching and learning environments. It is important to develop both 'culturally-general' and 'culturally-specific' instructional strategies when designing and facilitating online courses.

Understanding cultural preference on technology use: All the teaching and learning activities in online environments are conducted via technologies. Cultural orientations may determine students' reactions and preferences on particular technological tools. For instance, rich technological tools reduce a feeling of solitude and uncertainty which frequently happen to online environments. Students in collectivist cultures feel comfortable with face-to-face interactions since synchronous interactions are effective in enhancing a sense of belonging (Duarte & Snyder, 1999). Students with high contextual cultures tend to learn better knowledge and information in visual presentations. Video conferencing or face-to-face meeting can serve to clearly deliver important messages and social presence to students.

On the other hand, lean technological tools lack immediate feedback, uses a single channel, and support limited cues (Workman, Kahnweier, & Bommer, 2003) and they send fewer communicational cues or provide slower feedback. Email, one of lean technological tools can be fully utilized by students under low contextual cultures by delivering explicit words, arguments, debates. Thus, instructors should aware that the dominant use of a particular technological tool may be comfort for some students, but a cognitive burden for others.

Conclusion

A variety of online courses across different disciplines have been delivered to international students over the years. While current research studies recognize the importance of cultural understanding in online learning environments, technologies have long being used under instructional intentions with little regard for the cultural orientation of students. Further, little has been done to examine the relationship of pedagogy, technology, and cultural factors in online environments. It is fortunate to say that there is a growing attention to cultural issues related to online teaching and learning recently.

It is obvious that online teaching and learning is not an easy practice. It is even harder than face-to-face classroom setting and it requires more time and effort than expected. A "culture-technology fit" (Massey et al., 2001, pp. 84) with a pedagogical perspective may be new to all students, instructors, and online

educational practitioner. However, it would be our responsibility to dig it out in order to develop cross-cultural online learning environments. It is expected that the initial step forward this topic contributes to increase the quality of online teaching and learning in the end.

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Analyses of Case-Based Learning in Online MBA Program:
The Good, the Bad, and the Ugly

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Introduction

A business school puts high values on 'theories into practices' in which students conduct real-world tasks as much as or more than any other fields. With extensive application of knowledge and skills, case-based learning has been regarded as a powerful pedagogical tool across business disciplines. A case plays a vital role in areas such as accounting, business law, management, marketing, finance, and information systems.

Some benefits of the case-based learning method include the development of connections between theoretical and practical knowledge, student engagement, reasoning, and reflective decision-making (Lundeberg, Levin, & Harrington, 1999; Wang & Bonk, 2001). Such skills are necessary for MBA students to be ready to perform well in real-worlds, conduct ill-structured tasks, and be able to make decisions based on constantly changing sources of information.

However, despite the growing popularity of using the case-based approach in distance education of business, Oram (1998) indicated that most online case studies adopt traditional text-based materials, resources, and approaches. There is little agreement about such fundamental issues as how to support online case-based activities, and what to assess the learning performance of online case-based activities. It is unclear how online MBA courses have been designed to support students' learning experiences with case-based activities.

This study focuses on the review on current states of online case-based learning as a way of MBA professional development. It explores the perceptions of instructors and students on actual implementations of case-based learning within an online MBA program, from both pedagogical and technological perspectives. The results of the study are expected to enable instructors to better understand the key components of online case-based learning to understand how to create meaningful environments.

Literature review

Case-based learning in a business school context is defined as a method that "involves studying actual business situations, written as an in-depth presentation of a company, its market, and its strategic decisions, in order to improve a student's problem-solving ability. Cases typically investigate a contemporary issue in a real-life context. There are multiple issues to consider and many correct or viable alternatives to solve the case issues are presented" (Helms, 1999, pp.71). This definition echoes that case-based learning can help students prepare to deal with real-world problems that they will face at the time when they leave an academic environment, and ultimately to find success within a specific business organization or profession by using these previously learned skills and experiences.

With the case study method, students are prompted to recall, anchor, and integrate their prior experiences to analyze cases and to explore solutions to identified problems in the cases through discussions, reasoning, reflection, and decision making (Lundeberg, Levin, & Harrington, 1999; Wang & Bonk, 2001). Cases that present real or hypothetical problems and scenarios can prompt deep discussions to develop solutions (Benbunan-Fich & Hiltz, 1999). Designing activities with interesting and pedagogically sound cases that closely relate to course topics is important for student engagement in learning.

The case-based learning approach can be equally effective in online as it is in a traditional face-to-face classroom settings (Cheney, 2000, as cited in Rouke & Anderson, 2002). In fact, it is a tradition that case studies have been conducted in individual learning modes, not collaborative ones. However, Learning is an engaging process under which students build knowledge through social interactions and collaboration (Liu, Lee, Bonk,

Magjuka, & Liu, in press). Thus, group discussions and collaborations are the most important parts of online case-based learning, according to Rourke and Anderson (2002).

Findings and implications

This study is conducted in an accredited online MBA program at a top ranked business school in a large Midwestern university. The program has grown to include hundreds of students in just a few years and was reviewed as a representative program to examine issues of online case-based learning. Data collected in this study included content analyses of course documents and class assignments, surveys of students, and interviews of faculty members and students.

The study findings confirm that case-based learning has been one of the widely used instructional methods in the online MBA program. From both students and instructors' perspectives, the attainment of the equivalent quality of online courses with their counterparts in face-to-face settings seemed to be an underlying goal, and at times, a mandate, for delivering online courses. While this creates a positive culture in this program for achieving high standards of online education, in certain ways the online instructors tended to replicate the classroom-based learning as much as possible in the online environment. Thus, many instructors retained the same course packet formats for teaching business content in online courses. Lengthy, heavy text-based cases still were the dominant format in many of courses.

Other types of case learning such as personal reflections, students' case generation and evaluation based on personal job settings, online expert commentaries or evaluations, and role assignment in case discussion can be considered (Bonk & Dennen, 2003; Bonk, Hara, Dennen, Malikowski, & Supplee, 2000). Such studies take advantage of the diversified adult learners' backgrounds and the capabilities of technology to break the temporal and physical barriers. However, these activities were not used much in the online MBA program. In stead, simulation cases were used in several courses and some innovative use of technology (e.g., Breeze chat tool, Case Builder tool, etc.) for online case-based learning was applied to ensure the quality of case studies. Interestingly, several pilot instructors developed 'story-based scenario' and the scenarios of these cases were embedded in an online environment with threaded discussions, polling, and online resource exploration. As a result, these cases proved to be more engaging and appealing from the students' perspectives.

Also, the study indicates that there were several factors that affect instructors in transforming the format of text-formatted cases. For instance, there might be financial constraints, copyright issues, long development time, pedagogical concerns, and heavy uncertainty about the educational benefit and cost ratio of case transformation. These concerns and issues can interfere with diverse formats of delivery such as multimedia based case presentation for dual coding effects of learning.

On the other hand, the instructors extensively vary in terms of choosing individual work or group work or some combination of both for students working on case analysis. In quantitatively-geared courses, the instructors tended to emphasize individual processing skills on the case analysis. In more judgmental courses, they were more focused on the group work and extensive case discussions. In general, students considered group work is a better approach for complex case problems. However, due to their busy schedule and locations in different time zones, the difficulties in coordination tended to be a frustrating experience for students to work in teams. The free-riding issues also affected students' satisfaction in teamwork associated with online case-based learning.

The MBA courses varied in terms of the degree of instructional support and guidance for effective case-based learning activities. Some instructors took advantage of the courseware tools and technological features. For instance, the course announcement in the course management systems were the most frequently used tool for presenting hints, guidelines, and thinking sheets that can scaffold students' online case-based learning. However, about one-third of the instructors actually moderate discussion forums to redirect and augment students' arguments.

Asynchronous discussion forums are used in almost all the courses in case-based discussions at either class-level or group-level. While most instructors tended to prefer to use this medium as tools for facilitating in-depth reflection on cases and high quality discussions, students tended to be frustrated by the impersonal feature and delayed exchange of information. When group conducted case analyses and were able to select their communication tools, teleconferencing tools were regarded as efficient and effective tools for brainstorming and decision making in case-based discussions. In the meantime, asynchronous discussion forums were mostly used to upload and download deliverables and share case information. Chat rooms were not used effectively in facilitating case-based learning activities. Part of the reason for limited use of real-time chat tools were the low comfort level of instructors with such tools and the constraints of chat systems. Simply put, it is not easy to stimulate in-depth thinking and quality case analyses or discussions in a synchronous chat environment. Among the key difficulties was scheduling time for participants to attend a synchronous chat session. Consequently, email is used by instructors to post instructions and

specifications of the case analysis. From the students' side, the email is mainly used for clarifying administrative issues.

Conclusion

This study indicates that the case-based learning method is a key approach in the online MBA program just as in traditional MBA courses. The results of this study provide instructors and educational practitioners with some implications for instructors around the globe who plan to implement case-based learning activities. Clearly, those in other professional schools will be interested in practical guidance and support on how to effectively make a successful transition of the traditional case study method to the online case-based learning approach, and on how to embed pedagogical strategies of case-based learning in their online courses.

This study provides a starting point for understanding the current status of case-based learning in an online MBA program. Further, a systematic research agenda need to be established in the areas of virtual group work, online moderating, online mentoring, online performance and information support, and tools to support case-based learning and student interactions.

One issue centers an interest in socio-cultural aspects of online case-based learning. They may want to know how to design effective group work to solve online cases, how to embed dilemmas in cases that support social interactions and dialogue, and how to support instructor moderation in these environments. Further, instructors and support staff should realize that the success of online business courses depends on the appropriate use of pedagogy into business contexts, not on the introduction of advanced technology itself. Finally, policy makers, foundations, and government agencies should be aware of the findings here and target funding for the more powerful learning approaches and ideas.

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Designing a Teacher Professional Development Program
for the Effective Use of Web-enhance PBL

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Abstract

The purpose of this project was to design a professional development program to support teachers' effective use of web-enhanced Problem-based Learning in middle school science classrooms. Implications for program design were derived from empirical research, needs of practicing teachers, and practical guidelines from teacher professional development literature. Synthesis of our research results suggested the following key design features: 1) model PBL to teach PBL, 2) balance technology, pedagogy, and the PBL method, 3) enable the teachers to bridge theory and practice, 4) enrich the experience within a Community of Practice, 5) use optimal blending of online and offline learning environments.

Problem Statement

Problem-solving skills have increasingly been recognized as desirable skills to be developed in Pre-K-12 education. According to Mayer (1989), "problem-solving skills should be learned within the context of realistic problem-solving situations. Instead of using drill and practice on component skills in isolation – as suggested by the skill-based approach – a meta-skill based approach suggests modeling of how and when to use strategies in realistic academic tasks" (p. 53). Problem-based learning is one pedagogical strategy that helps students develop deep understanding within a knowledge domain and develop effective problem solving skills especially in the sciences. PBL does this by engaging learners in the learning process and in activities to solve real world, authentic problems (1996; Hmelo & Evensen, 2000; Taconis *et al.*, 2001; Voss, 1989).

Although many studies indicate positive impacts of PBL on student learning, as a promising pedagogical strategy, this practice is not often found in the classroom as many researchers had expected. This is partly because PBL is very different from traditional ways of teaching such as teacher-centered lectures (Smith *et al.*, 1995). As a result PBL may not be easily adopted in teaching practice or adopted in ways that are truly PBL. This phenomenon may also be explained by the fact that many teachers may not have had enough opportunities to develop their understanding and skills about PBL itself. Considering that "the ability of teachers during the small group learning process is the major determinant of the quality and the success of PBL" (Barrows, 1992), it appears important to foster that process by providing teachers with specific information or guidance about how to flexibly use or incorporate a variety of instructional approaches to PBL. Current guidance for PBL implementation still is theoretically oriented, far from the practitioners' reality. This project, therefore, focused on designing a framework for professional development about Web-Enhanced PBL that is scalable and replicable, and one that creates a link between theory and practice in using PBL.

Purpose Statement

The goal of this project was to design a professional development program for middle school science teachers who are willing to use PBL more effectively in their classroom. Implications for program design were derived from

empirical research, needs of practicing teachers, and practical guidelines from teacher professional development literature.

Context of the Study

The professional development program is designed to facilitate the teachers' effective use of Web-enhanced PBL program, using an existing program named KaAMS (Kids as Airborne Mission Scientists. See the website at http://ide.psu.edu/kaams/kaams). The KaAMS web site provides PBL-based lesson plans and teaching resources fro middle school science. KaAMS, as a NASA funded project, was created to help teachers inspire middle school students to learn science by integrating a variety of web resources in a flexible and authentic way.

Approach to the Program Design

Literature Review Results on Teachers and Teaching Practice

The design of the teacher professional development program for KaAMS is grounded on a literature review of teaching practice. From the literature, several teachers' characteristics were predicted to influence the use of general teaching strategies including problem-based learning (Grabowski et al., 2000). More specifically, the researchers found five major variables related to the technology use and PBL teaching methods: computer and Internet skills, feeling of preparedness to use the Internet, attitude toward the use of web resources, pedagogical beliefs, and science teaching efficacy. These variables were believed to influence science teaching practice (Ching *et al.*, 2005) . Thus, the researchers consider those factors in program curriculum design so that the terminal goal of 'supporting teachers to use PBL more effectively in their classroom activities' can be achieved.

Empirical Study Results on Teacher and Teaching Practice

The researchers conducted a study examining the interrelationships between teacher characteristics and teaching practice using several predictor variables as identified from the literature. (See Appendix A). The major purpose of this study was to get closer to the teachers with questions about who they are and what they do in their classroom. Most of all, the empirical data from this study served as direct input into the design of the teacher professional development program. To verify the theoretical model which emerged from the literature review, twenty seven middle school science teachers ranging from fifth grade to eighth grade participated in the study. (Lim *et al.*, 2006).

The results suggest some interesting, yet meaningful, implications for designing a teacher professional development program. First, teachers' computer and internet skills appear to be highly influential to teaching practice. For example, a teacher who has higher computer skills is likely to adopt more varied teaching strategies such as PBL or an Internet-based activity, and the vice versa. Second, teachers' science teaching efficacy was negatively correlated attitude toward web resources. In other words, a teacher who has higher science teaching efficacy shows negative attitude toward Internet resources. This can be interpreted as a teacher with high efficacy may not be dependent on online resources. A third, pedagogical belief was a critical variable in predicting teacher's teaching practice, especially PBL use. It is notable that there was a significant correlation between computer and Internet skills and pedagogical beliefs, which means there is a high probability that teachers who have higher level of computer and Internet skills might believe in the constructivist approach.

Implications for design:
- Improve computer and Internet skill
- Provide a chance to reflect on the usefulness of web resources, with the consideration of teachers' level of teaching efficacy.
- Develop a positive attitude toward the pedagogy of Constructivism.

Teacher Interview Results on Web-enhance PBL Use

Several middle school science teachers were directly involved in the process of program design. In January 2006, as a part of a pilot study, two science teachers in Pennsylvania implemented the KaAMS PBL lesson plan in their

classroom to provide rich feedback on KaAMS application, while another two teachers reviewed the KaAMS resources to provide suggestions and comments on KaAMS program. The data from these teachers, as one of the most important data sources, answer the questions such as; what kind of difficulties do teachers encounter when using the KaAMS PBL resources? or do they need more information, resources, or support during the PBL implementation? Ongoing reading of the qualitative data was complemented with the constant comparison method of data analysis provided by Glaser and Strauss (1967). The collective experience of all four teachers formed the basis for the three themes that emerged: frustration, teacher as a facilitator, and potential. Throughout the course of the research study other issues and concerns came to light, but it was these recurrent three themes that remained constant throughout.

At the beginning of implementation, the teachers felt frustrated when trying to adopt this new teaching practice and activity recommended in web-enhanced PBL. Although, the web-enhanced PBL program provided a detailed teacher manual, the teachers perceived this new teaching approach as different from their own teaching practice. A lack of resources, especially hardware, was another barrier to implementing the web-enhanced PBL lesson plans. Time constraint was a key reason given by the teachers as to why they were hesitant about using this new curriculum. Finally, the State test was another big cause of their frustration because they felt these regulations prevented them from implementing new pedagogical approaches. Although they were frustrated with this new approach, they seemed gradually to integrate KaAMS into their classrooms. Interestingly, all of four teachers' pedagogical beliefs showed that they preferred to use a constructivist approach in their science classroom that focused on authentic problem solving, collaborative learning, and promoting students' thinking. They indicated that this new teaching approach, also, had affected their perceptions on their role in teaching science--changing from a didactic teacher to that of a facilitator. During and after participating in this project, the teachers believed that web-enhanced learning environments make students' learning more dynamic and active, and motivate students to actively engage in their learning process. Teachers perceived, also, that this new practice encouraged their students to actively engage in communication or interaction between students and teachers.

Implications for design:
- Minimize frustration, maximize success, and demonstrate the flexibility of the approach: the teachers felt frustrated when trying to adopt this new teaching practice since they don't have enough time and the pedagogical approach is different from what they are used to.
- Convince teachers that this approach is effective from the beginning: All the teachers believed that this practice was effective especially in science teaching after implementing this approach. So, right from the beginning, it is important to convince teachers of the effectiveness of this approach.

Practical Considerations in Teacher Professional Development

Time, accessibility and financing are critical to teachers' choice of and participation in the professional development activities (T.M. Duffy *et al.*, 2006). Given the busy schedules and workload of middle school teachers, teachers typically only participate in a program that lasts less than 8 hours (Parsad *et al.*, 2001). While short programs meet teachers' practical concerns, previous studies also showed that the effects of one-shot programs are limited. They may promote teachers' awareness or interests in the new ideas or skills (Boyle *et al.*, 2005), but are insufficient in terms of preparing them for adopting new teaching methods, or integrating new skills. By reviewing a large body of literature, Boyle et al. (2005) suggested that professional development activities over longer periods of time have stronger sustaining influence on teaching practice because they offer teachers opportunities to go through an iterative process of practice and reflection on what they have learned. The findings of their survey further revealed that longer term professional development activities led to changes in one or more aspects of teachers' teaching practice. In short, to design a professional development program, the challenge lies on how to find the balance between practicality and learning effectiveness.

With the advancement of the internet, online delivery of professional development programs seems to be a solution to overcome teachers' practical concerns about professional development. However, professional development programs that are fully delivered online are at the expense of face-to-face interaction. Programs that need to affect a change, especially related to developing skills of new teaching practice with technology, would benefit from face-to-face interaction. A face-to-face program accompanied by online supporting (professional or peer supports) systems, namely a blended method, should be a promising solution. Learning in a blended environment allows the

convenience brought by an online environment while not sacrificing the face-to-face social interactions (Osguthorpe & Graham, 2003).

Implications for design:
- Prolong the professional development to improve its effectiveness
- Provide sustainable online support systems to enhance face-to-face interactions

Conceptual Framework for the Design

These implications from research and practice informed the development of a conceptual framework for the professional development program whose purpose was to facilitate middle school science teachers becoming experts in implementing web-enhanced PBL in their classroom.

Apply PBL to Teach PBL

By situating teachers in a PBL learning environment themselves, this professional development program will help teachers develop an understanding of PBL from a cognitive, psychomotor and affective perspective. By following the PBL process to learn PBL, the teachers, first, will need to assess their existing knowledge of technology, pedagogical beliefs, and PBL through *self-diagnosis*. Then they will explore and develop a deep and contextualized understanding of Web-enhanced PBL (*cognitive*). While practicing the PBL strategy successfully (*psychomotor/skill*) during the program, teachers are likely to feel the benefits and build confidence around adopting this strategy in their classrooms (*affective*). This design addresses all three fundamental elements (i.e., cognitive, affective and psychomotor) of an attitude (Kamradt & Kamradt, 1999). It is our expectation that teachers will form a positive attitude toward the adoption of Web-enhanced PBL after participating in this program.

The design of this professional development program follows a PBL process synthesized from different PBL models (Hmelo-Silver, 2004; Torp & Sage, 1998). We start from presenting the problem scenario to set the context for learning, and then we help teachers to self-diagnose what they know and what they do not know about the problem. Through collecting information about the unknown, teachers learn deeply about the problem and form their own solutions to the problem. In the last stage, teachers will present their solutions to the public and share their learning processes.

Balance Technology, Pedagogy, and PBL Method

The literature review and empirical research results revealed that the computer and internet skill and more constructivist pedagogical beliefs are both critical to predicting the use of PBL in the classroom. Accordingly, the researchers have included technology skills as well as pedagogical understanding in the professional development program. Without these two components, the terminal goal of helping teachers integrate web-enhance PBL would not be accomplished. Figure 1 and Table 1 depict how technology, pedagogy, and PBL method are balanced as three major themes of this program.

Provide a Bridge between Theory and Classroom Practice

Knowledge *about* theories is not sufficient to become expert PBL teachers. A link to success is to provide opportunities for teachers to 'practice in their own classroom' so that they are able to transfer and sustain what they learned. From this point of view, the program is designed to provide a link between theory and "classroom practice" in each theme. More specifically, every theme starts from the basic concepts and ideas related to the theme taught using a PBL approach as described above, followed by in-depth discussion about application and integration. After finishing each offline session, teachers return to their classroom and apply what has been discussed during the program. The reflective action plan that is developed at the end of each theme connects the teacher professional development program and their reality, the classroom.

Enrich the Experience within a Community of Practice

Considering that one of the implications for design is to prolong the professional development experience, providing a community of practice is quite important. Researchers interpret the word 'prolong' not only in the context of the

length of hours but also of the depth of engagement. Within a community of practice, teachers learn, share, and reflect, which enables them to solve their own problems in their own real context and to build a case library throughout the iterative process of learning. The Community of Practice component is designed based on the theory of Case-based Reasoning by Roger Shank, and Situated Cognition by Lave and Wenger. The application of PBL and integrating online space are the enablers of building a community of practice among the teachers.

Deliver Via Optimal Blending of Online and Offline

According to the design implications from a practical perspective, blending of online and offline is strongly recommended to pursue both efficiency and social interaction. The design of this professional development program maximizes the strength of each delivery method (See Table 1). First, teachers improve their computer and internet skill over the internet to equalize entry behaviors, while starting to share information with and about each other. The basic concept of mastery learning is applied at this point of warming up. Second, all of the teachers get together face-to-face for a day (per each theme) to work collaboratively. This offline activity is expected to increase the quality of ongoing interaction with the group work increasing the opportunities to getting to know each other. Teachers, then, return to their school, but with the expectation that learning will be ongoing. Teachers carry out their action plans while communicating with experts and peers. The combination of 1 day offline and 1 week online is repeated for each theme to maximize the effectiveness and minimize the cost of time and travel.

Figure 1. Conceptual Structure: Learning to Use Web-Enhanced PBL

Implications	Model	Theories

Face to Face Problem Scenario **On-line**

Technology

1. Improve computer and Internet skill

Identify knowledge deficiencies

Diagnosis of Computer Skills

2. Provide chance to reflect on the usefulness of web resources

Collecting information

IT Training - Needs base

Technology in Classroom - Case study

Apply new knowledge

Mastery Learning - B. S. Bloom (1968)

Carry out the action plan in the classroom **Reflection on CoP**

Case based reasoning - R. Schank (1999)

3. Develop a positive attitude toward the pedagogy of Constructivism

Diagnosis of Pedagogy

Identify knowledge deficiencies

Pedagogy

Introduce teaching method

Collecting information

4. Minimize frustration in implementing new teaching practice

Pedagogy in Classroom - Role play

Apply new knowledge

Problem based learning - Hmelo-silver (2004)

Attitudinal Change - Kamradt & Kamradt (1999)

Carry out the action plan in the classroom **Reflection on CoP**

5. Provide successful experience with new teaching practice

Diagnosis of PBL teaching

Identify knowledge deficiencies

PBL Teaching

Situated Cognition - Lave & Wenger (1991)

6. Use optimal delivery system

Introduce PBL teaching

Collecting information

PBL in Classroom - Design lesson plan

Apply new knowledge

7. Provide sustainable supporting system

Implement PBL with Peers

Go Public!

Community of Practice

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Detailed Design

Based on the conceptual framework, details of the professional development program to facilitate teacher's ability to implement web-enhanced PBL are shown in Table 1.

Table 1. Timetable for the Teacher Professional Development Program

	Warming-up Technology	Theme 1 Technology		Theme 2 Pedagogy		Theme 3 PBL teaching	
Delivery method	1 Month Online	1 Day Offline	1 Week Online	1 Day Offline	1 Week Online	1 Day Offline	1 Week Online
Content	1. Online checklist to diagnose my computer skill level 2. IT training - Choose 2 online courses that fit to my needs	1. Program Introduction - General announcement - Problem Scenario - CoP 2. Online Treasure Hunt Competition - group activity - reward for the winning team 3. Case Study on Technology integration in the classroom - What is the good use/bad use? -What about me? 4. Develop an action plan	Carry out the action plan in the classroom and post the reflection on CoP	1. Who am I? - diagnose myself 2. How should I teach science? - introduce various learning theories 3. Role Play - Behaviorism/Congitivism/Constructivism 4. Develop an action plan	Carry out the action plan in the classroom and post the reflection on CoP	1. Do I really understand what PBL is? - diagnose myself 2. KaAMS introduction as a web-enhanced PBL case - introduce PBL - introduce how to use KaAMS web site 3. Develop a lesson plan and Practice (Go Public!) - Micro teaching using KaAMS lesson 4. Develop an action plan	Carry out the action plan in the classroom and post the reflection on CoP
Strategy	2. Use commercial web site providing online training programs	2. Use a computer lab/ divide as small group/ present a question that can be answered by web surfing/ presentation from learners 3. Use a couple of different cases on technology integration to facilitate discussion 4. Learners reflect their own experience.		1. Use surve questionnaire from KaAMS research. 3. Present situations and let learners take the roles. Facilitate discussion. 4. Learners reflect their own experience.		1. Present quick quiz about PBL (e.g. 10 myth about PBL) 3. Select a few teachers who are willing to teach a KaAMS lesson 4. Learners reflect their own experience.	

Conclusion

The purpose of this project was to design a professional development program to support teachers' effective use of web-enhanced Problem-based Learning in middle school science classrooms. Design implications for the program came from several years of empirical research, listening to practicing teachers who used KaAMS lesson plans, and reviewing practical guidelines from teacher professional development literature. Synthesis of our research results suggested the following key design features: 1) model PBL to teach PBL, 2) balance technology, pedagogy, and the PBL method, 3) enable the teachers to bridge theory and practice, 4) enrich the experience within a Community of Practice, and 5) use optimal blending of online and offline learning environments. Blended with the practical and empirical results is our own understanding and beliefs about learning as informed by learning and instructional theory. As shown in the Conceptual Framework, mastery learning, case based reasoning, attitudinal change, problem based learning and situated cognition were prominent in helping to develop the details of the design. The resulting professional development program, therefore, is more than a workshop for teachers. It alternates between carefully selected, appropriate face-to-face, offline and online expert and peer supported experiences that maximize learning, efficiency and transfer of theory into classroom practice.

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Appendix A: Conceptual Framework of Correlational Results (Lim et al., 2006)

**: Correlation is significant at the 0.01 level (2-tailed)
 *: Correlation is significant at the 0.05 level (2-tailed)
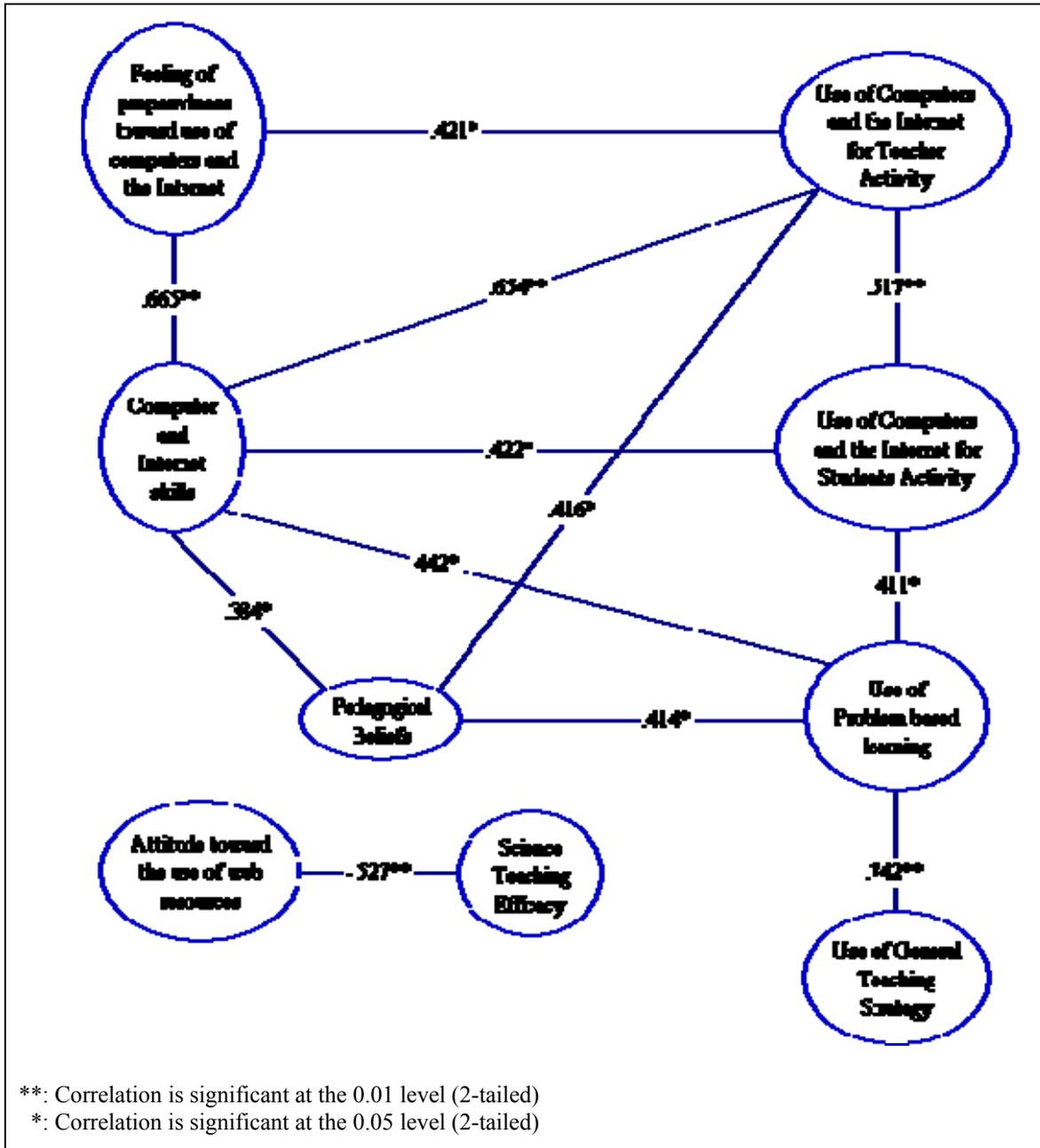
A Research Agenda for Developing and Implementing Educational Computer Games

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The Need for a Research Agenda

Video games have exceeded U.S. box-office in the annual sales (Tran, 2002) and emerged as the most frequently used interactive media among children (Kirriemuir & McFarlane, 2003). Game-based learning advocates (Gee, 2003; Prensky, 2001a) argue that this powerful medium can and should be utilized for laudable educational outcomes. However, although teachers and administrators acknowledge the positive effect of computer games on students' collaboration, discussion, and thinking skills, they are not convinced that games can be used as part of the school curriculum (McFarlane, Sparrowhawk, & Heald, 2002). Instead, the type of educational games that schools are familiar with is edutainment, which usually focuses on the motivational effects of games typically employing game-like drill and practice activities to achieve lower level learning goals. Many of the edutainment endeavors, which use the entertaining elements in video games to make learning fun, failed to produce anything either educational or entertaining (Kirriemuir & McFarlane, 2003; Okan, 2003; Prensky, 2001b). Additionally, researchers have limited experience designing or implementing effective game-based learning, especially with educational computer games. Although there exists 40-years of research on educational games, the research community is small and many research issues remain unresolved.

What research should be conducted to build a knowledge base that supports the design and implementation of educational computer games? Hannafin and Kim's (2003) critique of web-based teaching research can inform researchers interested in educational computer games. They criticized web-based teaching research as being too diffuse and contradictory; many studies reexamined design issues that have already been investigated in similar media in the past. They argue that web-based teaching research should explore whether existing theory and research provides guidance to web-based learning, which principles are relevant, and which inquires should be conducted to build a knowledge base for web-based learning. They advocate that researchers should examine the unique attributes of the web to develop teaching and learning processes that are philosophically different from traditional approaches. We believe this advice is valuable for researchers interested in educational computer games as well. As a research community, we need to examine relevant learning and instructional theories to identify guidance for designing and implementing educational computer games. We should also review previous research on educational games, whether they are electronic or non-electronic, to determine what has been studied and what issues remain to be addressed. In addition, rather than focusing on all design issues related to educational computer games, it is probably more productive to examine educational affordances unique to computer games. It is in this spirit that we initiated our own research on educational games and developed a research agenda to guide our future work.

To provide guidance for our own development and implementation of an educational computer game, we examined current learning and instructional theories and the affordances of video games to identify design guidance that leverages the strengths of video games and various theories such as problem-based learning (Barrows, 1996), situated cognition (Brown, Collins, & Duguid, 1989), cognitive apprenticeship (Collins, Brown, & Holum, 1991), to name just a few. We distilled several main principles for designing our own educational computer game (Ma, Williams, Richard, Prejean, & Liu, 2006): 1). situating problems in a rich context in order to engage students in scientific inquiry that reflects the way experts work; 2). present problems in all their complexity and offer tools, resources, and scaffolds to make complexity manageable; 3). provide learners with increased power of agency; 4). provide opportunities for authentic assessment of student performance. How do these guidelines work in educational computer games? What new strategies or new theories should be developed and tested to guide educational computer games? This paper presents a research agenda that explores these issues.

Potential Research Areas

The first four research areas listed below are related to the four design guidelines we generated from the literature. The rest of the research areas concern other important factors impacting the use of educational computer games.

Problem Presentation

Many contemporary theories on learning environments are built around a central problem in a rich context (Barrows, 1996; Hannafin, Hill, & McCarthy, 2000; Jonassen, 1999; Schank, Fano, Bell, & Jona, 1994; Spiro & Jehng, 1990). Modern video games provide opportunities for immersive and authentic representations of problems with the use of rich narratives, 3-D environments, real-time cinematics, as well as stirring audio effects and music. What media components should be used to present the problem context in a certain game? How do these different media components in problem presentation impact learning? Pre-rendered movies or real-time cinematics are two common strategies used to present the context in commercial computer games. Is one strategy more appropriate than the other for presenting certain problems in the educational computer game?

In some commercial computer games, problems or tasks are presented to the players when they approach a non-player character (NPC) to receive a quest or quests. These NPCs may serve as pedagogical agents (Baylor & Ryu, 2003) in educational computer games. What roles can a pedagogical agent play in educational computer games? In addition to using a NPC as a pedagogical agent, can a teacher play as an agent when the need arises? Could the facilitation and scaffolding role be shared between the agents played by the teacher and NPC? What scaffolding tasks are more appropriate for NPC? What tasks are appropriate for teachers? What impact does a pedagogical agent have on learner performance and motivation in educational computer games?

In computer games, problems are organized either in a structured "quest" or an unstructured "sandbox" format. What format ("quest" or a "sandbox") is more appropriate for a particular type of problems, learning outcomes, or content areas in educational computer games?

Facilitation Strategies

In the learning and instructional theories cited in this paper (Barrows, 1996; Hannafin et al., 2000; Jonassen, 1999; Schank et al., 1994; Spiro & Jehng, 1990), the role of the instructor shifts from the "saint on the stage" to the "guide on the side." Facilitation strategies are the key component to enable learning in educational computer games. For example, Egenfeldt-nielsen (2005) found that teachers play a critical role in helping students make a connection between game playing and scientific concepts. He found that although educational computer games provide experiences needed for students to construct knowledge, the deep understanding of the scientific concepts does not come automatically. Although students may develop spontaneous concepts themselves; developing scientific concepts requires the facilitator to help make the connection. The two facilitators in his studies were overwhelmed by the responsibilities and failed to deliver the assistance needed by students. This study reveals that despite the fact that educational computer games have great potential to benefit education, there are many challenges for facilitation.

What support do students need to maximize the educational benefit of computer games? What facilitation strategies should be provided in educational computer games? Learning and instructional theories suggest various facilitation strategies (Barrows, 1996; Brown et al., 1989; Collins et al., 1991; Schank et al., 1994; Spiro & Jehng, 1990). For example, cognitive apprenticeship recommends strategies such as modeling, coaching, scaffolding, articulation, reflection and exploration (Collins et al., 1991). How are these strategies used in educational computer games? How can support and scaffolding be built into the game to alleviate facilitators' responsibilities? How effective are these strategies? Moreno & Mayer (2005) found that guidance in the form of explanatory feedback resulted in improved student learning in an interactive game, but reflection in the form of asking students to give explanations for their answers did not affect learning. New findings from cognitive and learning sciences may also suggest strategies for use in educational computer games. For example, researchers who study analogical encoding (i.e. learning by comparing two cases) found that teaching students to compare cases side-by-side improves knowledge acquisition and transfer (Kurtz, Miao, & Gentner, 2001). Analogical encoding aids students in attending to the deep underlying structures (i.e. principles) of cases thereby reducing potential distraction of surface features. Our team is developing an anagogical encoding tool in an educational computer game to scaffold how to draw analog from two cases in order to solve new problems (Williams, Feist, & Ma, October 2006).

Computer games have unique characteristics that may afford innovative approaches to implementing facilitation and scaffolding strategies. For example, who should provide modeling in educational computer games? Should some modeling be provided in the game by a NPC or some by an agent played by the teacher? What modeling tasks are appropriate for NPCs and what are appropriate for teachers? How do these strategies impact learning? Moreover, many games have Heads Up display (HUD), status monitoring tools, resources, community building tools, and tutorials (Pellegrin, Ma, Williams, & Kunnel, 2006). How can these tools add to or enhance the tools and resources described in various computer-based learning environments (Hannafin et al., 2000; Jonassen, 1999)?

Narratives are a key component in many computer games. By and large, the conventions of western narrative are founded on aesthetic principals advanced by Aristotle, who argued that, at its best, narrative has the capacity to be both entertaining and edifying. Character and plot are two key elements in this convention. Characters act to pursue the object of their desire or motivation. In the course of their pursuit or quest, characters encounter obstacles or problems that interfere with achieving their goal. Characters seek solutions to problems and take action to overcome obstacles. This narrative structure has much in common with stories and cases, key elements used in learning and instructional theories such as learning by design (Kolodner et al., 2003), goal-based scenarios (Schank et al., 1994), and analogical encoding (Kurtz et al., 2001). What role should narrative play in educational computer games in light of these theories? For example, goal-based scenarios (Schank et al., 1994) emphasize the use of stories not only to present the problem, but also serve as tools to facilitate reflection, as a resource to provide advice, and to provide feedback to show consequences of actions.

Formative Assessment

Formative assessment plays a critical role in effective teaching (Brandsford, Pellegrino, & Donovan, 1999). It reduces the learning time needed, better motivates students (Corbett and Anderson cited in Koedinger, 1998), and leads to strong learning gains (Black & Wiliam, 1998). It is believed that immediate feedback may contribute to the experience of flow (Csikszentmihalyi, 1991). Despite its effectiveness in bringing about learning gains, formative assessment is lacking in schools (Black & Wiliam, 1998) because it is extremely time consuming and it places high demands on the teacher.

Video games offer many opportunities to monitor and assess players' performance that goes beyond those typically found in traditional learning environments. The processing speed and networking of modern computers allow players-as-characters to interact with their simulated environments and circumstances, and with other players, in real time. Not only does this increase the plausibility of the fiction and allow the players to immerse themselves further in the character and plot, but it also reinforces the connection between decision-making and outcome. Moreover, interactions among multiple players provide opportunities for peer feedback, collaborative problem-solving and community building (Kolo & Baur, 2004; McFarlane et al., 2002). In addition, video games allow players to retain and access great volumes of data, either through quantitative measurements such as score-keeping, through item acquisitions, increases in abilities and aptitudes, verbal record-keeping devices, and mapping. The persistence of data is a key feature of the medium, allowing players to assess their own performances against that of the system or of other players. This feature may also become a critical tool for performance assessments by external observers such as a teacher. Video game techniques and technologies may provide more frequent and effective means to assess students' performance. What tools can be built into educational computer games to conduct formative assessment? Computer-based formative assessment tools have used sophisticated multiple choice questions (Hunt & Pellegrino, 2002) or natural language processing techniques such as latent semantic analysis (Landauer & Dumais, 1997) to assess learning. These tools can be integrated into educational computer games. However, current technologies may not have the intelligence to replace teachers for all formative assessment tasks required. What formative assessment should be conducted by teachers? How can the results of assessment be used to customize an individual's learning experience? In one study, Squire, Giovanetto, Devane, and Durga (2005) found that a key role the facilitators played was to constantly monitor and assess students' game playing. When the game was too complex for students, the facilitators had to create simplified, customized game scenarios on the fly. This type of assessment and facilitation requires high facilitator ratio, which might not be feasible in many situations. More research is needed in this area.

Learner Agency

Learner agency is a key factor that may contribute to intrinsic motivation (Malone, 1981) and flow (Csikszentmihalyi, 1991). Video games provide the players with increased power of agency. Simulations are found

in many video games. They enable the players to transcend the constraints of time and space to explore the dynamics of a real or imaginary system (Alessi & Trollip, 1991). Players manipulate variables and test hypotheses to construct mental models of a domain (Rieber, 1996). Moreover, in video games, simulations are embedded in interactive storytelling (Murray, 1997). In traditional storytelling, audiences are simply spectators to the drama, passively observing the motives, decision-making, and actions of characters onstage. In video games, however, the players identify fully with a character, act on the plot, and experience the cause-and-effect of their actions. Additionally, cutting-edge AI technologies offer players a choice of roles and tasks, and challenge them with tasks appropriate for their ability level. This allows the player to have control over their experience and to engage in problems within their zone of proximal development (Vygotsky, 1978).

Video games may provide players with increased power of agency. What strategies can be used to enhance a sense of agency in educational computer games? How do these strategies impact learning and motivation? For example, one question concerns learner agency and academic achievement. Players have preferences in terms of the types of activities they would pursue in games (Bartle, 2005). Some are more aspired to win the game; some enjoy more to explore the world; some spend more time socializing; and others focus more on dominating competitors. In educational computer games, how to help children with different preferences to achieve academic goals but still give them a sense of agency by allowing them options and freedom to pursue their interests?

Settings for Educational Game Use

Several researchers suggested that using regular school hours for educational games might be a problem, because of the time schedule and the existing script for work and roles that occurs during regular school hours (Egenfeldt-nielsen, 2005; Saegesser, 1981). Computer games may last for hours, yet regular school hours are divided into small class periods. It is difficult to confine game play within a short period of time. Moreover, classroom teaching is usually teacher-centered and schooling is considered work, whereas games are more player or learner-centered and games are perceived as play. Research on the use of computer games has taken place in regular school hours in the classroom setting (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Egenfeldt-nielsen, 2005; Ketelhut, Clarke, Dede, Nelson, & Bowman, 2005; Rosas et al., 2003; Zheng, 2006), in afternoon school programs in youth facilities outside of school (Squire et al., 2005), or in learners' homes (McFarlane et al., 2002). Different settings have different dynamics and social cultural rules. What strategies are needed to implement educational computer games in varying settings? How should teachers and administrators be involved and supported? Are some games more appropriate for one setting than another?

Facilitator Knowledge, Attitude, Roles

Previous research on educational games indicates that the facilitator is a key factor impacting the outcome of educational use of games in the school setting (Bredemeier & Greenblat, 1981; Egenfeldt-nielsen, 2005). Facilitators' attitude toward games and their knowledge about games as well as the subject matter makes a significant difference in students' learning. Egenfeldt-nielsen (2005) found that the facilitator who has more experience with computer games and who has a view of history as more than historical facts tend to be more successful in facilitating history learning from a computer game. In a study described by Squire and colleagues (2005), facilitators were expert players of Civilization 3.

Existing research shows that facilitators play various important roles in learning environments enhanced by computer games. For example, in an after-school program in which student participants played a strategy game Civ 3 to learn history (Squire et al., 2005), facilitators played the role of teachers and cheerleaders at the beginning of the program, and they became more like mentors or expert players as students gained more competence. The facilitator sometimes played the game along with the students. Egenfeldt-nielsen (2005) also found that teachers play many roles. They had to solve computer problems and helped students playing the game. At the same time, they had a critical role of helping students appreciate and explore historical information and dynamics as well as make the connection between game playing and scientific concepts. Facilitators may need help to acquire the knowledge and skills required to perform their roles. What support do facilitators need? How should the support be provided to facilitators? For example, should it be provided through training, just-in-time tutorial and resources, or a combination of different strategies?

Addressing Learner Differences

       Computer games are arguably the most popular media among children. However, there are many individual differences when it comes to educational computer games. Squire and colleagues (2005) found that middle class boys reported dreams to become game designers, whereas children with lower social-economic backgrounds were challenged by games and did not have game design aspirations. Similarly, in Denmark, Egenfeldt-nielsen (2005) found that some students had little experience with computer games. They gave up on the educational computer games played during the study. Only a few students succeeded in this class. Those that succeeded in the class generally had more experience with computer games, liked history, and had extra energy to engage in learning. Learners in educational computer games may have different levels of experience, skill, and self-efficacy with games. How can educational computer games be designed and implemented to meet learners' varying needs? Lai, Ma, and Williams (October 2006) generated some design guidelines to improve learners' self-efficacy in educational computer games. How effective are these strategies? More research is needed in this area.

Methodology

Design-based research may provide a framework for an effective methodology in researching educational games. Design-based research emphasizes the design of innovative learning environments based on theory and empirical research through an iterative process of design, implementation, analysis, and redesign (Design-Based Research Collective, 2003). The purpose of this iterative process is not only to enhance the particular intervention being investigated but also to develop theories to account for the impact of the intervention and to create models to inform the design of other innovations. Design-based research requires collaboration among practitioners, researchers, and technologists (Reeves, Herrington, & Oliver, 2004). This emerging methodology has been used to inform the design and investigate the impact of such innovative educational programs as *The Adventures of Jasper Woodbury* (Cognition and Technology Group at Vanderbilt [CTGV]) and *GenScope* (Hickey, Kindfield, Horwitz, & Christie, 2003).

To address the research issues presented in this paper, both qualitative and quantitative methods may be needed to guide data gathering and analysis. These methods are appropriate for different stages of design-based research (Bannan-Ritland, 2003; Design-Based Research Collective, 2003; Kelly, 2004; Shavelson, Phillips, Towne, & Feuer, 2003). Qualitative methods are especially helpful during the exploration phase of a design-based research project (Kelly, 2004; Shavelson et al., 2003) when models (Sloane & Gorard, 2003), conjectures (Sandoval, 2004), or hypothesis (Kelly, 2004) are formulated in the context of real world problems and interventions. Quantitative methods are helpful later when knowledge that emerged from qualitative explorations is validated.

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Innovative Multiple Outcome Design:
Using Narrative Simulation to Train P-12 Teacher Mentors

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Abstract

Given the increase in P-12 education reform efforts over the last decade, mentoring new teacher interns can be a daunting responsibility. Experienced teachers, in training to be mentors, often find themselves inundated with large amounts of didactic information as they prepare for guiding new interns. In an effort to develop a more effective means of training mentors, the Educational Professional Standards Board (EPSB) in one state enlisted the help of instructional designers to develop an online course that would effectively prepare new mentors and revitalize experienced mentors. The focal point for the online course is a narrative simulation embedded with standards-based information, designed to promote reflection and offer opportunity for practice making difficult decisions. As a fulcrum for the online course, the narrative simulation employs an innovative multiple outcome design to frame dialogic interaction between the mentor and the instructional content. In this paper, we discuss theoretical and practical considerations for using multiple outcome decision points to support dialogic interaction within a narrative simulation.

Introduction

As demands for accountability increase, P-12 education is flooded with high-stakes tests, regulations, specified curriculum, instructional guidelines, and performance standards for teachers. There is the charge of *No Child Left Behind* to assure that all students perform at the same minimum academic standards, regardless of ability, preparation, support outside of school, or opportunity. There are national standards for public education, state mandates for student achievement, and local demands that hold school systems, schools, administrators, and teachers accountable for reducing variance in student performance. Whatever the intent of such demands, a myopic focus on standardizing student performance can create the impression that there are best practices to apply across contexts, events, teachers, and students. In fact, educational leaders at local, state, and national levels produce an enormous amount of textual information (online and in paper form) presumably in an effort to establish best practices for P-12 classrooms. These large amounts of didactic information often overload new teacher interns (first year teachers), as well as experienced teachers serving as their mentors, leaving little time for the kind of training that may better address teaching and learning in widely diverse real world contexts.

New teachers and their mentors are left to navigate this maze of information, prioritize it and interpret it in their day-to-day instructional practice. To characterize the situation of these teachers and their mentors, in instructional design terms, it is as though design and development of mentor training begins and ends with producing and refining content, with little attention to how such content can be delivered most effectively. Recognizing the need for better delivery mechanisms in training teacher mentors, a state Educational Professional Standards Board (EPSB) contracted with university-based instructional designers to assist in developing an innovative and effective online mentor training course. The goal was to design an online course that would both effectively prepare new mentors and revitalize experienced mentors. The focal point for the online course is a multiple outcome narrative simulation embedded with standards-based information that is designed to offer opportunities for practice making difficult decisions.

Design Challenges

Given this task, we began by examining the form and content of previous mentor trainings, reviewing and prioritizing content, and initiating conversations with experienced mentors. We explored state teacher standards, new teacher expectations, mentor training materials and agendas for past training sessions. While the content of all was easy to understand, the amount of information and the redundancy with which it was organized presented several difficult design challenges. For example, there was relatively little content that addressed implementation, which left a gap between expectations and actual learning activities that would prepare mentors to guide interns. In

fact, during our initial conversations with experienced mentors, most indicated a high level of frustration with previous trainings, because of the constantly revised and unwieldy amount of standards-based content. Moreover, the training lacked opportunities to prepare for the more difficult unanticipated situations that occur in mentoring new teachers.

Our major instructional challenges included: (1) presenting large amounts of prescribed standards-based content, (2) engaging learners who were all experienced teachers, some new to mentoring and others who had been mentors in the past, (3) providing opportunity for practice solving unanticipated problems, and (4) facilitating dialogic interaction both among learners and with the course content. Additionally, the course needed to be suitable for long term use with only minor revisions. In order to make the course engaging for both experienced and new mentors, we situated the content (provided to us by the EPSB) in an online interactive environment that revolves around a narrative simulation based on an actual case of mentoring (*Staying Past Dark*). We distilled the storyline, events, characters, and critical dilemmas from a case study of a new teacher and a mentor who struggled with a variety of difficult challenges (Jones, 2003). After condensing the case, we rendered it as a narrative simulation with a range of strategically placed information on new teacher standards, guidelines and expectations. *Staying Past Dark* sets the stage for several subsequent modules in the interactive course, which combines a variety of problem solving activities, research to practice information, and self-assessments, as summarized below.

1. The Community of Practice framework (Wenger and Snyder, 2000).
2. *Staying Past Dark*, a narrative simulation that is based on actual events experienced by mentors faced with many mentoring issues and decisions.
3. Information and exercises that focus your exploration of the practice of mentoring as critical inquiry and collaborative problem solving. Specifically this means that we will discuss activities that explore dialoging, conferencing, questioning, and critical thinking as key elements in mentoring. Collaborative responsibility of all participants in a mentoring experience is emphasized.
4. Assessments that are professionally and personally challenging, requiring you integrate your insight, experience, and knowledge of course content.
5. The *Work Sample* approach (replacing the portfolio documentation used previously in mentor training) that will be used to evaluate interns during year two of the pilot project.

Making informed decisions in novel, varied, or unexpected situations requires a different kind of mental activity than that involved in knowing or remembering prescribed standards and practices. The rationale for combining standards-based didactic information with problem-solving practice was based on the fact that mentors not only have to refer to the current expectations for new teachers, they must also assist interns in applying standards-based requirements to a range of circumstances. Such enactment involves *productive thinking* that results in the ability to transfer knowledge rather than *reproductive thinking* that may promote problem solving in similar situations but does not transfer to novel instances or events. In fact, a long-term challenge in teacher preparation is that many day-to-day decisions in the classroom cannot be standardized because they are contingent on student responses and particular objectives at any given moment (Hammerness, Darling-Hammond, and Shulman, 2005). While meeting standards and new teacher expectations is essential for interns, they are faced with unique problems on a daily basis. Mentors must be prepared to help interns make difficult decisions when there is no prescribed solution.

Conceptualizing Narrative Simulation Design for Dialogic Learning

Characteristics of Effective Mentors

Recent research on mentoring has articulated various characteristics of effective mentors (Feiman-Nemser, Schwille, Carver, and Yusko, 1999). These characteristics include the ability to: (1) reflect about one's own practice, (2) articulate goals, strengths and growth areas, (3) establish a strong foundation for working together, (4) use a variety of teacher assessment instruments, (5) analyze and prioritize assessment data objectively, and (6) listen carefully and question judiciously during conferences. In order to meet such tall orders, mentors must understand and handle a complex of situations that require reflective reasoning and professional judgment. For example, they need to know how to deal with their own *first impressions* of a new colleague they are asked to mentor, exploring their own biases, as well as those of the new teacher they mentor. Mentors also must understand the phases of new

teacher experience, how to conduct strategic observations, how to articulate areas for professional growth, and how to intervene when problems occur.

Using Narrative to Understand Experience

In order to create an interactive environment that would accommodate large amounts of didactic (standards-based) information and promote reflective thinking, we choose a narrative framework for the online course. We used narrative because of its potential to be engaging, encourage reflective thinking, and situate information in familiar contexts (Brown, Collins, and Duguid, 1989; Cognition and Technology Group at Vanderbilt, 1990, 1993; Lave and Wenger, 1991; Polkinghorne, 1988; Young, 1993). According to Bruner (1990) narrative promotes a different kind of thinking than didactic information. While presenting information as *facts* can lead to logical or paradigmatic modes of thought, it leaves little room for interpretation or imagination. Narrative, however, can represent human behavior and events as lived experience in a manner that offers opportunity for interpretation and imagination, prompting learners to infer meanings that are not explicit. In fact, many insist that human beings think in narrative form and that some of our most memorable experiences are held in mind as stories (Vitz, 1990; Sarbin, 1986; Spence, 1982; Fisher, 1995). Epistemologically, the use of narrative in instruction relies on a constructivist perspective or the view that knowledge is constructed rather than transmitted. From this perspective, learners play an active role in their own learning (Duffy and Cunningham, 1996). Finally, we view learning as a social process that is enhanced by interaction and dialogue (Jonassen, 1999; Hatano and Inagaki, 1993; Vygotsky, 1978).

Narrative and Problem Based Learning

Narrative has been used extensively in problem-based instruction and has been found to improve comprehension and transfer (Conle, 2003; Egan, 1988; Laurillard, 1998). One important use of narrative has been in goal-based scenarios (Schank, Fano, Bell, and Jona, 1993). Goal-based scenarios (GBS) are designed to develop skill and content knowledge by simulating events in situated contexts (Schank, Berman, and Macpherson, 1999). Unlike narrative simulation, GBS require users to work toward a prescribed goal as characters with predetermined roles. Although GBS employs *realistic* narrative, it can be fictitious and stimulate game-playing strategic thinking rather than the kinds of critical, imaginative, and reflective decision-making required in narrative simulation (McCrary, 2002).

As an instructional intervention, narrative simulation has a long history of effectiveness in accident prevention, farming and mining safety, and solutions to work place problems, such as sexual harassment (Cole, 1997; 2002). It has been particularly effective in personalizing new information, changing practices, and shifting attitudes (McCrary, 2002: McCrary and Mazur, 1999). As simulation stories develop, dilemmas evolve, which engage learners in real world problems, decision-making, and solutions. Dilemmas drive this type of learning and learners literally become characters in an unfolding story. It involves (1) learning that is grounded in everyday activities, (2) situational knowledge that transfers to similar circumstances, (3) learning that results from a social process involving certain ways of thinking, perceiving, problem-solving, and interacting, and (4) learning that exists in complex social environments made up of actors, actions, and circumstances.

Traditionally, narrative simulations require learners to read segments of a story, followed by a question, and select a course of action by choosing from a list that includes correct and incorrect answers. More recently, design approaches for narrative simulation have been effective in providing learners with practice making difficult decisions even when there is no single correct course of action. For example, studies on the use of *Jeff's Story*, a narrative simulation on social justice, have demonstrated its effectiveness in personalizing difficult social problems that have otherwise been considered remote or irrelevant by the learner (McCrary, 2002). Given this evolution of instructional narrative, we went a step further in developing a teacher mentoring simulation with divergent outcomes. Unlike traditional narrative simulations with a single outcome, *Staying Past Dark* departs from the main storyline at a most critical point and allows users to choose one of three narrative paths, each resulting in a distinct outcome based on the users' choice of action. The learner is prompted to choose an ending based on what s/he anticipates the outcome of the problem situation will be. The simulation thus becomes a fulcrum for dialogic interaction between the mentor and the instructional material. Reflection on the simulated problem is personalized and operationalized as the mentor projects an outcome. In the sections that follow we focus on the theoretical and practical considerations for using multiple outcome decision points to promote dialogic interaction within a narrative simulation.

Dialogic Learning and Professional Reasoning

Dialogic learning has been extant since ancient times (van der Linden, 2005). The Socratic dialogue technique is included in most teacher preparation curriculum and instruction or pedagogical methods course. Recent research on dialogic learning has elaborated the complexities, benefits, and challenges of using dialogic approaches in educational settings that have institutionalized positivistic pedagogies to effect didactic instruction (Ruf and Badr Goetz, 2002). The use of dialogue is often couched as question and answer *interaction*. A close examination of the etymology of the word dialogue, however, reveals the complex and layered dimensions possible in dialogic learning. Dia, from the Greek meaning, two and logic meaning, reasoning. It is this *reasoning* that was a crucial element in designing the narrative simulation for teacher mentors. Mentors and interns are required to go beyond decision-making and reflect deeply to examine and analyze how those decisions embody their theories-in-action and professional reasoning in the classroom.

Design: Multiple Outcomes for a Narrative Simulations

Based on composite information from experienced mentors during our developmental research, we found that mentors, as experienced teachers, often anticipated outcomes or wondered about the success of an intern when problems occured. Mentoring training often focused on techniques such as conducting a post-observational conference, but did not provide opportunitites to puzzle about or work through those nagging internal questions? Would the new teacher make it? Would the new teacher truly change her practice to meet the challenges of a difficult class? Would she leave teaching altogether? Or, would she just bide her time, thinking the criticisms would blow over, and hope for a better group of students next year? These are the dilemmas and experiences we sought to capture and address by using a multiple outcome design within a narrative simulation. By selecting an outcome to the year-long mentoring situation portrayed in the simulation, the mentor exposes his or her cognitive and affective responses to the real-world situation posed in the story. Critical aspects of the mentoring relationship can be examined in light of the mentor's choice.

Staying Past Dark: A Case for Training Teacher Mentors

Staying Past Dark focuses on a case in which the first year teacher experienced a range of problems and the mentor was faced with difficult decisions. In order to create a qualitatively different instructional environment aimed at encouraging critical forethought (simulation) instead of informed hindsight (case study), we condensed the actual story of mentoring, determined critical decision points, added corresponding question and answer choices, and employed first-person, present-tense language (see figure 1).

Figure 1. Sample story segment of narrative simulation.

Staying Past Dark
The Beginning

I let central office know I would be willing to serve as a mentor for a new teacher. When they assigned Kristin to me, I told them I looked forward to the experience.
I met with Kristen right away and we talked about how this internship would go. She was already nervous about her first year of teaching because she heard her fourth graders were out-of-control. This group of kids had been terrors in the third grade and no one had been able get them under control.
I didn't know how to respond to her concerns because I couldn't tell if they really assigned a new teacher an impossible class or if she was just having first year jitters.

Please read the following question and select the response that best represents what you would do as Kristen's mentor.

Question A: As Parker Olsen, the mentor, how would you have responded to Kristen's initial concerns?

1. I would meet with the principal right away and discuss Kristen's concerns, assigning a first year teacher an impossible class, and the fact that she might need extra help managing a class that no one else had been able to control.

2. I would talk with Kristen more about her concerns and question her to try to find out more about the situation.

3. I would just listen, say nothing, and wait to see what happened when I observed her teaching.

4. I would speak with the third grade teacher who had these kids last year and try to find out if Kristen's fears were on target.

STANDARD II: The Teacher Creates and Maintains a Learning Climate for Students

A. The teacher communicates high expectations for all students.

B. The teacher supports student diversity and addresses individual needs.

C. The teacher uses positive classroom management techniques that foster self-control and self-discipline to create and sustain a climate that motivates students to learn.

D. The teacher facilitates mutual respect among class members through cooperative and independent learning activities.

E. The teacher employs creative and flexible use of instructional time and materials.

F. The teacher supports instruction through the creative, flexible, and safe use of physical space.

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Incorporating the Multiple Outcomes Design Component

After working through various decision points within the narrative simulation each learner departs from the main storyline based on a selected response to a dilemma-based question midway through the exercise. From that point, users follow one of three possible narrative paths, each resulting in a different outcome to the story. We derived the two additional real world outcomes from stories told by experienced educators during our developmental research sessions. Figure 2 shows the divergent outcome segment of the narrative simulation, followed by introductions for each possible path.

Figure 2. Divergent outcome segment of narrative simulation.

Now it's your turn!

How do you think this story will end?
Will Parker's plan work and will Kristen remain in teaching?

Click on one of the following story endings and follow that scenario to the END.

Who'd Have Thought	A Sad Realization	Loosing a New Teacher

_____
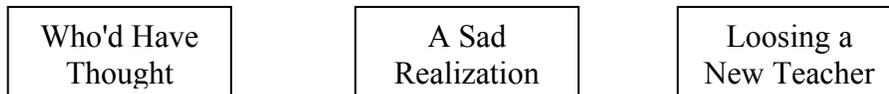
Wednesday January
Who'd Have Thought

I developed four components of a work sample, 1) contextual factors, 2) unit overview with learner objectives, 3) lesson plan, and 3) assessment plan. I used materials from my own teaching files and updated the formats to reflect current KTIP criteria as a way to provide Kristen with concrete examples for her to use in making her own work sample.

I went over the School Performance Report for Greenbrier Elementary and suggested she also use that report to develop the contextual factors component. When she saw the numerical and graphic data about achievement gaps, content comparisons, and demographics, the light bulb went on. She could see how this report could be used to improve her instructional planning. She said she thought it would be fun to really explore contextual factors for her group of students. She seemed to have a much better attitude after the Christmas break!

_____

<p style="text-align: center">Wednesday January 9
A Sad Realization</p>

I developed four components of a work sample, 1) contextual factors, 2) unit overview with learner objectives, 3) lesson plan, and 3) assessment plan. I used materials from my own teaching files and updated the formats to reflect current KTIP criteria as a way to provide Kristen with concrete examples for her to use in making her own work sample.

When we met, I gave her my materials, and asked her to begin doing her own work sample by first completing the contextual factors' component and having it ready for our next meeting in two weeks. I went over the School Progress Report with her and she said she thought it would be fun to really explore contextual factors for her group of students. She seemed to have a much better attitude after the Christmas break!

_____

<p style="text-align: center">Wednesday January 9
Loosing a New Teacher</p>

I developed four components of a work sample, 1) contextual factors, 2) unit overview with learner objectives, 3) lesson plan, and 3) assessment plan. I used materials from my own teaching files and updated the formats to reflect current KTIP criteria as a way to provide Kristen with concrete examples for her to use in making her own work sample. When we met, I gave her my materials, and asked her to begin doing her own work sample by first completing the contextual factors' component and having it ready for our next meeting in two weeks. I went over my examples with her and she said she thought it would be fun to really explore contextual factors for her group of students. She seemed to have a much better attitude after the Christmas break!

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As we developed *Staying Past Dark* certain criteria guided us through several formative evaluations. Those criteria included fidelity to the actual story events to retain a sense of veracity for experienced educators. The narrative simulation, even when diverging into three possible outcomes, had to remain believable to these experienced professionals to maintain their interest and motivation to work through the entire exercise and take advantage of the embedded didactic information.

<p style="text-align: center">Design Criteria for Using Divergent Multiple Outcomes in a Narrative Simulation</p>

While real world stories must maintain fidelity when transformed to narrative simulations, it is also important that stories be condensed by removing extraneous information. The aesthetic power of narrative, however, can be diminished if a balance is not carefully preserved between the inclusion of descriptive language and concern for instructional efficacy. The primary power of narrative lies in both its believability and the ways it can inspire readers to imagine, to see, and to feel the story. Designing narrative simulation for instruction requires that the story be segmented into brief accounts, each segment including a dilemma that can be followed by a question and possible response choices. In this case, we took the main storyline from a case study on a new teacher intern. We also had to assure that affective qualities, such as descriptions of characters, setting, and emotions, inspired compassion and empathy. With these criteria for story-based simulation in mind, we needed to also elaborate criteria for adding the divergent multiple outcomes component. The iterative process of developing *Staying Past Dark* resulted in the formulation of the initial design criteria for the multiple outcomes approach shown in Table 1 below.

Table 1. Design Criteria for Narrative Simulations for Dialogic Learning: An Initial Formulation

Design Criteria	Design Process/Product Characteristics
Simulation Fidelity	Case-based and rate based data used to develop story line
Simulation Veracity	Narrative based on actual, real-world situations, data from formative evaluation and user-centered design required
Definition of Narrative (rather than paradigmatic) Learning Outcomes	• Affective outcomes for users defined, based on characteristics of professional mastery (e.g. for teacher mentors, recognition of bias)

	• Cognitive outcomes for users defined, based on required cognitive knowledge and skill for user mastery (e.g. for teacher mentors, ability to revise instruction based on learning outcomes)
	• Instructions to read the story in sequence and not skip ahead
Narrative Structure for Content	• Story events occur over time
	• User assumes the role of a character in an unfolding story.
Engagement with Narrative	• Chunking story line to pose incremental elements of the dilemma
	• Plausible decision points for user-choices.
	• Feedback based on user-choices
	• Opportunities to explore other choice responses
Opportunity for Dialogic Interaction: Internal	• Definition of multiple, plausible outcomes from user-centered design processes
	• Inclusion of prompts to spur reflection and analysis of the dilemma and resolutions
Opportunity for Dialogic Interaction: External	• Definition of multiple, plausible outcomes from user-centered design processes
	• Inclusion of prompts to spur reflection and analysis of the dilemma and resolutions
	• Inclusion of collaboration and communication tools to encourage dialogue among users of the narrative simulation
	• Archiving of dialogues (e.g. in a threaded discussion group) for ongoing dialogue, reflection and interaction. Archiving also provides opportunities for those not involved in original dialogue to participate vicariously.

Discussion

Staying Past Dark delivers an otherwise confusing maze of teacher standards, student achievement expectations, and professional ethics in a more personally relevant manner as embedded text annotations throughout the unfolding story. The inclusion of *Staying Past Dark* in this online mentoring course has been successful in transforming the traditional EPSB instruction from a more static and often redundant experience to one that engages mentors in an active and reflective discourse on teaching and learning. It is more congruent with the actual practice of applying standards to mentoring intern teachers in varied contexts. Were it true that human development could be standardized, then learning to become effective teachers might lend itself to more traditional didactic instruction. In fact, learning to mentor new teachers would be a relatively easy task, requiring concrete knowledge of correct practices to meet predetermined goals. When charged with training experienced educators to effectively mentor novice teacher interns, however, it becomes clear that organizing and distributing state teacher standards and new teacher expectations does little to help mentors guide interns in the day-to-day enactment of those standards. More importantly, mentors must assist their new teacher colleagues in becoming confident problem solvers, who can wisely reason through the complexities inherent in the myriad classroom activities in which engage each day. Narrative simulations with divergent multiple outcomes provide one opportunity for the mentors to explore these complexities and reflect on their own decision-making by providing opportunities for both internal and external dialogic reasoning. These conversations, both internal and external, are the substance of professional judgment that rarely occurs through traditional, didactic, non-dialogic instruction.

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Deeper Learning Through a Contribution Model for Learning Object Design

Patricia McGee

Abstract. The proliferation of learning object repositories while useful has not necessarily resulted in exemplary instructional design. This paper puts forth a learning object pedagogical design that is based on the contribution of the learner. Through thoughtful, engaged, active, and purposeful learning, the learner constructs understanding and creates an object that becomes part of the object's learning sequence. In this way the learner has ownership of what they know in a manner that contributes to the learning of others.

Moving curricula from the classroom to digital formats requires management, oversight, and learning designs for access and dissemination through knowledge systems. The focus on knowledge management in higher education can be seen in the trend toward *learning objects*. Although defined in a number of ways, depending on the context and culture from which they emerge, the author defines a learning object as any digital asset that is intended to be used to support learning, can be modified, and can be re-used in different contexts for different purposes. Learning objects should be re-useable and re-purposeable over time and location and interoperable across systems and software (see Robson, 2005). Unlike other technology products that support learning, such as learning/course management systems (L/CMS), learning objects have been conceptualized in an era of standardization and interoperability. Soon after the adoption of the term *learning object,* designers, developers, and managers stressed the reusable and interoperable attributes of a learning object but as standardization and specifications begin to be adopted, these attributes are less of a focus. They speak to the underlying assumptions about the use of technology to support learning - how *it works* has generally come before how *it is designed* and *used* for learning. The contributions of the 2002 work of Wiley and associates has not led us to universal strategies that are specific to objects, but rather tactics that can be used with either multimedia or learning systems in general. This paper argues for a learning design that is contributory and then describes a formative project that embraces principles of a contribution pedagogy while supporting deeper learning.

Although current discourse and literature tends to deeper learning as a desired outcome (see Carmean & Haefner, 2002; Van Weigel, 2003) what actually happens when learning objects are used may not reflect these principles. This disparity may be more extensive than what we can observe in classroom practice or through what is captured through digital learning systems that can track and document learner actions. How often or frequently a student posts messages or access information cannot tell us about their level of thinking, therefore, we should design around principles that are most likely to result in deeper learning. Deeper learning has been conceptualized in learner-centered principles; although there are several approaches to articulating such principles, the author's uses those principles put forth by Carmean and Haefner (2002) because these are specifically articulated for the application of technology in higher education. According learner-centered principles, deeper learning occurs when the learning experience is social, active, contextual, engaging, and student-owned. *Active* learning focuses on real world problems through which learners practice and receive feedback and reinforcement from peers and experts. Learning that is *contextual* must focus on the learner rather than the content. A content-driven approach doesn't readily allow for learner differences or modifications, but learning objects can modify content so that is contextualized for the individual (i.e., geographical location, system interface, prior knowledge, etc.). Deeper learning requires consideration of the learner's learning environment, ways of learning, as well as experiences in the world (e.g. level of reading ability, language, text, vs. visual, etc.). Learning that is *social* requires feedback and interaction between learners and instructor and, in the case of learning objects, feedback may be also situated in the technology. *Engaging* learning has to be designed to appeal to the learner's preferences and experiences but also to their order to motivate and challenge. Individualized learning provides the learner multiple learning paths, multiple representations of content, multiple strategies, and multiple options for engagement and motivation to meet one objective. If the learner is to have *ownership* over what they are learning, there must be some aspect of self-determination and control that allows them to examine and evaluate unfamiliar content and process, and to be recognized for their actions or productions. Is this way the leaner must make decisions and come to conclusions, supporting independent thinking and reflection.

Embedding deeper learning principles into learning objects by actively engaging the learner and providing them ownership of knowledge they have produced ensures that learning transcends the classroom. In order to apply these principles to learning objects, we must consciously consider the entire learning environment and how we

articulate the processes within them. For example, Laurillard and McAndrew (2003) propose the design of generic learning activities that shift teaching from a transmission model to a construction model. Their *conversational framework* is an iterative process requires the learner to engage, act, and reflect upon what they know and how they come to learn through the production of learning objects. The learner is deeply engaged through a process of determining and interacting with the content and others.

Diaz and McGee (2005) have identified a *contribution pedagogy* model of knowledge management utilized by higher education and evidenced in social networks that engages the learner in constructing content thereby contributing to the knowledge base of the course, if not the institution or social network at large. The contribution pedagogy model is based on certain assumptions: knowledge is generated through a learning community (such as a class); content that is generated by learners has multiple benefits (to the instructor, peers, and others); there is an increasing shift from transmission to construction of knowledge; and, this model is primarily pedagogical. The contribution pedagogy model is typically course-based and enacted through a system, such as an L/CMS or other collaborative systems. Such systems are varied, for example Elgg[1] Collaborative Online Reporting (COR)[2], Online Student Collected and Reported Annotated Resources (OSACR)[3], and Wikipedia[4] are all collaborative in nature and allow users to contribute what they know as an object. Increasingly there is evidence of peer-to-peer forms of knowledge sharing that are related to learning and in the form of objects such as videojug[5] and Second Life[6].

The trend in knowledge management through organized sharing reflects the shift toward a learning object pedagogy in which learners not only learn from experience by participating in the generation of the object but also by contributing to the learning of others through object development and re-use. Collis and Strijker (2003) suggest that by having learners generate learning objects, and contribute to a course repository that grows with each offering of the course, the burden of producing objects is shifted away from the institution and the instructional process. This results in a variety of benefits: time is saved for the instructor or content-generator, resources are designed by the population for which they are intended by providing a locally better "fit" with the intended audience, learners can contribute and revise objects over time by updating content or presentation, and the tacit knowledge of the learner is transparent and can be shared or studied by the institution (Collis & Winnips, 2002). Such an approach extends on deeper learning where the learners are sharing, doing authentic tasks with others, and contributing through interactions and productions (Collis & Moonen, 2005). By allowing the learning to contribute self-generated materials that are publicly available and used by learners and instructors alike, contribution pedagogy is enacted.

Project Overview

To truly support deeper learning, learning objects must be designed to consider all facets of deeper learning principles. Interactivity increases the active engagement of the learner and adaptive content can address the learner's context. The social aspect of deeper learning has not been clearly demonstrated in standalone objects unless interactive functions are attached or associated, such in a learning/course management system (L/CMS). One aspect of deeper learning that is most challenging to achieve is ownership. There do exist objects that aggregate performance items that are saved or stored and result in something that documents the learner's abilities. There also exist learning objects that are generative in the sense that they allow the user to produce something of their own creation: a product 'owned' and taken away by the learner. However, ownership implies more than production and performance; it requires that the learner is acknowledged for their thinking, effort, performance, or production. It is the author's contention that learning objects should embody the notion of contribution pedagogy by inviting users to contribute content, thus engaging the learner in the process and content of learning rather than just adapting to the learners predispositions. the *content* delivered through the instructional model that the object embodies could come from any discipline. It is the proof of the *instructional concept* that is illustrated in this paper.

The *content* of the learning object designed to illustrate how contribution pedagogy can be enacted comes from visual culture (see Elkins, 2003; Mirzoeff, 1999; Mulvey, 1999) chosen because the concepts from this area can be applied in multiple disciplines (communication, business, education, fine arts) and in multiple contexts (continuing education, higher education, secondary education, training). Entitled *Eye-to-Eye* this learning object was designed in Flash™ using XML with a database that allowed random access to learner-generated objects.

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[1] http://elgg.net/

[2] http://cedir.uow.edu.au/deploy/cortex_demo/

[3] http://cedir.uow.edu.au/deploy/iact_demo/

[4] http://en.wikipedia.org/

[5] http://www.videojug.com/

[6] http://secondlife.com

The object design draws from several instructional strategies. First, as a high level organizational strategy, IMS learning design specifications (IMS, n.d.) were followed, using a method that incorporates play and act with a role as author to complete a cycle of learning experiences, see Figure 1. Second, the tutorial (IMS method) and practice IMS play) components were designed according to Shepard's (2003) Learning Object Design Assistant (LODA). Shepard describes three types of objects: information, tutorial, and practice. The *Eye-to-Eye* project incorporates all three types, treating each as a shared content object (SCO) that when aggregated provide a complete learning experience. However, each SCO is designed so that it can be used independently.

Figure 1. IMS Learning Design Overview
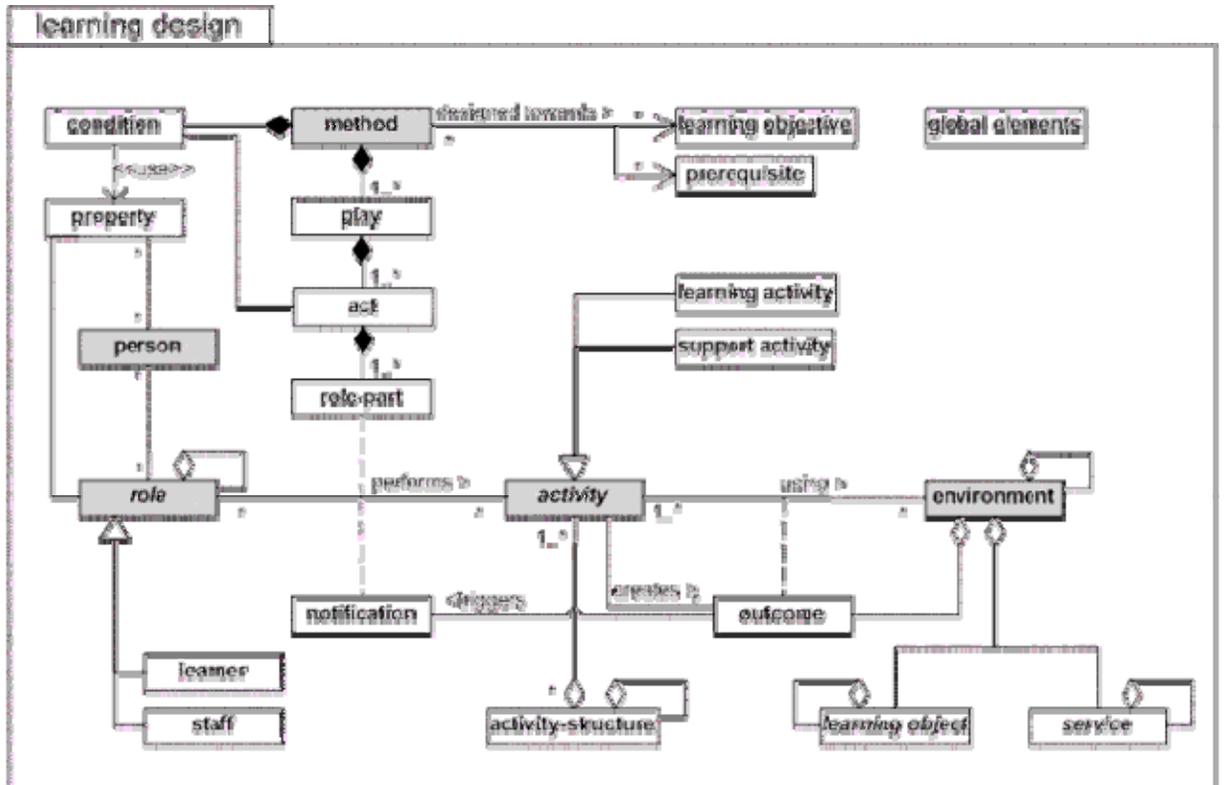
An instructional analysis resulted in the development of a tutorial, practice area, and then a design area in which the user can create (using images from a digital repository) a digital product that becomes part of a database and subsequently integrated into the tutorial component of the object see Figure 2. Associate throughout the first two SCOs is a glossary that defines key terms relating to the power of visual point of view and how we can use it to interpret and convey meaning. Users can enter the tutorial and proceed through an overview of theory and concepts and practice what they have learned. Users also have the option of going directly to the third SCO in which the sure can create their own SCO. The third SCO is supported with an asset that explains how to use the interface, as well as an asset that provides guidelines for creating a powerful story.

Figure 2. Overview of Eye-to-Eye SCOs
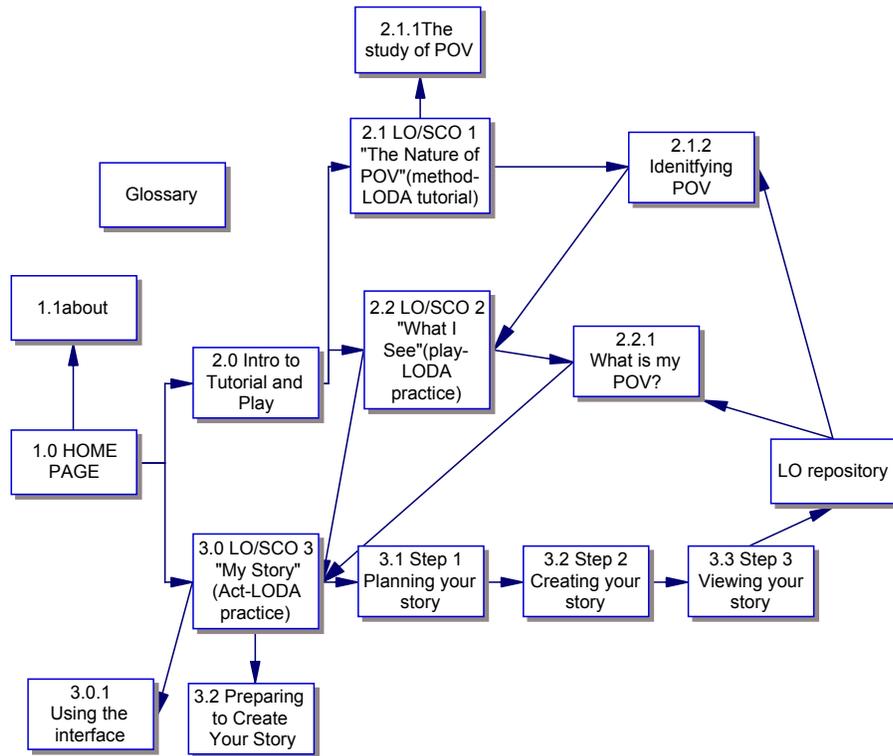
When the user enters the object he or she is given the choice of entering the tutorial or the practice area, see Figure 3. The tutorial SCO reviews visual point of view principles while allowing the user to explore key concepts. The practice SCO allows the user to make decisions and enter information that is complied and re-presented throughout the practice area. In this way, the user is able to make sense of what they have learned, and tentatively apply (practice) their new knowledge.

Figure 3. Screen capture of Eye-to-Eye

Enter Tutorial (method)

Enter Practice (play)

The final SCO is where the user is able to act an author when they create their own object. They user must create a user name and password that is then associated with the object that is created. Once in the SCO, the user selects a theme, selects and orders images, and adds text subtitles to the images. The ultimate goal is to allow users to upload their own images and add audio, however, institutional restrictions have not permitted this option so far. Objects that users create are stored in a database until randomly called up in the tutorial.

Unlike course-based objects, this project was designed to be used either within a traditional course or as a standalone object. In this way, multiple perspectives from a variety of disciplines and life experiences can be saved and reflected in the content of the tutorial.

Conclusions

The trend toward open knowledge suggests that student contributions to course content will continue to be seen in higher education and given the concern with identifying intellectual property rights (such as The Digital Object Identifier[7] (DOI®), Digital Rights Management[8] (DRM), and the increasing number of digital repositories. Shifts toward an open knowledge economy appear inevitable (Norris, Mason, & Lefrere, 2003), and efforts such as the Creative Commons[9] project are evidence that there is a demand for strategies that support the exchange of individually (rather than institutionally) generated content. Johnson (2003) describes five markets in the learning object economy: proprietary (e.g., private training venues), commercial (e.g. publishers), free (e.g. MERLOT), shared (e.g. consortia), and peer-to-peer (between institutions or individuals). A pedagogy that embraces trends in the economic market and social network for sharing and contribution is appealing to the learner as well as to the institution that will benefit from engaged and productive learners.

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[7] DOI identifies and tracks use of digital objects, primarily to protect and document how intellectual property is being used.

[8] DRM identifies the rights of holders, permissions, and tracking usage.

[9] See http://creativecommons.org/.

Assessing What Really Matters: Rubrics Can Improve Student Achievement

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Educators look for tools and motivational processes that will enhance learners' acquisition of knowledge, skills, and attitudes, as well as improve achievement of academic objectives. Scoring rubrics are highly touted in books and practitioner publications and are widely used at many academic levels as a teacher's tool to expedite the grading process (Arter & McTighe, 2001; Goodrich, 1996; Popham, 1997; Stevens & Levi, 2005; Wiggins, 1998). A rubric is typically 1-2-pages and has three essential features: evaluative criteria, gradations of quality definitions, and a scoring strategy (Stevens & Levi, 2005).

A well constructed rubric sets learning goals, guidelines, and levels of standards for performance of a specific assignment (Andrade, 2000; Arter & McTighe, 2001). It is typically used for evaluating what really matters: relatively complex, open-ended tasks, projects, or assignments that require integration of multiple skills and criteria (Arter & McTighe, 2001). These types of works allow students to develop the knowledge and abilities that educators look for and that society values in workers (i.e., critical thinking, problem-solving, creativity). However, a rubric is more than just an evaluation tool. It has instructional benefits that are potentially strengthened when instructional guidance on the use of the rubric is offered students, such as helping to improve student motivation, support learning during the process, and raise achievement (Andrade, 2000; Stevens & Levi, 2005).

Instructional Benefits of Rubrics

The instructional benefits of using rubrics go beyond teacher efficiency for grading, to clarifying and communicating the learning objectives, and promotion of principles of equity and fairness. As an instructional tool, rubrics make teacher's expectations very clear (Andrade & Du, 2005); provide meaningful, informative feedback to learners about their strengths and areas in need of improvement (Andrade, 2000); communicate the goals to students and help them plan an approach to an assignment (Andrade & Du, 2005); support the development of critical thinking, skills, and understanding (Andrade, 2001); and help students develop personal habits of self-assessment (Saddler & Andrade, 2004; Stevens & Levi, 2005), such as checking their work, revising, and reflecting on feedback (Andrade & Du, 2005).

Rubrics allow instructors to communicate the importance of some academic skills over others. The criteria for rubrics are assigned a value, points or percentage, according to the importance of those criteria on the final product. By including a scoring value that makes it clear that those components that relate to a specific outcome (Stevens & Levi, 2005). Meaningful feedback on student performance has been found to promote higher levels of academic achievement for all grade levels and is most effective when it contains as much detailed, specific information as possible (Brinko, 1993). Students benefit from the use of clearly defined performance criteria that encourage a shared vocabulary and a clearer understanding of the important dimensions of quality performance. The rubric offers information about the highest level of achievement possible, the strengths of their work and areas for improvement. As a result, the student can read the higher-level description as self-assessment guidelines for improvement.

Used in conjunction with sound instructional practice, rubrics can contribute to students' development of higher order thinking skills such as, analysis, evaluation, and creativity (Huba & Freed, 2000). In addition, rubrics encourage critical thinking by showing expected levels of performance or achievement and inspiring students to develop the reflective practice of self-assessment and self-improvement. In a study of 8th graders writing a persuasive essay, Andrade (2001) proposed that thinking-centered rubrics helped students think more deeply. To promote critical thinking, a criterion was included in the rubric that prompted the student to anticipate the other side of the argument and prepare an explanation in defense against it. Students without the rubric did not consider the counterpoint arguments against their claim.

Despite the noted benefits of using rubrics, for many educators, rubrics don't live up to their promise as effective guides for both teachers and students (Popham, 1997). Some teachers perceive rubrics are difficult to construct and don't adequately capture their intentions for evaluating student performance. In practice, teachers who use rubrics often present it to the learner without meaningful instructional guidance or discussion about its purpose or effective use for completing the assignment (Arter & McTighe, 2001). As a result, students don't benefit from the rubric to improve performance and educators feel their effort to create it was wasted. Given the mixed evidence on rubric use, what's a good strategy for using it to promote the types of outcomes the teacher deems important?

Design an Effective Rubric

A best practice for effective rubric use is to begin with a well-designed rubric. It is challenging work to create a rubric, but the effort doesn't have to be arduous. Arter and McTighe (2001) provide clear and extensive guidance for designing effective rubrics. Begin by collecting examples of student performance that demonstrate the skill or behavior under consideration. Next, sort the student work into groups and write down your rationale. Group labels could be as simple as strong, middle, and weak. Third, examine your list of rationale and cluster the reasons into "traits" or important dimensions of performance. Next, write a definition of each trait that describes what the trait is about, not what good performance looks like. Fifth, find multiple examples of student work that exemplifies the strong, weak, and middle performance on each trait. Last, conduct formative evaluations of your rubric and refine the descriptions so they communicate better. At this point you should use a metarubric, a rubric for rubrics, to evaluate the quality of your rubric.

There is no single right way to design and use a rubric. Another method described by Stevens and Levi (2005) includes four key stages: Reflecting, Listing, Grouping and Labeling, and Application. Stage 1: Reflecting involves thinking about the desired learning outcomes of the assignment and what your expectations are. Stage 2: Listing focuses on details of the assignment and the learning objectives. In Stage 3: Grouping and Labeling, you organize your reflections into groups of similar expectations that will likely become the dimensions of the rubric. Stage 4: Application is where you apply the dimensions and descriptions from Stage 3 to the grid format of the rubric.

These two process examples provide guidance for what to do when designing effective rubrics, but there are still more methods for *how* to design rubrics. The continuum of methods ranges from primarily instructor-driven to primarily student-driven (Stevens & Levi, 2005). While it may initially seem risky to involve students in rubric construction, it can be very effective and beneficial for both students and the instructor. Students become stakeholders in the educational process creating greater student buy-in to the assessment standards (Whittaker, Salend, & Duhaney, 2001). Student participation helps prevent misunderstandings and misinterpretations of the rubric before they affect student work (Stevens & Levi, 2001).

Provide Instructional Guidance

Instructional guidance on the use of a rubric to complete a task has been shown to increase the overall utility and effectiveness of the rubric (Andrade, 2000, 2001; Andrade & Du, 2005; Stevens & Levi, 2005). One good instructional practice that promotes critical thinking and effective use of the rubric is classroom discussion of the rubric prior to the students beginning the assignment. In a focus group study of undergraduate students, Andrade and Du (2005) found that undergraduate students' perception of improvements in the quality of their writing (i.e., student achievement) was attributed to understanding and using a rubric. Another study (Andrade, 2001) examined the effects of rubrics on 8th graders writing skills and found that simply handing out and explaining a rubric seemed to help students improve their writing.

Andrade (2000) notes that while research studies present evidence for a link between rubrics and student learning, the mechanisms behind the achievement advantage provided by rubrics is not known. Research has shown that if a rubric is used as part of the instructional strategy when the assignment is given to students, it is likely to serve its purposes of informing students of the standards of performance and supporting their achievement (Andrade, 2001). When learners better understand performance standards for the task, it is likely they will be able to compare their performance with the standard (Andrade & Du, 2005). Andrade discovered rubrics are not completely self-explanatory, so students need help in understanding rubrics and their use. When students where given a rubric without explanation, "The more motivated students anguished over what to do with it, and the less motivated filed it

in their notebooks and promptly forgot about it" (Andrade, 2005, p. 29). The rubric and standards for success should not be a mystery to students, rather when students know the criteria in advance of their performance, they are provided with clear goals for their work. In the same way, when students have access to performance criteria and scoring guides, they have the opportunity to self-assess and improve their work as it is developed (Wiggins, 1998). This method can enhance the quality of student learning and performance, not just evaluate it (Arter & McTighe, 2001). Some of the rubric's criteria break down the components of critical thinking in an explicit manner, while the descriptions of the criteria explicitly lay out the requirements of how the student's execution of the criteria can be critically analyzed. Critical analysis of the rubric's criteria may be so basic to instructors creating the rubric that they are left implicit in the assignment and so may be overlooked by the students until the assignment is complete.

The instructional strategy of discussing the rubric and communicating its purpose in advance makes the instructor's implicit expectations explicit. Interviews with undergraduates in an educational psychology course regarding rubric use revealed they liked having the rubric in advance so that they knew "what's expected," and contrasted it with the "guessing game" they felt they had to play when instructors did not provide a rubric (Andrade & Du, 2005). In addition, instruction on rubric use models, in reverse, the criteria by which the work will be graded (Stevens & Levi, 2005) and supports the development of academic skills and understanding pertinent to achieving a level of quality for the assignment (Andrade, 2000).

Rubrics Promote Motivation

Even with the combined benefits of good design and instructional guidance, any tool would have minimal effect if the user were not motivated to use it. Students' motivation, namely self-efficacy, for accomplishing a task may be increased when using a rubric, resulting in higher student achievement. Self-efficacy is a belief system proposed by Bandura (1986, 1997) and is defined as a person's judgment of their ability to plan and carryout the actions required to achieve specific types of performances. Self-efficacy is believed to be an important variable in understanding students' behaviors in educational contexts (Schunk, 1989) and to significantly influence students' motivation to learn and for skillful performance (Pintrich & Schunk, 2002; Schunk, 1989). A learner's self-efficacy beliefs are a key factor in motivation for accomplishing a specific task (Pintrich & Schunk, 2002), such as arithmetic division problems (Schunk, 1981) and writing performance (Meier, McCarthy, & Schmeck, 1984). According to Bandura (1997) self-efficacy is a generative characteristic and therefore can change depending on the task. At the start of a task, students have different beliefs about their capabilities to acquire knowledge, perform skills, master the materials, and so on (Schunk, 1989). This initial sense of self-efficacy varies as a function of previous experience and personal characteristics and therefore can be promoted. Interventions that have been found to enhance learners' self-efficacy include: skills for self-evaluation, self-monitoring, and experiencing progress towards set goals (Schunk & Ertmer, 2000); ability to synthesize and analyze content (Meier, McCarthy, & Schmeck, 1984); setting goals (Schunk & Ertmer, 2000; Zimmerman, Bandura, & Martinez-Pons, 1992); receiving rewards for meeting set goals (Schunk, 1984); possessing knowledge of what to do, perceiving a challenge worth accomplishing, and receiving performance feedback about progress (Pintrich & Schunk, 2002); and the teaching of effective learning strategies that will help them accomplish the set goals (Corno & Mandinach, 1983; Schunk, 1987b). See Appendix A: Concept Map of Relationship of Rubric, Instruction, Self-Efficacy, and Academic Achievement.

Self-efficacy and Rubrics

Rubrics have the potential to promote students' efficacy for a task by serving as the mechanism for the self-efficacy enhancement interventions noted previously. Although a review of the literature has not revealed an empirical research study that directly correlates rubrics and self-efficacy, the literature does yield a body of research about three correlated concept pairs: rubrics and self-evaluation (or self-assessment); self-evaluation and academic achievement; and academic achievement and self-efficacy. Self-evaluation is the key construct that ties rubrics to self-efficacy. Rubrics can be used as a self-evaluation tool for learners (Stevens & Levi, 2005) and self-evaluation is one of the factors affecting self-efficacy (Zimmerman & Martinez-Pons, 1990). The learner can self-assess his or her performance, in part, on feedback from others (Bandura, 1997), themselves (Schunk, 2003), or materials (Pintrich & Schunk, 2002), like rubrics.

Zimmerman and Schunk (2001) found in multiple research studies that self-assessment activities can promote achievement and inspire learning behaviors typically associated with academic success, such as goal

setting, self-monitoring, and revision. A well-designed rubric makes self-assessment easier, particularly when used as a "goal-setting guide," and shared with students prior to starting a task to help them understand the nature of the levels of achievement goals and performance expectations for each level (Andrade & Du, 2005; Arter & McTighe, 2001).

The process of self-evaluation of performance can be supported by the use of a rubric that specifically describes the criteria against which the learner compares their performance. Another link between self-efficacy and rubrics is when learners know they are making progress and success towards a set goal based on information of performance levels detailed in the rubric. The learner can set goals for task performance based on the criteria explicitly stated in the rubric or derived from it. The criteria, as well as the organization of the rubric, can inform the learner of the processes and procedures for completing the task and help them determine "what counts". Rubrics can be linked to self-efficacy via feedback the learner receives from the rubric while completing the task (Pintrich & Schunk, 2002). Determining one's self-efficacy requires information about one's performance, which can be evaluated with the standards set in the rubric. Self-efficacy can be increased when learners are taught effective learning strategies. Instruction on using a rubric can be considered a learning strategy and if taught as guided practice, is likely to increase self-efficacy, and subsequently academic achievement.

Conclusion

Assessing what matters, such as complex, open-ended tasks that involve critical thinking, problem solving, or creativity require a good description of the traits and qualities that comprise successful performance. Rubrics provide a structure for organizing the list of traits by levels of qualities for instructor and student use. Developing a rubric can be challenging, but teachers can follow a number of well-documented procedures described in the literature to mitigate the process.

By itself, a rubric offers instructional benefits, like clarifying the teacher's expectations and providing the student with meaningful feedback. When coupled with instructional guidance, a rubric has the potential to increase student self-efficacy and achievement for the task. Self-efficacy is the belief a student has that they can accomplish a task and motivates them to apply more effort. The rubric supports self-efficacy by offering the student a way to self-evaluate their work, get meaningful feedback, and determine their progress toward the goal of the task. The result could lead to higher student achievement. Although the outcomes of rubric use are by no means guaranteed, the potential for improved student achievement is tantalizing.

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Concept Map: Relationship of
Rubric, Instruction, Self-efficacy, and Academic Achievement

Be a Scientist, Do Practical Science:
Teachers Explore Marine Biotechnology and Bioinformatics

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Introduction

Science teachers in California are required to teach the state standard for inquiry-based science, molecular biology, genetics, and the role of technology and computer analysis in the study of biology. However, the field is changing so rapidly many teachers lack a clear understanding of how to do science using current technology and how to make the complexity of science relevant to their students. A three-week summer workshop, *Marine Biotechnology and Bioinformatics for Teachers*, was held in July 2006, at the California State University, Monterey Bay campus in California, where 13 middle- and high-school science teachers were paid a stipend and immersed in "doing science like scientists do." The teachers were from the San Francisco Bay Area, the California Central Coast, Southern California, and one from Georgia.

The workshop was a comprehensive project sponsored by the Information Technology Experiences for Students and Teachers (ITEST) program, established by the National Science Foundation (NSF) to address the looming shortage of technology workers in the United States (ITEST, 2006). Three principle investigators and project staff from CSU Monterey Bay, Moss Landing Marine Labs, and San José State University collaborated to develop the workshop.

The workshop was situated in a problem-based learning context within the field of marine biotechnology and bioinformatics. The teachers used current research methods for DNA extraction and analysis of mussels searching for an invasive species. The workshop was designed with instructional strategies for rapid integration of new knowledge and best practices for transforming high-level, new science knowledge into lesson plans for students. Overall, the teachers had a very positive response to doing rigorous science that took them out in the field and back into the wet lab. Recommendations and future directions for the next two workshops are discussed.

Outdated Standards

California education standards for science content include planning and conducting experimental investigations in cell biology and genetics, including DNA sequencing. For many experienced teachers the technology and research methods have evolved since they were formally trained and the state standards have not kept pace. Many other science teachers have not had an in-depth exposure to the practice of scientific inquiry. This workshop was designed to begin a process for addressing the lack of current science standards involving technology.

California and National Standards

The California science standards include one high school standard for biotechnology, listed under Biology/Life Sciences, Genetics, and referenced as genetic engineering. There is no reference found in the California science or technology standards for bioinformatics (California State Board of Education, 1998). The subject matter experts for this workshop defined biotechnology as the use of biological processes to solve problems or make useful products. Bioinformatics is defined as the use of computers to store, retrieve and analyze biological data. Further searching for information technology yielded no result in the California standards. The national science education standards do not have a standard involving biotechnology, bioinformatics, or information technology and the word "technology" is not found in the 276-page document (1996).

Marine Biotechnology and Bioinformatics for Teachers Workshop

Learning the nature of scientific inquiry is better suited for an extensive, three-week, immersive, hands-on workshop, where teacher participants can really get into doing what scientists do while conducting research. The goal of the workshop was to develop the teachers' ability to assimilate high-level, scientific, and technological

information and procedures, then break it down into teachable chunks suitable for the middle- and high-school students in their classrooms.

Marine biotechnology was used to gather data that could be analyzed using bioinformatics techniques. The field of marine biotechnology was chosen for the workshop because two principle investigators had both specialized in marine biology. Information technology was integrated with marine biology in the form of bioinformatics. The workshop theme was based on an authentic biotechnology problem for scientific inquiry: identifying an invasive mussel (*mytilus galloprovincialis)*, which can only be determined by examining DNA evidence using bioinformatics software.

It takes time to do science: harvesting mussels from the local waters of Monterey Bay, setting up wet labs on campus, running experiments, and analyzing data required numerous hours. To create a successful learning environment, it was decided to use an immersive, "hands-on, mind-on" model. A majority of the scheduled learning experience was devoted to knowledge acquisition and laboratory/field science practice in marine biology and biotechnology. The teachers were first given background information on the ecological problem this invasive species causes, then an explanation of the biotechnology processes that would enable them to investigate this problem. The second morning, the teachers collected mussels from a local pier and returned to the wet lab where they learned a series of procedures to extract and process the DNA.

Another significant portion of the schedule was reserved for learning to use bioinformatics software to manage the data analysis and sequencing of the DNA extracted by each participant in the laboratory. Early in the second week, the teachers used their DNA sequences that had been processed at an outside laboratory and began the analysis with software such as chromas, Blast, and Genbank.

The lesson plan development process was integrated throughout the first two weeks, overlapping the science and technology topics, and culminated in the lesson implementation in the third week. The design and development of the lesson plan component is presented in more detail in the next section. More information, resources, and materials about the Marine Biotechnology and Bioinformatics for Teachers Workshop can be retrieved from http://marinebiotech.net.

Workshop Design for Rapid Integration

This was the third year developing the workshop. The first two summer workshops were designed and developed by the two original principle investigators based on their expertise with marine biotechnology and bioinformatics. A third principle investigator with expertise in science education and instructional technology and an instructional designer were brought onto the project in the third year. The designers' primary responsibilities were to incorporate the lessons learned and develop innovative instructional solutions that would facilitate the transfer and application of knowledge to the teachers' science classroom. State standards were integrated in the workshop curriculum and explicitly taught so that teacher participants can more easily see how to incorporate them into their own science classrooms. The two marine scientist investigators, who also served as instructors, used the latest science methods in a technologically advanced laboratory and computer lab.

Pedagogical issues for teaching science methods were addressed by having teachers immersed in a problem-based learning (PBL) scenario derived from current marine biotechnology research that was being conducted at nearby Moss Landing Marine Laboratories, Moss Landing, CA. Going one step further, teachers were challenged with the requirement to transform their new knowledge into a lesson plan that could be realistically taught in their own science curriculum. It is generally accepted that a real demonstration of mastery is to teach someone. The NSF grant specified that teachers should be lifelong learners and willing to share their knowledge with their students. The issue of transfer was a high priority for the workshop to help insure that the teachers' students would also benefit from learning about current science methods in biotechnology and bioinformatics, as well as careers in information technology.

Marine biotechnology and bioinformatics are two information intensive topics that could have easily taken the entire three-week workshop. The decision to also teach lesson plan development created a pedagogical challenge. The two instructional designers worked with the two subject matter experts to develop a full 15-day workshop schedule to integrate all three content areas and balance the goals of the workshop. Instructional strategies

and planning were incorporated to support and facilitate knowledge and skill acquisition of the specific scientific methods presented. In the workshop design, lesson plan development was introduced in the first week and overlapped the marine biotechnology and bioinformatics topics to allow the teachers time to think of how they would create a lesson plan based on what they were learning. It was expected that teachers would complete their workshop learning experience by writing a lesson plan that would be delivered in their own classrooms during the academic year. In addition, teachers were expected to work in teams to develop a lesson and teach it to a group of students in the last week of the workshop. To facilitate developing lesson plans for both purposes, half-day sessions were included to teach problem-based learning with WebQuests, as well as other instructional strategies. The two instructional designers taught these sessions and closely supported the teacher teams during the development phase.

Although science teachers working within the Central California Coast and San Francisco Bay Area regions were the target audience for this summer workshop, the second important beneficiary of the workshop were the underrepresented student groups whom these teachers serve. This student population, which comprises low-income Hispanics, Latinos, as well as a significant percentage of Asian and African-Americans, does not advance into careers in information technology or STEM careers (science, technology, engineering, and math) in proportion with their numbers. This issue causes extreme concern in light of the multitude of well-paying information technology jobs available in nearby Silicon Valley and the entire San Francisco Bay Area. To meet an NSF grant requirement and provide teachers the opportunity to do a formative evaluation of their lesson plans, 20 local middle- and high-school summer students were invited to participate in the workshop during the last week. These students were a sample of the student population targeted by NSF.

Transparent Instructional Systems Design

Other instructional technology related interventions used during the workshop were transparent to the teachers. For example, using a basic participatory, team-planning model, teachers formed their own lesson plan groups, chose a topic from the workshop, and collaborated with the other three groups to design an appropriate sequence for the four lessons. The lesson implementation process was a form of microteaching and included the Japanese Lesson Plan (Columbia) protocol (Chokshi, Ertle, Fernandez, & Yoshida, 2001), where the quality of the lesson was determined by observing the learners' reactions. Within the teacher teams, those who were not giving large group instruction conducted the observations. Further instantiation of instructional systems design occured in the development of templates for the lesson plan format and other instructional materials prepared by the techers. The lesson plan was based on Bernie Dodge's WebQuest model (Dodge, 2006) and incorporated additional placeholders for standards, assessment of learning outcomes, and STEM career options. The students who were invited to participate in the lesson provided each team with immediate feedback as evidenced from the products they produced during creative, reflective learning activities following each lesson. In addition, the students then participated in a group debriefing and anonymously completed a survey.

Formative evaluation, a vital component of the instructional design process, focused on the teachers' lesson plans and implementation:
1. Formative evaluation of the lesson by the workshop program staff confirmed the teachers application of knowledge
2. Written feedback from the student participants and the products they produced after the lesson helped the teachers know the degree of effectiveness of their lesson
3. Peer feedback using the Japanese Lesson Plan protocol informed the teachers of how well their lesson was holding the students' attention

Best Practices

The best practices for teaching complex science to teachers are summarized below:

- Make instructional technology strategies transparent to participants
- Use project-based learning immersion
- Allow participatory groups to share ownership of the learning environment and outcomes
- Integrate new science knowledge for later transfer by requiring teachers to develop a lesson plan during the workshop

- Practice the lesson plan, collect feedback, and revise it for improvement
- Use formative evaluation at 3 levels to achieve a more complete analysis: program, peer, and student.

To further reinforce transfer of knowledge after the workshop, the teachers were required to attend six follow-up seminars over the following academic year. These seminars were designed to provide pedagogical support for delivering the lesson in the teacher's classroom, teach emerging technology skills, and focus more in depth on STEM careers.

Results, Recommendations and Future Directions

Preliminary results from the workshop show the majority of teachers were very satisfied with the experience of doing science the way real scientists do. They liked collecting mussels using carefully controlled research procedures and processing the specimens under the watchful eyes of the marine biologist and her teaching assistants. They expressed satisfaction with the rigor of learning how to carefully handle wet lab equipment, chemicals, and specimen dissection tools.

Recommendations

- Continue to use marine biotechnology as the basis for the immersion experience allowing participants to "be scientists and to do real science"
- Continue incentives (stipend and follow-up seminars) to encourage high-levels of commitment and increased focus on the learning process
- Increase instructional support for learning the science content
- Increase instructional technology support for developing and implementing the lesson plans
- Allow more workshop time to write lesson plans
- Establish unstructured preparation time for lesson plan development, such as library visits, reflection, collaboration
- Control workshop implementation to minimize scope creep of one topic into the time allotted for another topic

Future Directions

Given the outdated science standards at the national and state level, the results of this and the two future workshops could form the basis for a plan to initiate a major rewrite of the national science standards. In addition, the lesson plans and instructional products that emerge from the three workshops could form a solid secondary education curriculum for marine biotechnology and bioinformatics and be used to initiate science curriculum reform to integrate biotechnology and bioinformatics.

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Supporting Instructors in the Transition between Learning Management Systems

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Abstract

One of the most challenging technological tasks facing college faculty today is transitioning to a new Learning Management System (LMS) or from one version of an LMS to another. The speed at which the development of a given LMS progresses often outpaces the ability of faculty to easily adapt. New features and functionality may appear, and elements of the graphical user interface may change. These differences between LMSs, or versions of LMSs, can be costly to a faculty member, in terms of time, anxiety and effort. Helping faculty to make this transition is by definition a change management process, and we will also discuss a useful technique, Force Field Analysis, which can help instructional support staff identify and evaluate aspects of the overall situation that help or hinder the successful transition by faculty. We also provide a description of our Multidimensional Support Model (MSM) for instructional support staff to utilize as they help faculty survive this transition. The MSM focuses on implementation concerns, communication, and training issues within a socio-technical system (STS) such as an LMS. We describe our activities as primary support staff during a recent ongoing LMS transition, and present a model for supporting faculty as they transition between different LMSs, or substantially different versions of the same LMS. Our MSM model highlights the importance of a coordinated effort in communications, information sharing, and training between various support centers, on multiple campuses.

Context of Study

Our institution, a large Midwestern state university, is currently in the final stages of a transition between different LMSs, the second such transition in five years. While the systems are similarly named, Oncourse and Oncourse CL, they are actually completely different, both in user interface and technological underpinnings. What makes this transition particularly challenging is that our new LMS, Oncourse CL, is under active technical development as part of the Sakai Project (http://www.sakaiproject.org), an open-source software development effort that builds on the Open Knowledge Initiative (OKI) framework (Fuchs, 2004), and involves several universities sharing in the development effort. Although this provides considerable advantages to the institution in sharing of resources, costs, and knowledge, it also introduces many additional challenges for faculty and support staff. Among these challenges is the on going development process itself, which results in faculty often encountering new features, functionality, and related bugs.

Introduction

Learning Management Systems (LMS), sometimes referred to as Course Management Systems (CMS), are ubiquitous on today's college campuses. Morgan (2003) defines a CMS as "a software system that is specifically designed and marketed for faculty and student use in teaching and learning." Watson et al. (2007) define an LMS as "an infrastructure that supports the delivery and management of instructional content, the identification and assessment of individual and organizational learning goals, and the management of the progression toward meeting those goals". A typical LMS is quite complex, generally incorporating communication tools such as discussion forums, email systems and chat rooms, administrative tools such as drop boxes, grade rosters and course documentation, and interactive functions such as online testing and quizzing, automatic grading and e-portfolios.

An LMS is arguably the most complex software system that college faculty face in their day-to-day professional lives. Add to this the reality that many systems are in a constant state of change, due to various socio-technical system components that influences their design and development, such as the instructional needs of faculty and students (Morgan, 2003). An LMS may also be revised to accommodate improvements in technology, or technical and administrative priorities. Because of this, faculty often find themselves in the situation of having mastered one version of an LMS and now having to take on another. Given the busy life of the typical college faculty member,

with teaching, research, service, and family responsibilities, they often find it difficult to make time in their schedules to attend lengthy and exhaustive training seminars to learn all the complexities of a new substantially revised LMS. Sometimes faculty are hesitant of fully utilizing an LMS, in part, out of concern that it will change or not be available to them. The complexities of an LMS transition, the overall complexity of a socio-technical system, and issues with administrative and faculty communication are all significant challenges faced by instructional support staff in the training and support process. Morgan (2003) thus cites improvements in communication between administrators and faculty, the importance of minimizing disruptions, and the creation of policies and change management practices as critical steps in supporting and encouraging faculty use of an LMS.

As instructional support staff, we have faced the challenge of bringing faculty across the gap between different LMS versions or systems. We believe that other instructional support professionals will find our MSM model helpful as they design their own LMS transition strategy. College faculty will also benefit from learning about our model and related techniques, so that they can be informed about the support that they will need during an LMS transition, and will be prepared to request it, if not already available, from their institution.

<center>LMS as a Socio-Technical System</center>

In this effort, we utilize a socio-technical approach as our primary theoretical perspective. This approach suggests that the social and technical components of a system are closely linked. It further suggests that both the social and technical aspects are equally important when implementing, using, or evaluating information technology. Kling supports this concept of a socio-technical interaction network (STIN), noting that, "the STIN model shares the views of many socio-technical theories: that technology-in-use and a social world are not separate entities—they co-constitute each other" (Kling, et al., 2003). The abstraction of an LMS as a socio-technical system is further supported by Moore & Kearsley (1996), in which they explain that learning management systems are complex systems that involve a wide variety of technological, organizational, social, and instructional components. Taken alone, the design and implementation of an LMS is not a simple task. Combining that together with a transition from one LMS to another, increases the overall complexity exponentially, thus increasing the cognitive load and anxiety on many of the social actors within the STS; including instructional support professionals, faculty, students, and administrators. It also increases the importance of knowing the components of a system, the goals for the transition, and the forces that for and against the change effort. In an effort to illustrate a LMS as socio-technical system, it is useful to note the important social and technological aspects that define it. An STS is comprised of identifiable populations, groups, incentives, actors, undesired interactions, flows, and choice points (Kling, et al., 2003). It is all of these components that encompass a learning management system. It is our belief that having a complete socio-technical representation of our system will improve decision-making, and the resulting policies, procedures, and support model.

In devising our support strategy our first step of analysis was to determine the components and influencing factors of the LMS transition. After viewing our LMS through the prism of the STS approach, it became easier to identify the driving and restraining forces that may impact the transition. Assessing these forces prior to the actual implementation allows for the prioritization of limited support and training resources.

<center>Force Field Analysis</center>

A Force Field Analysis (FFA) was performed to identify the major forces for and against the change effort. Force Field Analysis, developed by Kurt Lewin (1943), is a common diagnostic tool used in many change management efforts. The result of an FFA analysis, if positive (the driving forces outweighing the restraining forces) suggests that the change effort will be successful, and where to position specific energy and effort in order to effect positive change or minimize difficulties. When creating an FFA diagram, the positive and negative forces are identified and then given relative weights of importance. Thomas (1985) notes that the utilization of FFA is present in numerous contexts, but that it was rarely applied to strategy. He goes on to state that FFA could provide new insights into the evaluation and implementation of corporate strategies. We chose to use an FFA analysis (figure 1) to help focus our training and support strategy at a local level. We based the FFA analysis upon our daily interactions as instructional support personnel with faculty who were using our LMS. While admittedly a subjective measure, by using FFA we were able to identify and prioritize training and other support efforts more effectively, as well as prepare for potential restraining forces in an effort to minimize those forces.

Figure 1- Force Field Analysis

Transition to New Learning Management System (Force Field Analysis)

Driving Forces (+)			Restraining Forces (-)
Course management efficiency (5)	→	←	Complexity of the system and transition (5)
Desire to ease current complexity (5)	→	←	Lack of consistency across LMSs (4)
Integration of digital media (5)	→	←	Incomplete feature set of new system (4)
Integration with existing systems (4)	→	←	Apprehension about new technology (4)
Improved features (3)	→	←	Bugs/problems with new system (4)
Availability of support (3)	→	←	Preferences for previous system (3)
Customizability (3)	→	←	Institutional disruption-social components (3)
Departmental priorities (3)	→	←	Faculty schedule / lack of time (3)
Market trends (push for new technology) (3)	→	←	Other departmental priorities (2)
Bugs/problems with previous system (3)	→	←	Institutional disruption-technology (2)
Leverage expertise from other software (3)	→	←	Faculty disinterest in new technology (2)
Faculty interest in technology (2)	→	←	Inertia / status quo (2)
sustainability of previous system (2)	→		
Requests and pressure from students (2)	→		
	47	**38**	

The Multidimensional Support Model

Our MSM model (figure 2) is an attempt to clarify our support and communication techniques and brings together many of the practical and theoretical underpinnings of our overall strategy. The model reflects a clear and flexible timeline, the importance of communication between the support centers, the teaching and training centers, and the system development team, as well as the importance of communicating with faculty in regard to support and training. The model also illustrates the reciprocal or iterative nature of the process by indicating bi-directional communication between all institutional support teams, and the primary users; in this case the faculty. A key aspect of the MSM model is the multidimensionality, which is carried through the entire model in the coordination and communication of the support staff and development team, and in the multidimensionality of modes of support and training for faculty.

Clear and Flexible Timeline

A clear and flexible timeline set forth by the development team and administrators is another important element in our support model. The clarity of the timeline would speak for itself in terms of the importance of communicating with faculty about specific dates, and when changes will take place. Even more important is the willingness of technical and institutional administrators to recognize potential problems in the transition, and to take action by shifting or extending the timeline in order to alleviate any potential problems. This situation occurred at our institution where the administration extended the transition timeline after collecting feedback from faculty and

support professionals. This willingness to shift the transition timeline to continue to operate the current and new system for a longer period of time helped ease faculty stress, and minimize disruption.

Figure 2- Multidimensionality Support Model
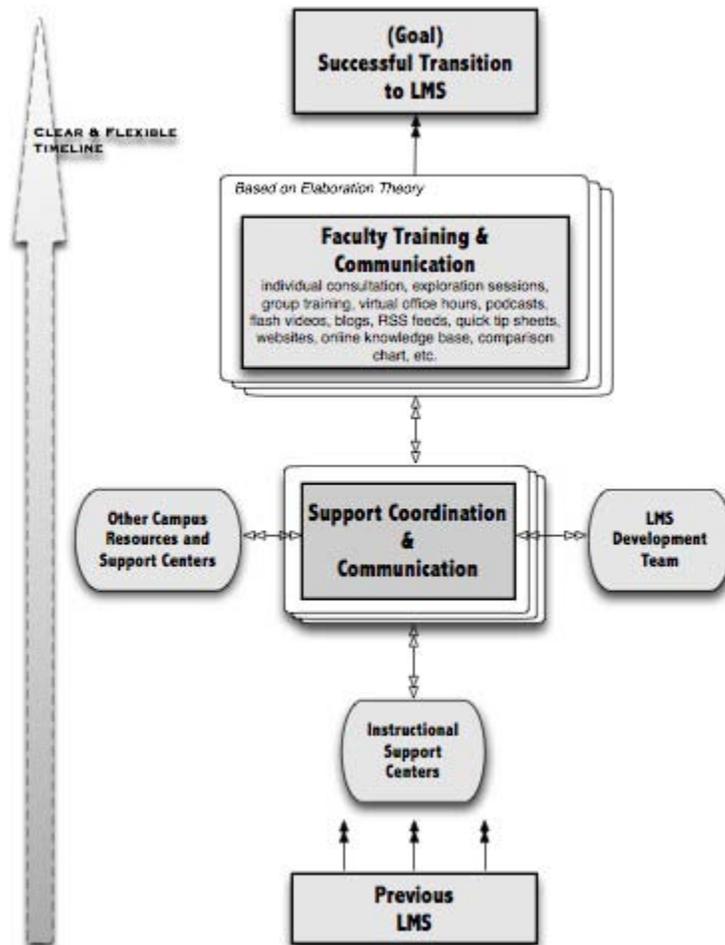
Support Coordination & Communication

The key aspect of multidimensionality in the MSM model is demonstrated in the coordination and communication between support staff and the LMS development team. The continual flow of information between the various support centers and campuses is carried out through various face-to-face and technological channels. This communication is multidimensional, iterative, and bi-directional. It continually precedes and follows major and minor system updates, training sessions, bug reports, and other feedback received from faculty and students. An array of media resources is utilized to maintain continual communication and coordination including the use of phone, instant messaging, email, blogs, wikis, online knowledge bases, print-format job aid documents, and large and small-scale meetings via videoconferencing. All of these media are critical elements of the coordination and communication strategy. A positive side effect of using these online technologies is that faculty also have access to many of these same support resources, thus reducing communication lag time, and increasing transparency in the support process.

Faculty Training & Communication

Due to the complexity of our situation, the training component of our support model was influenced by Reigeluth's Elaboration Theory (Reigeluth & Stein, 1983). This theory provides guidance in designing instruction

and encourages the teaching of complex ideas and procedures by first presenting the learner with the simplest form of the task, or the epitome, and then later presenting more complicated tasks or versions of the task. In any LMS, there are often numerous ways of accomplishing a certain instructional goal, some of them more complex than others. In our training, which is necessarily procedural in structure, we chose to teach first the most basic, simplest ways of operating in the system, and then later provided more complex directions for more challenging tasks when a user is confident and ready. We chose this model for its ability to reduce complexity in the learning task, with the hope that it would also reduce faculty stress and anxiety by alleviating some of the complexity of the overall system transition.

The aspect of multidimensionality with our model is demonstrated in the support that precedes and follows the group training sessions and one-on-one tutorials. We utilized an array of media resources to raise awareness of the changes in the LMS and then to start faculty along the path to adoption. The use of email announcements, print job aid documents, animated Flash tutorials, online support knowledge bases, virtual office hours (offered via Macromedia Breeze), live synchronous text-based chat and traditional phone support, as well as related blogs and podcasts were all critical elements of the communication and training strategy. This array of media resources, along with the face-to-face, individual consultations and group sessions, allowed faculty a multiplicity of means to get support, which helped them in getting started, minimizing their stress, and successfully utilizing the new and/or improved LMS with their students.

Limitations and Further Research

This paper is based on our own experiences working as instructional support personnel at a large state institution in the Midwest. It is possible that instructional support staff at other types of institutions may have different results following our model, and may have reasons to adapt it to their own contexts. Smaller institutions, for example, may find communication with faculty to be easier, and to require fewer delivery methods. If the transition between LMS versions focuses on just a few features, is purely technological, or is just cosmetic, there may not be the need for such a complicated transition strategy. Other factors, such as faculty use patterns, size of courses, makeup of the student body, etc., may impact LMS use and thus the transition strategy.

Further research in this area is obviously needed. A study that collects the experiences of support staff across numerous institutions, and types of institutions, would help in the effort to refine this model, as would studies featuring a variety of LMSs. Surveying faculty directly, or interviewing them, might also help to better assess the factors in the FFA analysis.

Conclusion

This article offers the reader a glimpse into the on-the-ground realities of an LMS transition at a large Midwestern state university. As online instructional environments are constantly in flux due to efforts to incorporate innovative technologies and tools, and to function within an ever-changing technological infrastructure, a clear vision related to supporting faculty through these changes is a necessity for support staff. We present our MSM transition model with the hope that our experience developing it will assist and inspire instructional support staff at other universities as they strive to help faculty members reach their goals as they face similar transitions.

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Supporting Instructors
through a personal support system

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Summary

Instructors are using E-learning but face new pressures for instance to perform more efficiently and offer their teaching in ways they are unfamiliar with. In a multi-method research project the activities of university instructors related to E-learning were analyzed. An international survey was one of the research methods. A Personal Performance Model of instructors was developed. Based on this model a Personal Performance Support Tool was designed and developed. In four rounds of formative evaluation the usability was investigated and improved. This research shows that such a performance support tool can offer instructors more control and support on their work, time management and course quality in this new era of E-teaching.

Pressure on Instructors

External demands from society, students, and government force universities to change their mission statements and to define new targets for teaching and learning. Currently education in Europe is in transition towards a new program structure. This Bachelor/Master structure implies that program structure and current courses will change to fit within new demands. It will mean offering new programs to a much more-diverse student population with various backgrounds coming from various countries in Europe. This change in student demographics will also increase the need for external flexibility in offering education services, especially online. At the same time there is much more emphasis on quality, both from government and society, to offer good-quality education within time and budget. Schools and universities have to set up strict administrative procedures to audit finances and quality, and they are held accountable for students' results. These tight budget constraints also lead to increased accountability for faculty (Fisser, 2001).

Chevaillier (2000) observes that "all the changes that have affected higher education systems in the last three decades around the world have inevitably had an impact on the working and living conditions of academics." (p. 28). As an overview, some of the changes are depicted as pressures on faculty in Figure 1.
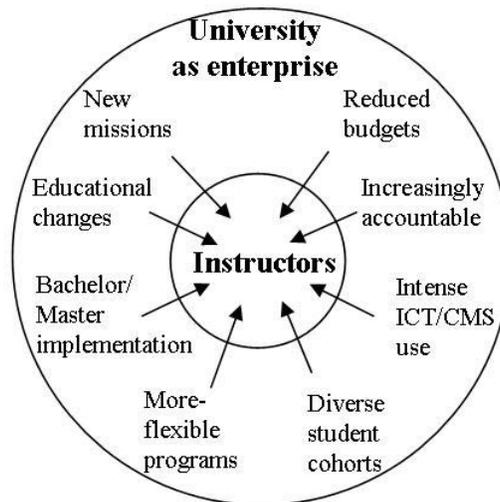
Figure 1. Examples of changes that will affect performance of instructors as a group.

The use of Course Management Systems (CMSs) such as *BlackBoard, WebCT, Learning Space,* and *TeleTOP*, has greatly facilitated distance education and blended learning (Collis & Moonen, 2001), but instructors have to learn how best to offer their courses using such a system and become efficient at managing their time and teaching-related activities involving the system (Gervedink Nijhuis & Collis, 2003). In general, academics usually do not welcome such substantial changes with their accompanying risks and uncertainty (De

Boer, 2003). Academics indicate that they feel stressed caused by increasing workloads and therefore sometimes leave the profession (Meyer, 1998) or do not want to invest time in developing new forms of education (Collis & Messing, 2001). These observations lead to a multi-method research project that has been running from 2001 to 2005 to investigate how instructors can be supported when performing teaching-related activities in this climate of changing expectations (Gervedink Nijhuis, 2005).

As these change processes are still evolving, pressure on academics will continue to increase. Simultaneously, academics are being held more and more responsible and accountable for their own performance. Yet, their workload is already (too) high and satisfaction (too) low which influences job performance and teaching quality in a negative way. How will instructors cope with these changes and pressures and perform well as a group and at a personal level? This lead to the initial problem statement for the research:

How can an individual instructor stay in control of these pressures?

Research Approach

The Human Performance Technology (HPT) methodology (Stolovitch & Keeps, 1999) was used as a framework to analyze the instructor's teaching-related activities (Figure 2). Within the teaching task of academics, two major categories of activities can be distinguished: teaching activities that are directly linked to student learning, such as delivery of face-to-face sessions; and teaching-related activities to manage and control the instructor's personal performance, such as planning and administration. Using a CMS makes these teaching-related activities a substantial part of instructors' work.
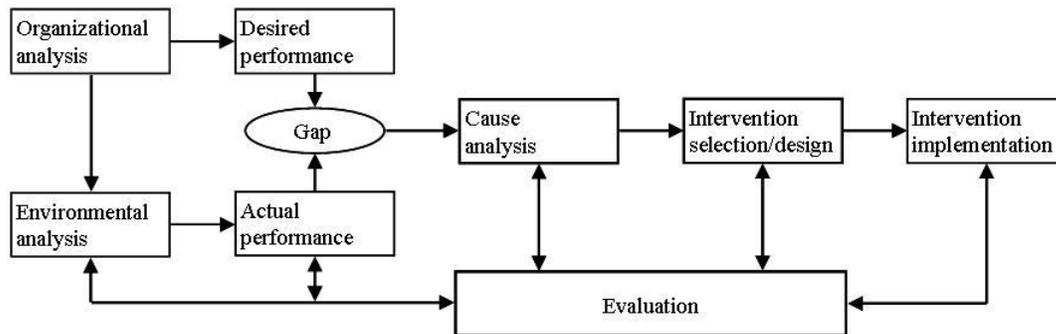
Figure 2. Schematic HPT model, based on Stolovitch and Keeps (1999).

The steps are shown as iterative processes in which the problem is analyzed and causes are identified, followed by a development process to create an intervention which is then refined until an optimal state is reached. This part of the HPT process can well be addressed by the development-research approach (Van den Akker, 1999; Reeves, 2000), in which four major steps are defined: analysis of needs, development of solutions, evaluation and testing, and documentation and reflection. In the development-research approach (Reeves, 2000) the practical problems are analyzed by researchers and practitioners. The close involvement of practitioners in research both as objects of study and as researchers is also the focus point in Action Research, sometimes known as participatory research. In Action Research the researcher is placed in a position as a partner "working alongside those affected by the problem, rather than as an objective observer who might impose changes from the outside" (Ryder & Wilson, 1997, p. 2). In this research the researcher and the practitioner were united in one person and his reflective insights formed the start of the development process.

In a multi-method research approach, data was collected through interviews (sometimes also using card sorting) and questionnaires, and through analyzing timesheets of instructors, log files of CMS usage by instructors, and CMS content entered by instructors. An international survey was carried out to investigate faculty needs and support in 6 European countries and Australia.

As an example from the international survey, one of the findings about the level of support offered to instructors is shown in Table 1.

Table 1. Current level of support for instructors using ICT for teaching purposes.

In your opinion, the level of support for instructors with respect to the use of ICT for teaching purposes in your institution is?	Instructors (*n*=347)	Decision makers (*n*=189)	Support staff (*n*=154)	Total (*N*=690)
	M (*SD*) - current - predicted	*M* (*SD*) - current	*M* (*SD*) - current	*M* (*SD*) - current
Level of support for instructors	2.96 (1.09) 3.37 (.98)	3.14 (1.01)	3.15 (1.06)	3.03 (1.06)

Note. Scale: 1=very low, 3=average, 5=very high.

Table 1 shows that the current level of support available for instructors with respect tot the use of ICT for teaching purposes scores about average. Instructors are significantly less positive (*p*<.05) than the other two groups as according to decision makers and support staff the current level is slightly above average. Instructors expect that in the near future this support will significantly improve (*p*<.05), although still just above average (*M*=3.37). Overall the level of support is valued as average which indicates that more support should be offered to instructors.

Conceptual Model

A conceptual model of instructor's performance was developed. The model shows the teaching-related performance of an individual academic in the context of his or her job, with work relations in four 'directions'.
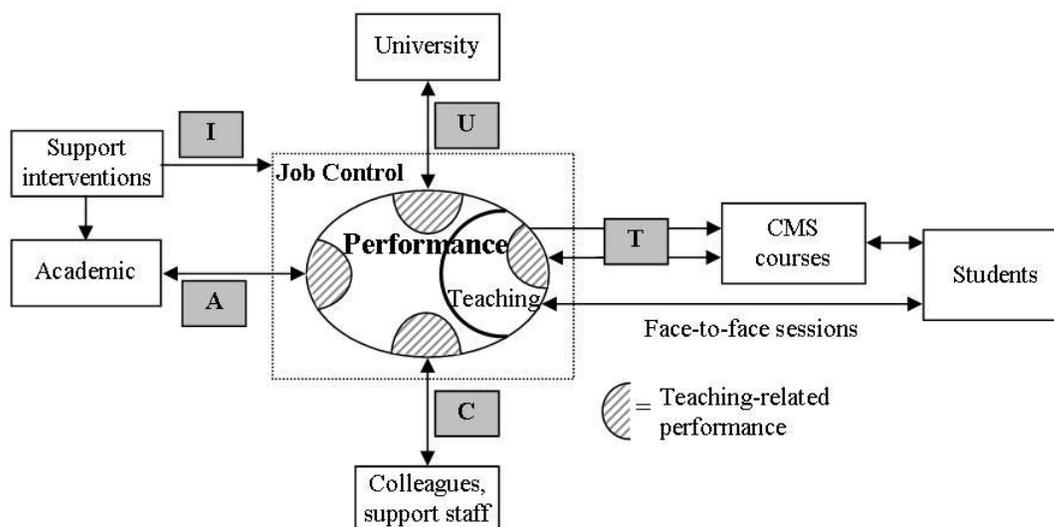
Figure 3. Conceptual model of Personal Performance

The first direction (A) is a direct link between the personal characteristics of the individual academic and job performance. A second direction (U) indicates academic's performance within a specific university context. A third direction (C) indicates collaboration with colleagues and support staff, and a fourth direction (T) indicates direct teaching, such as face-to-face sessions, combined with the teaching and management of online and blended courses within a CMS such as *Blackboard*. Being able to manage and control their own work within the dynamics of this model is an important way that academics can improve the efficiency and effectiveness of their personal performance, and one or more support interventions (I) can offer support.

While the conceptual analysis identified desired performance, a series of studies was carried out to map actual performance, and identify gaps and their causes. The results of these studies gave a basis for comparing the desired and actual personal performance of academics in terms of their teaching-related activities and identified potentially serious gaps in terms of maintaining control over time and task management.

Results showed that instructors are willing to change but do not have the right tools and support available. Also the universities are not offering on-going support to handle managerial and organizational support for the individual instructor. The international survey showed that instructors indicate that in the future,

increasing efficiency will become even more important and that ICT use is expected to be even more important in the future than today, both for work and teaching. The study also showed that through efficient and effective management of a course environment (that is part of a CMS), does not yet receive attention in staffing policies and that the necessary incentives and rewards for staff to make the effort to handle a CMS in a well-managed way are lacking (Gervedink Nijhuis, 2002). Instructors also indicate that they want to be well organized and want to plan their time in advance. This could imply that instructors can benefit from a planning tool that supports them to plan their time in advance.

Personal Performance Support System

An intervention was designed, using design-research methodology (Reeves, 2000). In this research the intervention took the form of a series of prototypes of a Web-based support tool. These prototypes were designed, developed, and evaluated to lead to a final, elaborated prototype of a Personal Performance Support tool to support instructors in their teaching-related activities. The last version of the prototype was accompanied by an implementation plan, indicating the institutional practices needed before such a tool could be of maximal value for instructors.

Instructors need integrated support at various levels, as their work is complex and when performing instructors use various resources, knowledge, and heuristics. As Gery and Jezsik (1999) put it: "An EPSS [Electronic Performance Support System], because it is incorporated into the work process, enables individuals to get up to speed quickly and work more efficiently. It manages complexity and work flow for the user, and it is capable of supporting diverse working styles. In addition, it enables performers to share knowledge." (p. 143). This seems quite appropriate for instructors to improve their performance. Therefore, an EPSS which may incorporate aspects of expert systems and job aids seems the most beneficial.

The final version of the support tool incorporated various kinds of support, such as background information, checklists, procedures to use a CMS, and administrative documents and forms. This support is offered in a context-sensitive manner to help the instructor focus on the relevant parts. The user interface offers instructors sequential overviews of activities to perform, but specific support can be accessed in a direct manner. An example of a support page is shown in Figure 4.

Figure 4. Example of a webpage within the Personal Performance Support Tool offering support to create a lecture.

Research Findings

The formative evaluation of the final version was carried out by instructors, management staff, and support staff at the University of Twente. The potential usefulness as rated by instructors is shown in Table 2.

Table 2. Overall potential usefulness of various parts of the PPST by instructors (*n*=11).

Question	Instructors *M* (*SD*)
What is your overall impression of the **look and feel**?	3.91 (.54)
What is your overall impression of the **screen design**?	3.55 (.69)
What is your overall impression of the **navigation**?	3.91 (.70)
What is your overall impression of the (potential) usefulness of the **tasks and activity lists**?	4.36 (.50)
To what extent do you think that the **tasks and sub-tasks** match common practice of instructors?	3.45 (1.21)
What is your overall impression of the **content** of the PPST tool itself (excluding the content of resources, such as articles, documents, forms)?	4.18 (.60)
What is your overall impression of the (potential) usefulness of the **resources**, such as articles, documents, forms, that are linked in the PPST tool?	4.00 (.89)
What is your overall impression of the (potential) usefulness of the **planning** support?	3.90 (1.20)
What is your overall impression of the **overall** (potential) **usefulness** of the support tool for teaching-related activities?	4.00 (.89)

Note. 1=very negative; 3=neutral; 5=very positive.

Table 2 shows Instructors rated the potential usefulness of various aspects of the support tool as positive (M>3) with 'tasks and activity lists' and 'content of the tool' as more than positive, and 'match with common practice' as more than neutral, and screen design also rated as more than neutral. The PPST overall impression by instructors is that the usefulness of the tool is valued as highly positive (*M*=4.00, *SD*=.89). This implies that the PPST has the potential to be able to support instructors in their daily work and make it more effective and efficient.

Most instructors (8) indicated that they want to use the tool or at least give it a try (2), whereas one instructor would only want to use some "bits and pieces". Two educational program directors indicated that they would not want to use the tool but in contrast one director indicated a general interest in using new tools. Support-staff participants were very willing to support this tool and submit additional references and guidelines to the tool.

With regard to the control issue of helping academics to remain in control of their time and teaching-related planning a majority of the participants (10) felt that using this tool would result in instructors being more in control of their work. As one instructor indicated, "it will offer me peace of mind", and another instructor noted that using this tool "may prevent some planning disasters to happen.". One support-staff member stressed the ease of use of this tool as a database for all teaching-related documents and other related material. In contrast, one instructor and one director felt that this tool will not help instructors, as this tool has to be used in addition to their other work, and they are already overloaded.

It was found that academics also value in-person support when it is available, but they admitted that availability is often a problem (not only during the evening or weekend, but also during working hours). Support staff could offer a few workshops and to be 'at hand' when needed, although others just want to start using the tool and find out themselves. This in-person support can also help to update the PPST when instructors feel the need, or organizational procedures change.

After a final evaluation of the Personal Performance Model of instructors (Figure 3), the model was amended to include additional aspects, for instance the fact that within a university daily practice within various faculties will vary and a PPST should take this into account and be adaptable to meet faculty-specific needs. To fill the PPST with useful resources various 'suppliers' were added, such as directors of educational programs, managers, a librarian, support staff, and others who can supply documents, procedures, templates and more. Instructors and managers also suggested adding standard procedures to indicate that within workgroups collaboration procedures can facilitate easy workflow. Some participants also suggested that directors of educational programs should be involved to set up procedures. Both instructors and managers emphasized that this Personal Performance Support Tool should be able to link to other information systems at a university level,

such as Blackboard or a central administrative database, to offer easy access and prevent the need to submit information twice. As the tool has its specific functionalities it was suggested not to integrate it in another system.

Conclusion and Recommendations

Instructors and managers rated the potential usefulness of the PPST as high. Instructors are very willing to give it a serious try and indicate that using this tool will offer them more control for their teaching-related activities. This prototype still needs additional educational components and a way of interacting with other systems at a university level. As instructors perform their work within a faculty-specific environment the PPST should also be adaptable to meet the daily practice of the faculty involved. This means that the PPST should be filled with faculty-specific information, procedures, and documents.

Most participants, both instructors and managers, are reluctant about actual use as it will change work procedures and current practice of instructors. They emphasize that the deployment should be done very carefully and gradually, with a PR campaign and some short workshops. They also indicate that personal support is required, with also a procedure to suggest amendments.

A university can develop incentives for the use of this tool to increase the individual's personal control over teaching-related work processes and to improve the execution of administrative processes. Instructors will demand such a tool when pressure on them gets higher and educational demands lead to an overload of expectations. As both of these forces are building on the individual instructor, this will increase the need for such a tool. Universities should start now to consider the implementation of such a personal performance support tool. In this way instructors can stay in control of their teaching-related performance. In line with design-research methodology, the research concludes with a series of guidelines and recommendations that can help this process of staying in control to occur. In this research 17 recommendations were defined on how to support instructors for three distinct levels within a university: the organizational-management level, work-group management level, and the individual instructor level. The list was enhanced with recommendations for researchers of human performance and for designers of support systems for instructors. Some examples of recommendations are listed here.

At the organizational-management level one of the recommendations is:
- Management should provide instructors with clearly stated procedures, guidelines, and templates to streamline workflow and administrative procedures within faculties and workgroups.

At the workgroup management level one of the recommendations is:
- Workgroup management and peers should stimulate the common use of a PPST to streamline common work procedures within a workgroup.

At the instructors' level two of the recommendations are:
- Instructors should work in a systematic way, using a project-management work approach and define own personal-work procedures in order to control effective and efficient course preparation and delivery, taking into account their work-group and university constraints.
- Instructors should plan their time in a systematic way not only for face-to-face sessions but more-and-more for teaching-related activities, for instance planning for time to submit feedback to assignments or time to participate in online discussions.

The research suggests that when the list of recommendations is followed through it will create a working context for instructors in which they can more efficiently perform their teaching-related activities and that a PPST-type tool will be available to support them to optimize their organization and management of their own work. Finally, this research emphasizes the importance of offering support to individuals who have to perform in an ever-changing environment. As instructors become more-and-more self-responsible for their work and have to perform in increasingly efficient and effective ways and are being held accountable for good quality courses and results, they will need to be able to get support to stay in control.

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Promoting Scientific Thinking with Web-based Concept Maps

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Abstract

In this collaborative research project, six middle grades science teachers have co-developed concept mapping activities tied to soil and air quality environmental issues in the state curriculum. Project highlights include a two-day professional development seminar for teachers, collaborative lesson planning, and classroom instruction designed to promote student thinking skills about priority environmental issues. The project is supported by the freeware Cmap software program for preparing and editing Web-based concept maps. A mixed methods approach is employed with qualitative cases and quantitative control groups. Findings will demonstrate the type and quality of student thinking elicited by mapping activities, as well as potential benefits of mapping on learning outcomes.

Purpose

This collaborative research project between a university researcher and six middle grades science teachers promotes students' scientific thinking skills through Web-based concept mapping. The goal of the project is to increase student awareness of selected environmental problems in the community, as well as actions that can be taken to alleviate the problems. Teachers select topics that tie into the state curriculum, with soil quality and stewardship taught in grade 6, and air quality and stewardship taught in grade 7. Students use Web-based concept mapping software to organize and relate term sets.

Our state's science testing at the end of the 8th grade has an increased focus on processing information and higher-order thinking skills. The focus of this project aligns with these emerging requirements, since it tasks early middle grades students with processing online information sources through the basic thinking skills of qualifying, classifying, and finding relationships (Presseisen, 2001). Building this foundation of thinking skills is important for future science classes that apply end-of-grade tests based on thinking. Concept maps are one of several techniques recommended by National Science Education Standards to promote student thinking (NRC, 1996, p. 144): "Students need opportunities to present their abilities and understanding and to use the knowledge and language of science to communicate scientific explanations and ideas. Writing, labeling drawings, completing concept maps... should be a part of science education." Mapping tools in particular support recommended learning strategies in allowing students to build on what they already know about a subject and revise that understanding through further reading and discussion (Bransford, Brown, & Cocking, 1999).

The project is supported through Cmap software for online concept mapping (IHMC, 2006). With Cmap, teachers can establish and populate student Web folders with raw maps for editing and relevant resources to assist with the task (e.g., articles, Web links, images). Students can access their server-based folders from any Internet-connected computer that has the freeware Cmap tools software program. Students can create new concepts or work with seeded concept sets provided by the instructor. When connecting two or more concepts in a map, Cmap prompts the student to enter a descriptive relationship phrase or "proposition" statement, consistent with the recommended concept mapping approach (Novak, 1998).

Specific project objectives include:

Objective 1: The student will apply basic thinking skills to deconstruct environmental problems: a) *qualifying* or recognizing basic units of identity (creating concept categories), b) *classifying* or sorting pre-selected resources into concept categories, and c) *finding relationships* or patterns and sequences in the data.

Objective 2: Using their completed concept map, the student will engage in the complex thinking process of *decision making* to make recommendations for addressing stated environmental problems.

Theoretical Framework

A void exists in research that investigates concept mapping as an educational strategy to promote student thinking skills. A review of archived articles related to "concept mapping" in the ERIC Education database between 2004-2005 reveals literature more frequently related to:

- non-research descriptions of concept mapping as a methodological or educational tool (Carnine & Carnine, 2004; Goodyear, Tracy, Claiborn, Lichtenberg, & Wampold, 2005; Lee, 2004; Royer & Royer, 2004)
- applications of mapping to address specific needs such as sorting focus group findings (Cousineau, Goldstein, & Franko, 2004), sorting information to help pre-service teachers prepare lessons (Machin, Valeys, & Loxley, 2004), collapsing multiple maps to derive a program theory that depicts group thinking (Rosas, 2005; Yampolskaya, Nesman, Hernandez, & Koch, 2004), deriving remedial instruction paths (Jong, Lin, Wu, & Chan, 2004), or structuring information associated with writing tasks (Riley & Ahlberg, 2004)
- discussions of how to best interpret or assess concept maps (Jong et al., 2004; Passmore, 2004; Riley & Ahlberg, 2004; Van Zele, Lenaerts, & Wieme, 2004; Yin, Vanides, Ruiz-Primo, Ayala, & Shavelson, 2004).

Many researchers have used concept maps to document student knowledge structures, but with different topics, age groups, or under different conditions than the proposed study. Blake (2004) and Lewin (2004) documented individual understanding of rocks and home technology respectively. Kinchin, De-Leij, and Hay (2005) investigated the use of maps to improve undergraduate integration of microbiology course material. And other researchers have modified mapping conditions to determine if different source texts (Graff, 2005), given map structures (Lee & Nelson, 2005), or alternative control structures (Chiu, 2004) impact map development. Only one study investigated similar thinking skills to the proposed study--MacGregor and Lou (2004-2005) discovered concept map templates can assist with recalling and applying knowledge from Web sources during inquiry tasks.

To use concept maps for assessment, at least three things must be accounted for: a task with directions, some format for the student's response, and a scoring system (Ruiz-Primo & Shavelson, 1996). Tasks vary by constraints, with some providing pre-selected terms or propositions to students for mapping, and others asking students to generate their own list of terms or propositions. Response formats vary by mode, including paper and pencil, computer-generated, and interview. Response formats also vary by characteristics and difficulty, with some providing an easier fill-in-the-blank map structure for students on a partially-created map, others providing computer pull-down menus with relationship statements already defined, and some providing no map elements ahead of time.

At the training seminar, teachers were shown a continuum of mapping activities from fill-in-the-blank templates to partially completed seeded maps to completely open-ended maps, with the recommendation that novice students start out with seeded maps until they understand the mapping process and Cmap tool. Seeded maps also provide a common term set to score, making assessment more objective.

More than 20 different scoring strategies are available for maps when considering the variations in map type and the multiple map items that can be scored (i.e., concepts, sets/hierarchies, relationships, cross-links, resources) (Ruiz-Primo & Shavelson, 1996). A general recommendation is to focus on the adequacy of propositions as the most important map element, while downplaying scoring systems that simply count concepts and links (Rye & Rubba, 2002). In this study, teachers were trained to score student maps using a combination method of comparing the student map to their own instructor map (one point for every concept grouped similarly to the instructor's concept sets), and scoring the presence of selected map components (one point for each correct relationship statement and cross-link statement between concept sets).

Method

A faculty research grant was secured from the university during spring 2006 to support teacher stipends and travel to an on-campus seminar and researcher travel to school sites. Applications were solicited from 6th and 7th grade science teachers across the state, through contacts with state technology and science education teacher organizations. Six teachers were selected from different schools based on their interest in graphic organization tools and grouped into grade-level teams of three persons each. Cmap server software was installed at the university, allowing teachers and their students to store and edit their concept maps and attached resources entirely online.

A 2-day seminar was held on June 12-13, 2006, to train the cohort. On day 1, the cohort received direct training on Cmap features and practice generating and scoring maps with sample lessons. On day 2, teachers worked in grade-level teams to select resources and develop expert/instructor maps for two environmental lessons. The 6th grade team developed two instructor maps tied to soil erosion, while the 7th grade team developed two instructor maps tied to air pollution. A student version of each map was then generated consisting of a few seeded terms from the instructor map and the remaining pre-selected terms in an unstructured list for the students to organize and relate.

Currently, students are being assigned folders and passwords on the Cmap server using rosters provided by each teacher. Map templates and applicable resources selected by the teachers during planning will be duplicated and placed in student folders. The free Cmap desktop application will be installed on each internet-connected computer from which students will be constructing their maps. Teachers were required to secure the signature of their school technical support person, agreeing to assist with these installs, as part of their application for the seminar and study. Prior to their first lesson, each teacher will engage students in a short training lesson to learn both Cmap software features and general mapping procedures. The training lesson will task students with developing appropriately structured concept maps using a simple topic (e.g., basketball rules).

This is a mixed methods study with a quasi-experimental two-group control group design and a qualitative case study design. The unit of analysis is a case site comprised of one teacher and at least four classes, allowing for both quantitative and qualitative comparisons across sites. Each teacher will assign at least two classes to a treatment group and two classes to a control group, with an estimate of at least 150 students in each group at each grade level across the multiple school sites. Both groups will receive a pre-test before each of two lessons to measure their prior knowledge of relationships in the instructor maps developed by teacher teams. Both groups will receive the same instruction in the form of readings and regular lab activities. The experimental group will spend up to two extra days per lesson working with Cmap, organizing and relating pre-selected concepts. Both groups will complete a decision-making worksheet based on consequences and values, asking them to use evidence from class activities to justify relevant solutions (Swartz, 2001). This activity will be followed by a class discussion on the best solution options. Finally, both groups will complete a post-test with appended survey questions. Additional data sources include classroom observations at each school site, a teacher journal for reflections, and a semi-structured teacher interview.

Appropriate statistical techniques such as analysis of variance will be utilized to determine any differences in mean scores between pre and post tests. Descriptive statistics will be calculated for such data sources as student surveys and the mean number of correctly identified propositions per lesson. NVivo software will be used to import, code, and sort qualitative data sources (i.e., student survey comments, teacher interview data, journals), to seek any evidence of patterns within or across case sites. This qualitative data should be helpful to interpret the findings regarding any pre-test to post-test gain.

Preliminary Findings

Findings from the completed training include reluctance by teachers to trust their students with mapping of a more open-ended nature. Some teachers expressed concern that their students would not understand how to organize and relate concepts, and their initial student maps were very basic with only 4-6 terms to fill-in on a nearly completed map template. Through negotiation, teachers eventually developed seeded maps with only a few starter terms and multiple unsorted terms for students to organize and relate. The potential to elicit and depict student thinking is much greater in seeded maps than in fill-in-the-blank maps, which is a conception that took teachers some time and practice to understand.

One of the instructor maps created by 6th grade teachers at the summer seminar is depicted in Figure 1. The subject of this map is "topsoil erosion," including human causes, effects, and potential solution options. While Figure 1 depicts the completed instructor map, Figure 2 illustrates the seeded map provided to students. A few of the overarching header terms are provided on the seeded map, but the student is responsible for arranging the unsorted terms using "like" groupings and arrows in the space. The student must then generate written proposition statements to explain the relationship between each set of connected terms. These activities are tied to specific thinking skills--classifying and finding relationships (Presseisen, 2001). As noted previously, students will receive one point for grouping concepts similarly to the instructor (e.g., increased food production grouped with farming practices = 1 point, solid waste and nuclear waste grouped with landfills = 2 points). Students also receive one point for each correctly stated proposition/relationship statement, and one point for cross-links that go beyond the most basic

relationships. Pre- and post-tests were developed on the basis of relationships in the instructor map. Based on the map in Figure 1, sample test items include:

1. Due to growing population, loss of topsoil is caused by:
   a. animal waste   b. increased food production   c. deposition of materials   d. use good farming tools
2. Which of the following factors is directly related to construction and industry:
   a. landfills   b. glaciers   c. slope   d. precipitation
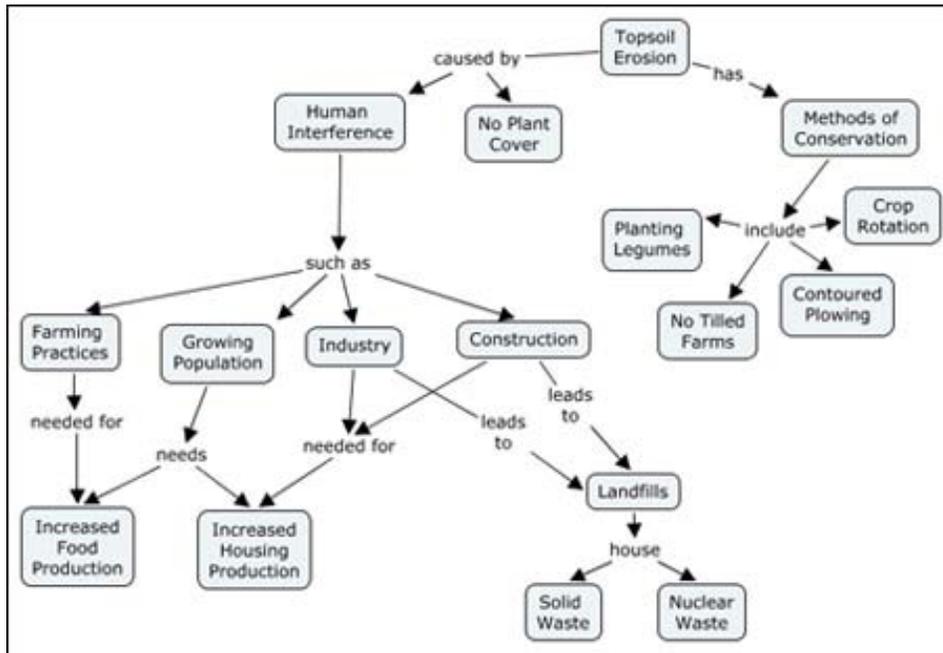
Figure 1. Sixth grade instructor map on human sources of topsoil erosion.
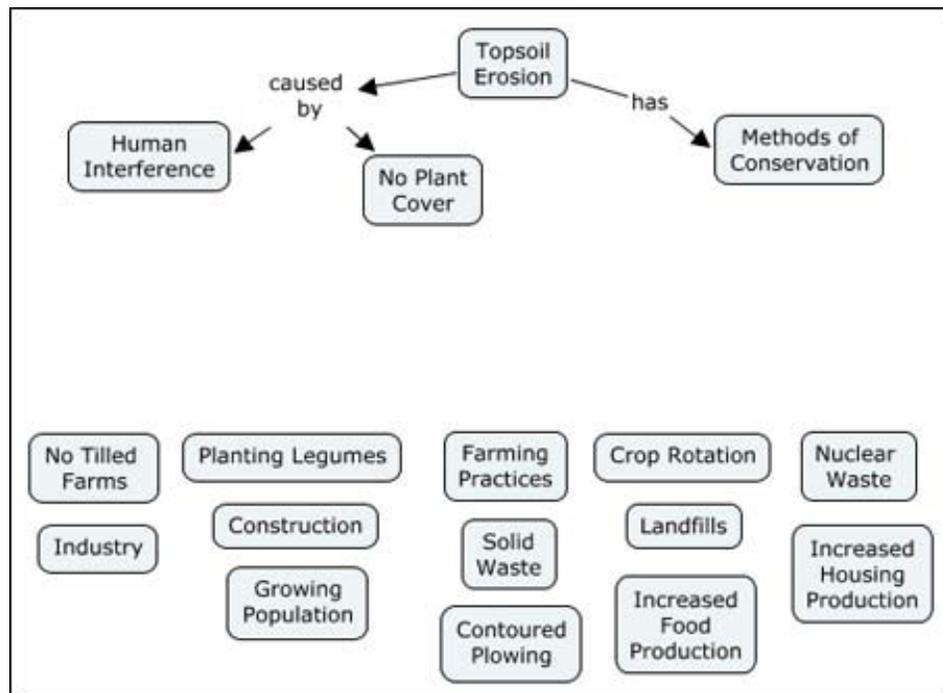
Figure 2. Sixth grade seeded map on human sources of topsoil erosion.

Figures 3 and 4 illustrate one of the instructor maps and student seeded maps created by 7th grade teachers at the summer seminar. The subject is human sources of air pollution. As with the 6th grade map discussed previously, the maps emphasize causes of the air pollution problem, negative effects, and solution options. Pre- and post-test items were once again based on relationships in the map. For example:

1. Ozone in the lower atmosphere causes all of the following problems, except:
   a. lower crop yield   b. disruption of water cycle   c. death of fish   d. severe health problems
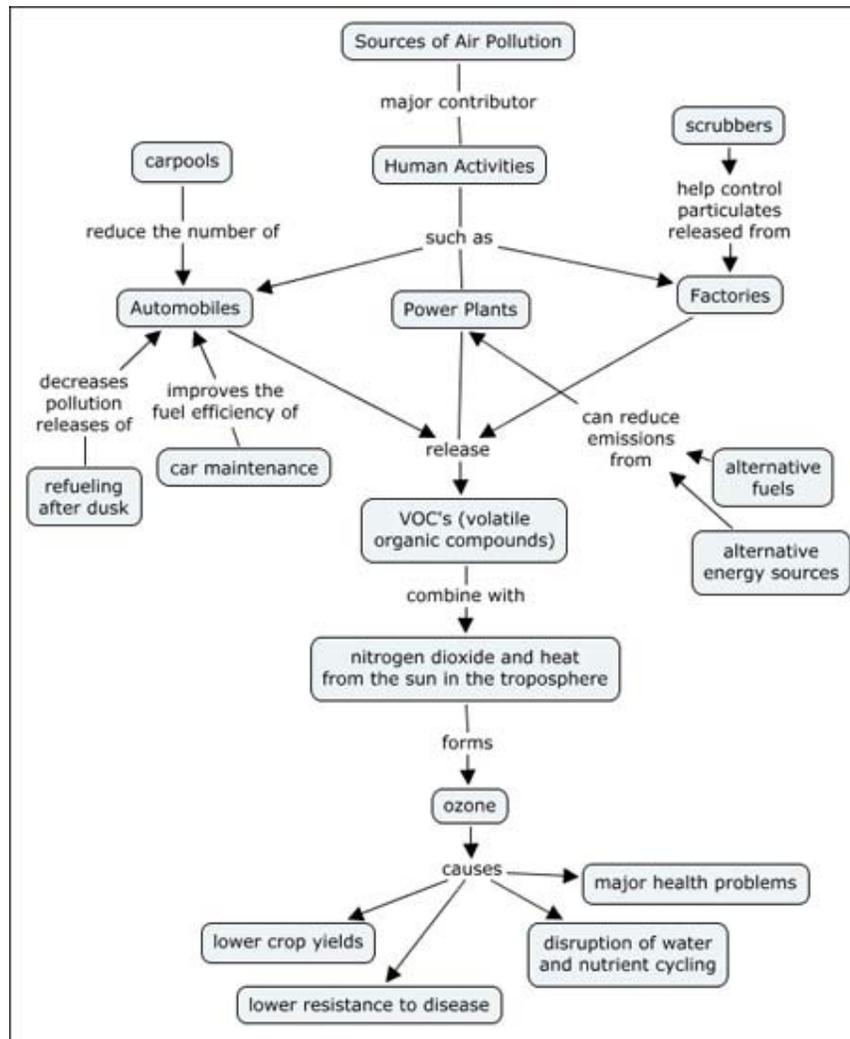
Figure 3. Seventh grade instructor map on human sources of air pollution.

The following research questions will be addressed by the instructional portion of this study, commencing Fall 2006. Multiple data sources are used to inform each question as shown in parentheses.

1. How effectively do students using Cmap classify or sort and categorize pre-selected resources into concept units (Cmaps, discussions, observation, journals)?
2. How effectively do students using Cmap find relationships or the patterns and sequences outlined in pre-selected resources (Cmaps, discussions, observation, journals)?
3. How appropriate is student decision making in terms of recommendations made to solve presented problems (worksheets, discussions, observation, journals)?

4. How much do students learn about presented problems (pre-test, post-test, Cmaps, survey questions, journals, interviews)?
5. How effectively can teachers prepare, implement, and score Web-based concept maps in their instruction (observation, journals, interviews)?
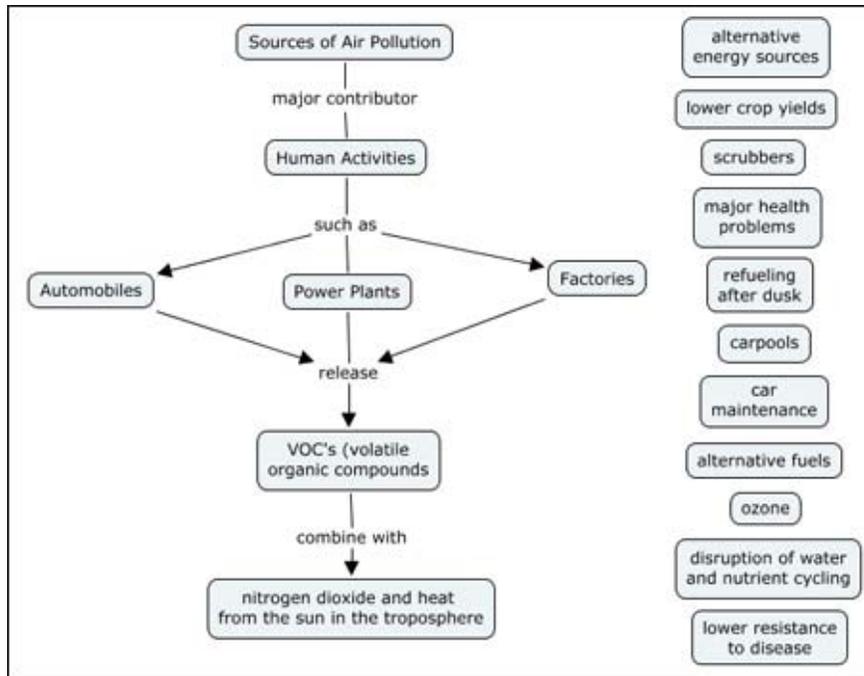
Figure 4. Seventh grade student map on human sources of air pollution.

Importance

Data from this study will be useful to detail the extent and quality of student thinking that can result from mapping activities with tool-based scaffolds. The control group design will help determine if mapping activities help students learn more about problem relationships than students who don't visually organize and relate terms. Qualitative data will help to define specific enablers or barriers to these learning activities across six different school sites and instructors.

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The Evolution of the Process of Online Collaborative Problem-Based Learning

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Abstract

The purpose of this study was to examine the evolution of online collaborative problem-based learning (PBL). It studied two semesters of PBL implementation in a course in computer-mediated communication (CMC). Data was collected from students' surveys, course instructor interviews and observations of the learning process. The results highlighted issues related to the scheduling of activities, supporting technology tools, facilitation, and strategies students employed during the process as important considerations for educators when implementing online collaborative PBL.

Introduction

In order to advance the understanding of online collaborative PBL, this investigation looked at the process in a holistic way to identify the areas in which potential adaptations of traditional PBL models might prove necessary. The research had the purpose of answering questions related to the development of the overall process of collaborative PBL in the online milieu together with the understanding of the development of its stages (i.e. group formation, problem understanding and refinement, learning and application, and finalizing the solution and presentation).

The study began with the analysis of an online course for its potential fitness for transformation into an online collaborative PBL experience according to characteristics of suitable environments for PBL (Nelson, 1999). The analysis yielded the course suitable in terms of all four characteristics. As a result, the researcher and the course facilitator engaged in a collaborative redesign process taking into consideration the literature of PBL. Thus, they adopted an ill-structured design problem so that students had the opportunity to fully customize it to their interests. It required students to design an ensemble of computer-mediated communication means to support the communication needs of some group of people endeavoring in an online learning, work or social context. The problem prompts were redesigned between semesters because of the observations from Semester 1. The redesign focused on modifying the problems to communicate more clearly the idea that the problems were about designing CMC and not about designing learning experiences.

In order to form groups, course designers determined that students would group themselves by participating in a series of activities that would enable them to get to know their peers and their interests and to identify common ground for collaborative work. Course facilitators also modified the prompts for conversation conducive to group formation so that students focused on the type of context in which they were interested in an effort to avoid focusing on potential solutions. While PBL methodology suggests that students determine the learning issues and find learning resources by themselves, the literature on online PBL suggested this was a problematic aspect (Taplin, 2000). Thus, course facilitators provided a core of resources and learning issues but encouraged students to acquire in-depth understanding of the particular issues that were relevant to their problems. There was no direct instruction but an exchange of ideas in the group as a whole with regards to the ideas exposed on those learning resources throughout the duration of each semester. Small-group members then incorporated relevant ideas into the resolution of their particular problems. Additional external tools complemented those available in the course management system (CMS) to support communication, collaboration, co-authoring, distribution, management, and reflection. Observations from Semester 1 made design modifications necessary in order to incorporate a tool that would help hold the cumulative knowledge of the small group. Course facilitators also introduced online calendars as a tool to help students coordinate synchronous chats.

Students underwent the PBL process in three stages. During the first stage, students engaged in the refinement of the problem they wanted to address according to their contexts of interest. This refinement consisted of specifying the audience for which they wanted to design CMC, the communication needs of such audience, the technology infrastructure they had, and a rationale for using CMC to support those communication needs. Students submitted a proposal at the end of this stage. This constituted a milestone in their work. Course facilitators provided feedback to these proposals which mainly consisted of requesting the clarification of ideas and considering the scope

of the projects. Students underwent a second stage by means of which they learned and applied their learning to the resolution of their problems. Thus, they used communication theory to describe communication in their specific contexts and to justify the selection of tools to satisfy those needs. Furthermore, they described the implementation of tools as part of their designs. Before the end of this stage, students submitted a draft of their ideas. Course facilitators provided feedback once again. During the stage that brought closure to the learning efforts, students finalized their solutions and prepared presentations for their peers in other groups. Classmates reviewed other projects and shared comments related to the description of the context, audience, and communication needs, the use of theory to describe communication needs and to justify the selection of tools, and the proposed implementation of those tools to satisfy the communication needs within the context. Group members assessed peers in areas such as knowledge of theory and tools, and their contributions to group work. Finally, students reflected on the experience once during the process and once at the end.

The study looked at implementations of this design during two consecutive semesters. The group in Semester 1 consisted of 30 students, 25 of which agreed to participate in the study. The group in Semester 2 consisted of 15 students; of those, 13 students agreed to be participants in the study. These participants were graduate students mainly in a program in educational technology which was the program that hosted the course. Both iterations had a small number of students from other fields. About three quarters of the students were located in the vicinity of the educational institution during both implementations. However, this did not increase reliance on F2F encounters to undergo the process according to student reports. Students had very limited experience participating in online collaborative PBL.

The data collected for this study consisted of the analysis of online documents (e.g. discussion board postings, chat transcripts, wikis, emails), administration of student surveys, and instructor interviews. Both student surveys and the instructor interviews were conducted at the end of each implementation. The analysis of documents spanned the duration of the online experience. This analysis helped devise the questions for surveys and interviews so that they would capture important areas for further exploration from the perspective of students and the instructor. Data was analyzed by reading through it one time to identify emerging themes. A second reading allowed for the coding of data and the refinement of theme categories. Important themes that were identified had to do with the time allocated for activities, the strategies students used during the process, the tools that supported work, their feelings during each stage, and the role of facilitators.

The researcher took several measures in order to ensure the quality of the investigation. She employed long-term engagement with the data to gain a deep understanding of the process (i.e. one year in understanding the concept of online collaborative PBL, one year undergoing the two implementations and one year analyzing the data and writing up the report). The report provided rich, thick description of the model of online collaborative PBL adopted and the implementation experience viewed from the eyes of the researcher, the students, and the course instructor. The study used a variety of sources of data (i.e. documents, instructor and students' perspectives) and a variety of methods to mine the data (i.e. analysis of such documents, surveys, and interviews). The implementation of these techniques had the purpose of enhancing internal validity and reliability. The study only sought external validity by allowing readers to establish the relevance of these findings to their contexts using the thorough descriptions given.

The Evolution of the Process

Introduction of the Problem

The introduction of the problem early during the learning experience as suggested by PBL literature was one of the things that seemed interesting to explore in the online milieu. While generally students did not think the introduction of the problem had been too early, they voiced concerns related to their lack of knowledge of the course requirements and their peers in order to be able to settle for problem ideas and partners. Students who appreciated an early introduction valued the opportunity to start their thinking about it early on. Thus, further research on this aspect can help enlighten ways to support students in gaining knowledge about the course requirements, peers and potential problem ideas in a variety of ways so that this design consideration can be implemented in online contexts as it was devised for F2F implementations.

Group Formation

The process of group formation was another interesting topic in the context of this research study. The way this process occurred in the two semesters together with the differences that became apparent after design changes suggested potential areas for further study. Because this stage took a long period of time, it is necessary to study a

combination of strategies for students to publicly access information about each other and exchange ideas conducing to forming groups early on. The use of customizable student homepage tools is recommended so that course facilitators request that students answer questions about themselves that are highly relevant to the purposes of the project instead of answering generic questions about themselves. The potential value of synchronous conversations can be studied as it might have been one of the factors by means of which students in Semester 1 were able to form groups slightly more quickly enabling additional time to work on later stages.

There were variations in the ways students went about the task of forming groups. Semester 1 students conducted synchronous conversations together with asynchronous and supplemented by reading about classmates in the CMS' student homepages. The potential impact of the emphasis in synchronicity at this stage (with its related challenges) together with concerns of inability to be synchronous from students in Semester 2 led to deemphasizing this as a strategy for group formation. Students in Semester 1 tended to use synchronicity very often at the beginning stages while relying on a bit more asynchronous exchanges towards the end. Students in Semester 2, on the other hand, tended to work asynchronously but voiced concerns later on related to the potential need to conduct synchronous exchanges. Sclater & Bolander (2004) pointed out the impact of the introduction of an activity in the value that students place on conducting it. Other authors talk about humans need for proximity in communication (Boden & Molotch, 1994). While no causal relationships can be established because of the nature of this investigation, further study can help establish ways to balance the need of immediacy with the need of flexibility so that students benefit the most of their online collaborative PBL experiences.

The Problem Resolution Process

The analysis of interactions revealed that students underwent this experience in a weave of synchronous/asynchronous exchanges, brainstorming/negotiating/synthesizing efforts and individual/collaborative co-authoring of group documents. Further study is recommended to help refine this model of approaches to conduct online collaborative PBL to see whether all intersections are possible, whether it fully characterizes the process and whether any particular combination is more likely to happen at particular stages. The individual/collaborative continuum has been explored by authors like Solomon (1993, as cited in Hewitt & Scardamalia, 1996) with his concepts of shared and off-loaded cognition. Understanding this can help select the most appropriate tools to support the tasks at hand.

The adoption of strategies seemed influenced by factors other than the appropriateness to support the tasks at hand. Available tools seemed to drive adoption of strategies. The ubiquity of email, availability of students, and limitations of tools seemed to supersede the tools match to support the tasks at hand. This selection of tools also seemed to lead students more often in the direction of more individual work. Sclater & Bolander (2004) suggested that the factors that orient students towards collaboration include previous educational experience, deep and surface learning, and the expectancy-value motivation theory. While these factors and the ones in this study do not concur, it is possible that the factors these authors mention contribute to student orientation towards collaboration as characteristics that are present before the learning experience begins. The factors identified in this study encourage different modalities of collaboration once the learning experience in underway. Despite this difference of factors, the behavior of groups in co-authoring documents was consistent with the definitions of Sclater & Bolander (2004). They characterized some of the groups as "cutting down and stitching together" (individual work that is later integrated) and "negotiated collaboration" (weaving contributions by an elected scribe). These two characterizations are compatible with the findings in this study.

Together with strategies for learning, online collaborative PBL also requires strategies for the management of the process. Thus, students needed to coordinate their efforts, assign tasks, report on their progress in achieving the tasks and schedule synchronous conversations when necessary. The depiction of these tasks is consistent with relevant literature on the nature of these management interactions (Guribye, Andreassen, & Wasson, 2003). These authors stress the need to differentiate computer-supported collaborative learning from computer-supported collaborative work when studying interaction. Among the reasons they provide for this differentiation are the fact that workers know their roles, form more stable groups while students are novices struggling with identifying the roles and the tasks that are associated with them and form more temporary groups for specific educational purposes. The importance of understanding collaboration in educational settings helps avoid borrowing design considerations from fields that are not fully compatible. It also helps to develop an understanding of the kinds of tools that are needed to support educational endeavors to make progress in the development of such tools (Garrison, Anderson, & Archer, 2003).

In studying the use of tools throughout the process, it was evident that email was the tool that accompanied students every step of the way. The chat complemented email for students in Semester 1 and the wiki complemented email in Semester 2. Email was used for management, group formation, role/task assignment, and brainstorming and negotiation. In some cases, it was deliberately chosen over other tools that could have better supported the process. However, its use proved challenging for a number of reasons. The default organization of email inboxes challenges the support of the process as it buries emails within the list of other personal messages. Prescribing ways of organizing inboxes to separate project emails would entail providing specific guidelines about the use of the tools. Nevertheless, inboxes that reach beyond their quota can interrupt conversations among group members in a way that can prove unhealthy for the well being of the group. Finally, using email for such tasks as scheduling chat sessions was inefficient.

While email provides convenience, chats provide a sense of immediacy. Regardless, the use of chat is not exempt from difficulties. Technical problems can interfere with communication thus making students feel uncomfortable when they are unable to contribute to the discourse of the group. The use of free providers can complicate matters if they inundate students' email accounts with spam as a result of the "free subscription". Misunderstandings can be exacerbated online sometimes through chat even in spite of the sense of immediacy. In light of these limitations, it is necessary to study ways to provide for immediacy while minimizing the weaknesses of this kind of supporting technology for online collaborative PBL.

Course facilitators adopted the wiki to provide for a place to hold the cumulative knowledge of students (Hannafin, Oliver, Hill, & Glazer, 2003). The wiki tool used did not afford contextual identification of contributors thus forcing students to rely on other conventions to allow for this. However, contextual identifiers can be troublesome even when only two contributors edit the same document. This can be furthered studied in research and development. The wiki had limitations as a tool to support directly composing on it. The particular tool that was used did not have auto-save features and constantly saving changes impacts the history tab which is an option (though limited) to identify contributors and their changes. It did not have the advanced editing features that users are accustomed to encounter in word processing programs. Thus students resorted to compose their documents in such programs and paste them into the wiki. This brought difficulties in that the formatting was altered; even formatting that was left as sign posts of peers' comments. The analysis of the use of the wiki throughout this experience uncovered a few potentially fruitful pathways for further study. It would be interesting to study whether the sense of common grounds it provides is grounded in real common foundations developed by group members or in perceived ones that might be nonexistent. The observation of the variation of work strategies after introducing different tools is compatible with research that attributes such impact to tools. Instructional designers of online collaborative PBL also need to consider the various types of manifestations of cumulative knowledge that they will need to support for these kinds of learning processes. The wiki can help support the co-authoring of mostly written documents but can fall short of supporting more presentational kinds of documents.

In considering the use of tools to support online collaborative PBL, two more aspects are worth exploring. As previously stated elsewhere in literature, the properties of supporting media need to be carefully matched with activities because of each medium's affordances and constraints. Guidelines can be offered so students make optimal use of these technologies but this would suggest interference with the self-directed goal of PBL. Most important, however, is the fragmented support that these technologies offer which could be interfering with a knowledge construction process that is intended to yield a single collaborative artifact that evidenced the cumulative knowledge of the group. Many tools provide support for synchronous/asynchronous, individual/collaborative, brainstorming/negotiating/synthesizing work. However, few incorporate support for all those kinds of interactions that could potentially be present in a semester-long online collaborative PBL process together with support for the management of all these interactions. The study of tools to support this process can help develop tools that support all work strategies in efficient ways. The current trend of adoption can also be further explored to identify whether significant pieces of the cumulative knowledge of the group are lost during the evolution of the process because of the inefficiency of this fragmented support.

During this online collaborative PBL experience students valued the active participation of facilitators during the process. The value was consistent with the way groups chose to work. Thus, students who engaged in synchronous conversations valued when facilitators participated in those while students who engaged in more asynchronous work valued when facilitators provided feedback. Also, feedback was more valuable in later stages when more asynchronous work superseded synchronous work. This valuing is consistent with the views of teaching presence in literature and its impact in student learning and motivation (Swan, 2003). In providing feedback, facilitators were, on the one hand, contributing to students perception of future success and, on the other hand,

enabling them to improve their processes and products along the way (Sclater & Bolander, 2004; Zumbach & Reimann, 2003). Students' value of structural support was also evident in their appraisal of the use of milestones throughout the process.

There is a tension between the self-directed goal of PBL (Barrows, 1986), adult learning theory (Merriam & Caffarella, 1999) and students' need for more structure as evidenced in this study. Authors in literature also speak of increased need for structure online (Steinkuehler, Derry, Hmelo-Silver, & DelMarcelle, 2002). Some recommend a number of ways in which guidance can help scaffold online collaboration. Swan (2003) has spoken about the greater attention to detail that is necessary. In describing efforts to support online communities, Kling & Courtright (2004) suggest an interventionist strategy in moderating online group work. Finally, Rummel & Spada (2005) found that more guided collaboration through scripts or examples shows positive effects on processes and outcomes in online student collaboration. Because of these issues, it is important to further research to understand how to support students in self-directed PBL online in light of their needs for more structure in these contexts.

On average, about half of the students (51%) expressed positive feelings throughout the stages of the online collaborative PBL process. Students in Semester 1 decreased in their expression of positive feelings as the process evolved, however. Moreover, students in Semester 2 expressed less positive feelings during their first stage. A number of potential reasons can be further explored in causing this. The whole group and small-groups in semester 1 were larger. This results in more work during interactions. Students in Semester 2 had more time to devote to the process because of regular calendar dates. Students in Semester 1 did not have a tool to hold the cumulative knowledge of the group. Further research can help enlighten whether smaller whole and small-groups can be more efficient in this context. It can also help elucidate whether the choice of tools to support the process can help foster a more promotive atmosphere.

Students more often reported that what impacted their feelings during the process was the nature of the groups' dynamics. Authors in literature explain that social-emotional needs of group exist and need to be superseded so they can move on to focus on more task-related needs. While the original PBL model recommends that students engage in group processing, students in this study continually reported difficulties in gauging their peers' reactions to their ideas thus presenting a potential challenge to online group processing. Emoticons can help here but they are dependent on whether the system supports them and whether students know the full range options available to express their feelings. Course facilitators did not structure this as it was left to the self-directedness of students. However, in implementing these guidelines of PBL, it might be necessary to explore whether specific guidelines need to be given to students, and how to enable this in light of the limitations of supporting technologies.

Ownership of the problem is important in PBL (Savery & Duffy, 1996). In light of this, students were allowed to propose their own ideas for problems to solve. However, this brought about different levels of sense of ownership among students. This affected whether they felt comfortable in suggesting certain kinds of courses of action. Thus, further study can help enlighten whether high levels of ownership can still be fostered while using generic problems in areas that are likely to interest students.

While agreement with a statement that time allocation had been sufficient was much higher in Semester 2 than in Semester 1, about 80% of students on average agreed that time was sufficient throughout the stages. Semester 2 students had more time to undergo this process so it is likely to see this as the cause for their higher agreement. This has implications for the length of PBL experiences online. It suggests that further research informs whether these long-term experiences are optimal or whether shorter processes are equally optimal when a long-term all-encompassing process is not possible.

Conclusions

In speaking about the limitations of conducting online collaborative PBL, students pointed out a number of reasons: impact of mediated communication, longer time to conduct communications, difficulties in scheduling collaboration events when using multiple perspectives of students geographically dispersed and group dynamics aggravated online. However, a large percentage of students in both semesters pointed out it had been a beneficial experience for them. The reasons for this benefit included establishing a clear link between theory and practice, meaningful learning in context (because of the particular case of this course that focuses on CMC), flexibility and convenience, the benefit of reflection, archiving, access to collaborate with dispersed peers, learning to be more articulated, the positive side of the lack of physical cues, and more time on task.

This research helped confirm statements of other authors in literature that state that online collaborative PBL is possible (Orrill, 2002; Price, 2000; Shoenfeld-Tacher, McConnell, & Kogan, 2004). In advancing the

understanding of this methodology when it happens online, this research study has helped uncover areas that are fruitful for further inquiry. This way, educational institutions that have taken on the goal of providing meaningful learning to their online students of education can do so and thus help them learn how to promote these kinds of constructivist learning environments for their own students.

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The Progressions of Our International Students:
Where Do They Go? What Do They Do?

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Introduction

Hundreds of international Educational/Instructional Technology (ET/IT) graduates enter the field each year. This paper examines their progression; where they go, what jobs they accept, how long they stay;and if they leave, where do they go? Can we learn how to help international students climb corporate or academic ladders? What barriers did they experience and can these be eliminated or reduced? Can American ET/IT programs help international students have quality experiences and fulfilling employment progressions?

Background, Justification, and Purpose

On any given autumn day at innumerable airports across America, hundreds of international students arrive ready to begin their studies in Educational/Instructional Technology graduate programs. If we fast forward between that time and two-to-seven years, the reverse process repeats itself as we wave farewell to our cherished colleagues and friends. In many instances, we stay in touch with them, at least for the coming year or so, just to make sure they arrived at their destination safely and went to an acceptable job. Then what? That is what we will explore.

Were we to chronologically arrange the arrival and departure of international students to and from America the litany would reveal that international scholars have been coming to our shores for the past two centuries or more from every corner of the globe. Our task, rather than catalog the comings and goings of these thousands, is restricted to only those AECT members or members of its precedent organizational variants, most of whom were engaged in the study of instructional technology in one form or another.

We wanted to find out who some of these individuals were and, while we had the entire world to use as database, decided to concentrate only on East Asia, more specifically, on China and Taiwan. We did this as a matter of convenience rather than for any specific empirical reasoning, because it is a source already well-known to us. We wanted to trace the progression of a selected number of Asian graduate students from the time they entered an American university to the present. We wanted to track their career travels and look at both the places they went as well as learn something about their academic qualifications. Going on the axiom that history repeats itself, we wanted to identify the histories of this select group of graduates in an effort to determine their own perceptions of achieved success. In doing so we wanted to benefit from their perceptions of how life had treated them along the way, and to ascertain instances when things had not necessarily gone as well as they had hoped.

We wanted to identify ups, downs, and in-betweens of their careers, to plot where they had been, where they went, and how long they tarried at each point along the way. We wanted qualitative responses from them as to what each event meant to them and those impacted by their presence. We wanted to get their impressions of what went right, what did not, what had best prepared them for their future careers and what was lacking that, had they known better, would have altered their course.

Method

Following along the lines of a questionnaire developed by the authors: C. C. Pan, Y. Tao, Z. Wang, R. A. Cornell, C. H. Ku, C. H. Lee, and H. Y. Ku (2001), we modified that instrument to obtain answers to the following ten questions from 11 participants:

1. When did you come to the United States for your first graduate study and where was it? 1950-60 ___ 1960-70 ___ 1970-80 ___1980-90 ___1990-2006 ___ Location by state or country: ___

2.   What was the terminal degree received, what was your major, and when was it awarded? M.A. ___ M.S. ___ Ed.D ___ PhD ___   Major: ___   Year:

3.   What were the most significant (or useful) courses you took during that timeframe?

4.   What were the least significant (or useful) courses you took during the same timeframe?

5.   What were the useful courses that you wish you had taken during the same timeframe?

6.   What was your first job upon graduation; where was it, and how long did you remain at that location?

7.   Can you list the subsequent jobs, titles, locations and durations?

8.   What have been major highlights in your career?

9.   What have been difficult times (job related) in your career?

10.   What would you do differently, given the passage of time that would help an emerging young Asian scholar to fulfill his or her career dreams?

In responding to the first three questions, surveyed individuals reported the following demographics:

- The majority (over 80%) of the respondents came to the United States during the past ten to 15 years.

- Approximately one third received the first graduate degree in Florida. Another one third went to a university in other parts of the United States.

- More than 80% were awarded a doctoral degree (mostly Ph.D.).

- Over 80% received a terminal degree in Educational/Instructional Technology.

- The majority (over 80%) graduated between 2000 and 2005.

Invitations were emailed to major Chinese Educational Technology groups and organizations, such as International Division of the AECT and the Society of International Chinese in Educational Technology. Data were collected via email and they were complied and analyzed accordingly.

<div align="center">Results and Findings</div>

Questions 3 through 10 were used to support the bulk of this data collection effort. Each of the questions is listed below, followed by the preliminary results.

3. What were the most significant (or useful) courses you took during that timeframe?

Approximately half of the participants reported some type of Instructional Systems Development course was the most useful course. The second significant course was a research course related to educational/instructional technology.

4. What were the least significant (or useful) courses you took during the same timeframe?

Over half of the respondents seemed quite satisfied with the curriculum. To name one least significant course, these participants chose some Education foundations course that is often considered a Ph.D. in Education program core course.

5. What were the useful courses that you wish you had taken (but did not) during the same time frame?

About 60% of the surveyed individuals wished they had taken courses in some special topics in Educational Technology, such as Human Performance Technology (HPT), electronic learning (eLearning), and course management systems/learning management systems (CMS/LMS).

6. What was your first job upon graduation; where was it, and how long did you remain at that location?

All the Ph.D./Ed.D. graduates worked at the higher education on the first job. The majority who stayed after graduating had a United States employer. A majority appeared to change their job or move to a higher ranked position within five years.

7. Can you list the subsequent jobs, titles, locations and durations?

For those who stayed in the U.S., their subsequent jobs were scattered across the United States. For those who returned to their home country, they tended to seek employment in prestigious institutions (e.g., by a national university) due to perceived increased job security.

8. What have been major highlights in your career?

Because a majority (over 80%) of this select group works in higher education, teaching and research appeared to be major highlights in their career lives. Two (male) of the participants were able to serve as administrators of some note in their institution (Taiwan).

9. What have been difficult times (job related) in your career?

When it comes to "work slump," those surveyed reported employment difficulties (about 30%), foreign cultural differences (about 20%), and marrying ISD to another discipline (about 20%) have posed difficult times in their careers.

10. What would you do differently, given the passage of time that would help an emerging young Asian scholar to fulfill his or her career dreams?

Given a second chance, 40% of them would seek professionalism by choosing a specific area and stick to it all the way through while in school. Another 40% would manage to collaborate more with professors and colleagues on research and development projects before graduation. About 30% wished that they had demonstrated good English language proficiency before starting to work. Two of the respondents (about 20%) emphasized the importance of mentorship, and they recommended that new Asian scholars find a way to approach the faculty advisor/mentor and learn from/with him or her.

Summary, Discussions, and Further Questions

Each year hundreds of students from China and Taiwan attend and graduate from an ET/IT graduate program in the United States. Their job progressions and perceptions of the program curriculum are two primary foci of this working paper. This investigation should interest those newly arrived Chinese students and concern our colleagues and friends who teach in an ET/IT or related program in the States. The results and findings are intended to empower the newcomers and prepare them for a more productive academic career than their predecessors.

The qualitative study was conducted using a purposive sample. The data were solicited via email and analyzed using hand-coded content analysis.

Its preliminary results indicated that all of our international students graduated and worked in the related area in the United States, whether or not they received a terminal degree. However, most of them received a doctoral degree and stayed in the higher education. The design (a.k.a. Instructional System Development) course and research in Instructional Technology are two of the most useful courses. Education (as opposed to ET/IT) foundations courses appeared unfavorable. These respondents also recommended that special topic courses that best represent the evolving nature of ET/IT, such as Human Performance Technology, eLearning, and CMS/LMS be included in the study plan. There seemed to be a pattern that the new graduates changed jobs within the five years after the graduation. These international students would go almost anywhere in the country to seek employment. They enjoyed research and development wherever they were employed. Regarding the work slump they have encountered, some seemed to have a hard time getting employed when they first graduated and some found difficulty in blending into the American culture. These young scholars came up with a list of recommendations for those who will follow. Their recommendations were:

- Pursue professionalism. Choose a distinct area in ET/IT earlier and make effort to become an expert in that area.
- Value collaboration. Don't sacrifice research and development opportunities with colleagues and faculty n order to graduate early. Such collaborative experiences may speak highly on the resume.
- Strengthen language proficiency. Acquiring English language skills and knowing more about the American culture can render the transition and/or adjustment to the new environment much easier. Teaching classes can be very helpful in this regard.
- Enhance networking. The ET/IT field is a small world in the sense that most people know each other and they communicate often with each other. Staying in touch with your mentor and keeping your friends close can easily expand your horizons of knowledge about the field. This informal relationship usually affords frequent opportunities for cross-organizational research and development projects.

From these responses we hope that graduate students, be they Asian or not, will have gained more insight as to how careers unfold, how individuals deal with situations that arise, and ultimately, how they fulfill their own expectations. Further questions below will be appended to this article and conclusions drawn.

1. Are the career experiences of these individuals similar or different than those that have come from other Asian countries?
2. Are there similarities or differences that might be anticipated by graduates from countries outside of Asia, i.e., Latin America, Europe, Africa, Australia, India?
3. If I am currently in an American instructional technology graduate program and getting ready to graduate and accept my first post-degree employment, what can I take away from this session that I can use tomorrow?
4. Does coming from a different culture make me more or less attractive as a job applicant within the United States?
5. By returning to my home country and taking my first job after having graduated, will my American degree help or hinder my prospects for advancement?

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Reconsidering Constructivism in Theory and Practice: Implications for the Effective Integration of Technologies into Constructivist Classrooms

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Abstract

This paper reviews key elements that contribute to the successful integration of technologies and constructivist pedagogical activities in K12 settings. Theoretical constructs of constructivism were identified from the relevant literature such as (a) preferred theoretical perspective, (b) the common notion of crisis in learning mechanism, and (c) methodological concerns. These theoretical constructs framed a review of ten selected empirical studies on the use of technology in classrooms that published for the period of 1999 to 2006. The main finding suggested that insufficient elaboration of constructivist theoretical constructs in empirical studies resulted in poor results or no significant effects on constructivist learning.

Introduction

> *I still feel like I'm teaching things the same way I used to.*
> (A secondary teacher, Interview, December 2004)

A great deal of research has examined teachers' adaptations of Information and Communication Technologies (ICT) into the classroom (e.g., Blumenfeld, Fishman, Krajcik, Marx, & Soloway, 2000; Bracewell, Le Maistre, Lajoie, & Breuleux, in press; Bryson & de Castell, 1998; Windschitl & Sahl, 2002). This research suggests that ICT is a pedagogical mediator that promotes constructivist or student-centered classroom learning. However, in contrast to the theoretical findings of educational researchers, teachers in most classrooms continue to struggle with teaching practices that have barely changed since they began adopting technologies into their classrooms. As Windschitl (2002) argued, teachers face various pedagogical challenges in integrating ICT into instruction including facilitating student knowledge construction and collaboration, distributing knowledge and roles and evaluating learning.

This paper reviews key elements that contribute to both the successful and unsuccessful integration of ICT and constructivist pedagogical activities into K-12 settings that have been reported in the literature. Theoretical constructs of constructivism are identified based on literature about constructivist theories. These theoretical findings in turn frame a review of recent empirical studies of technology-supported learning environments. This review aims to identify key elements in the integration of ICT into constructivist classrooms based on differences and similarities between theoretical constructs and empirical findings. Finally, we will suggest some implications of the findings for designing teacher education programs.

Constructivism as a Theory

> *Human knowledge is constructed.*
> (Phillips, 1995, p.5)

Although we do not believe anymore that human knowledge is simply absorbed through sensory experiences or is transmitted from one knower to another, it has been only two decades since we began seeing knowledge as by-and-large constructed. Despite the relative newness of this emerging view of knowledge, constructivism has become akin to a religion in the field of education. My intention in making an analogy between "religion" and constructivism, which was inspired by Phillips (1995), is not to exaggerate constructivism's impact on education. Rather, the analogy is entirely apt for two reasons; first, just as a religion has its own folk-tales explaining human origins, constructivism has its own account of the origins of knowledge; and second, as with many living religions, constructivism has many rival sects within it.

In this section, we will discuss first how constructivism has altered our view of the origin and nature of human knowledge. Second, we will illustrate the many faces of constructivism in education, laying stress on two prominent constructivist perspectives: radical constructivism and socio constructivism.

Nature of Knowledge

How can we come to know anything about our world? How can we approach knowledge that can contribute to its growth? Epistemology is the discipline that seeks answers to questions about the nature and justification of human knowledge (Hofer & Pintrich, 1997). Different paradigms in education often reflect different epistemological traditions. Each paradigm has its own beliefs about how one comes to know and what contributes to the growth of knowledge. When a paradigm shifts, its prevailing epistemological perspective often changes accordingly in a way to inform and justify educational practices (Gergen, 1995).

The predominant paradigm in the field of education from the 1950's through the 1970's was behaviorism, where the perspectives on knowledge stem from a positivist epistemology. Positivism held knowledge to consist of "hard facts" that can be observed, empirically tested, and proved or disproved. Because positivists held that right answers must exist "out there", knowledge in behaviorism was seen as something that can be transmitted from one knower to another and reinforced by stimulus-and-response. Drawing on such an epistemology, Skinner, a prominent behaviorist, saw learning as "an experimental analysis of behavior" (Skinner, 1974). In other words, learning outcomes are a series of repeated behaviors reinforced by external stimuli, and the internal causes of such behavioral changes are of no interest in this paradigm. Skinner's notion of a "black box" in learners was associated with an unexplained mechanism of how one comes to know. Because of this theoretical deficit, behaviorism failed to remain in a leading position in the field of education.

Unlike behaviorism, constructivism per se is a kind of epistemology. Constructivism's view of how learning occurs is based on an understanding of "how conceptual development should be approached and how it could be fostered" (von Glasersfeld, 1995a, p.5). It was to meet the growing awareness of a need for alternatives to the traditional theories of knowing in Western philosophy, which were unable to sufficiently explain how one becomes a knower.

Constructivism views knowledge as theory-laden and is philosophically influenced by interpretivism or postmodernism. This means that users interpret knowledge differently and that knowers construct new knowledge based on prior knowledge and experiences.

Since the time that constructivism became the leading paradigm in education, educational efforts have focused on understanding and enhancing the processes by which learners construct their knowledge. In doing so, some theorists, such as Piagetians and radical constructivists, attribute knowledge construction to the cognitive structures *within* individual learners; while others, such as Vygotskian or social constructivists attribute knowledge construction to social interaction *between* learners or between learners and environments involving the sharing and negotiating of meaning and culture.

In following section, we will illustrate and compare these two constructivist perspectives, the main sects of constructivism in education.

Radical Constructivism

Since Piaget (1970) claimed that knowing is an individual adaptive activity, it has been an unfalsifiable claim in education that students construct their own knowledge. Piagetian constructivism, which is often referred to as radical constructivism, argues that learning occurs through a process of disequilibrium, where learners constantly eliminate perturbations by accommodating new concepts or operations that prove incompatible with existing knowledge. That is, cognitive change or learning takes place when use of a scheme leads to perturbation, and then to an accommodation to the scheme in order to maintain or re-establish equilibrium (von Glasersfled, 1995a). To Piaget, therefore, cognitive development is regarded as "expanding equilibrium", an increase in the range of perturbations that the organism is able to eliminate in much the same way as organisms biologically adapt themselves to survive in ever-changing environments.

It is important to note that Piaget's notion of action schemes is radically different from the behaviorists' notion of stimulus-response. Although action schemes also underlie the feedback loops that cause changes in action, action schemes are explicitly goal-directed. This goal-directedness of action scheme enables learners to become increasingly self-regulated through the mechanisms of assimilation and accommodation.

The term, "radical" constructivism, associated with Piaget's genetic epistemology, was first introduced by Smock and von Glasersfled in 1974 in their research report, "The implications of radical constructivism for knowledge acquisition". As a researcher in the field of scientific reasoning, von Glasersfeld argues that "the virtually undisputed domination of a mindless behaviorism" (1995b, p.4) for half of the 20th century confounded the distinctions between training (for performance) and teaching (for understanding). This was an unfortunate consequence of least two factors. First, science was seen as a way to absolute truth; and second, therefore, a drill-and-practice type of reinforcement training was believed to lead learners to the achievement of intelligent behavior. However, when von

Glasersfeld found students in his school who became unable to solve problems that call for deeper understanding than mere rote-memorization, he began seeking a new perspective of learning that would be able to inform how conceptual development should be approached. Radical constructivism, in this regard, was an alternative approach that saw knowledge as "the internal mental construction of the individual" (Smith, 1995, p. 23).

Associated with cognitive psychology, research programs driven by radical constructivism have flourished in generating theories of teaching and learning. This is especially the case in the fields of science and math education where researchers have focused on understanding the knowledge structures that experts construct and on modeling efficient access to and retrieval of relevant knowledge for solving problems (e.g. Ericsson & Simon, 1984; Newell & Simon, 1972; Ericsson & Smith, 1991). While studying and externalizing these cognitive processes, researchers have become aware of how to scaffold or facilitate student construction of knowledge.

However, radical constructivism has also been criticized for its negligence of social interaction during the course of knowledge construction. Paour (1990) argues that it is because Piagetian constructivism "seeks to locate the psychological mechanism of adaptation in direct continuity with biological mechanisms" (p. 178). Phillips (1995) also criticizes the fact that von Glasersfeld's epistemology is developed in a way that is flawed in much the same way as positivist epistemology is flawed. To Phillips, radical constructivism is not a sufficient theory of knowledge construction or learning because it ignores social factors and it supports a standard set or structure of correct conceptions that all learners should have. Socio-constructivism has emerged to meet the demands for a more extended consideration of social and cultural influence on knowledge construction.

Socio-Constructivism

Unlike radical constructivism, socio-constructivism has many sects, which has perhaps contributed to complaints about theoretical illusion in constructivism. In their book, "*Construction in Education*", Steffe and Gale (1995) categorize socio-constructivism into three different paradigms: social constructionism, social constructivism, and socio-cultural approaches to mediated action.

The best representatives of social constructionism might be Thomas Kuhn (1962) and Imre Lakatos (1970). Although they have opposing perspectives regarding how scientific knowledge grows, both stress the active role of scientific communities in knowledge construction. Since social constructionism places greater emphasis on theorizing the social dimensions of knowledge construction than on education, we will not deal with it any further in this paper.

Both social constructivism and the socio-cultural approach are rooted in Vygotsky's accounts of social aspects of learning. Differences between these two approaches reside in their focus of inquiry. That is, the former focuses on individual development through support or interaction with others whereas the latter focuses on collective efforts mediated by cultural means including material and immaterial artifacts in everyday activities.

Social constructivism employs Vygotsky's (1978) notion of the "zone of proximal development" (ZPD). To social constructivists, cognitive development is analogous to expanding one's ZPD. The distances between levels of actual and potential development are determined by proper guidance by experts (adults) or peers. Thus children can widen their ZPD infinitely in talking and sharing with others. "Cognitive apprenticeship" (Collins, Brown, & Newman, 1989) and "reciprocal teaching" (Brown and Campione, 1994) are two well-known instructional developments of the notion of ZPD.

However, more radical socio-cultural perspectives criticize socio-constructivism for its insufficient account of what drives learning and human transformations in social and historical contexts. From socio-cultural perspectives, mental functioning cannot be understood without considering social contexts, including participation in social settings and the historical development of cultural artifacts and tools (Wertsch & Toma, 1995).

In fact, it was Leont'ev (1978), Vygotsky's student and colleague, who expanded the notion of mediation from individuals to collective activities. This expansion called for a better account for collective nature of activities; and it was Engeström who later elaborated Leon'ev's concepts into his Activity Systems Theory (AST) by adding such theoretical constructs as rules, communities and the division of labor in order to better represent dynamic mediation in collective activities (Engeström, 1987). By adding these constructs, Engeström distinguished AST from several other versions of activity theory in at least two ways: object-relatedness of mediation (Stensenko, 2005) and cultural-historical views for organizational transformation.

In Engeström's (1999) construct of "Expansive Cycles of Learning Action" learning occurs in crisis situations when members of an organization share common goals of overcoming the crises. When existing routines become problematic, members of an organization begin to externalize problems and to seek and to test new models to replace existing ones (by either creating new cultural means or artifacts or by adjusting existing ones, such as rules, documents, technology, etc). Consequently, a new model is chosen and becomes internalized and routinized by

members, and finally the crisis is resolved. In the course of these collective activities, members learn and these learning processes are again historically accumulated in their organization.

However, socio-constructivism cannot avoid the criticism of overemphasizing external activities in social setting and underemphasizing individual knowledge structures and cognitive processes, which cannot be isolated from external actions. Radical constructivists find the notion of artifacts that are believed to historically mediate activities in socio-constructivism especially unacceptable. Von Glasersfeld (1989) argues that one can never know what is in mind of another person by reading a book or looking at other artifacts because the meaning conveyed by words and other linguistic vehicles are inescapably subjective for both producers and receivers.

Summary

In the above section, we examined theoretical origins and constructs of constructivism and their relevance to the nature of knowledge. A summary of the examination is provided in Table 1.

Based on a review of constructivist theories, with particular emphasis on how the nature of knowledge has been considered in radical constructivism and socio constructivism, three major framing considerations were identified: (a) preferred theoretical perspective, (b) the common notion of crisis in learning mechanism and (c) methodological concerns.

Table 1. A summary of theoretical constructs in constructivism

		Sects	Representatives	Learning Principles	Methodology	Domains
Constructivism	Radical	-	Piaget Von Glasersfeld	Equilibrium between existing and new knowledge through iterative process of accommodation and assimilation	Modeling knowledge structure (i.e. Expertise approaches)	Mathematics Medical education (reasoning processes)
	Socio	Social constructivism	Brown, A. Brown, J. Lave	Social interaction Shared cognition Cognitive apprenticeship, LPP	Discourse analysis Conversation analysis	Science education (project-based learning) Literacy education
		Socio-cultural approaches	Vygotsky Leont'ev Engeström	Mediated learning Expansive learning cycle in crisis	Experimental treatment Discourse analysis Phenomenol-ogical studies	Cognitive/ social development Workplace learning

First, constructivist perspectives differ with respect to the nature of knowledge depending on the discipline under consideration (Cobb, 1994; Bereiter, 1994). Thus, the process of formulating research questions place researchers within particular perspectives because perspectives on knowledge construction in literacy education often differ from those in science education. For example, one the one hand, researchers in the fields of mathematics (Schoenfeld, 2002) and medical education (Kaufman & Patel, 1991; Patel & Groen, 1986) prefer radical constructivism since they tend to focus on learners' reasoning processes. On the other hand, in science education where project-based learning is commonly used researchers prefer socio-constructivism as they tend to focus on social influences on collaborative knowledge construction.

Second, as a learning principle, the constructs of expanding equilibrium in Piagetian (radical) constructivism (Piaget, 1970; von Glasersfeld, 1995a) and the construct of expansive learning cycles (Engeström, 1999) in Vygotskian (socio) constructivism (Vygotsky, 1978) are basically alike with respect to the importance of "crisis" for learning. The only difference between the two perspectives is that the former sees crisis as "internal occurrence within an individual" whereas the latter sees crises as "organizational and cultural occurrences in a community". Both perspectives require learning tasks to be designed so as to enable students to critically appraise their existing knowledge and to externalize and reconcile latent discrepancies in their knowledge.

Third, together with the previous two findings, different theoretical stances alter the methodologies to be employed. For example, on the one hand, if one wants to investigate the knowledge structure and reasoning processes of an expert mathematician, drawing on radical constructivism, cognitive protocol analysis with the provision of well-designed tasks is more appropriate. On the other hand, in order to systematically examine social and individual phenomena associated with the adaptation of new practices such as constructivist activities by teachers, it is more

appropriate for researchers to adopt a socio cultural approach such as the activity-theoretical framework.

These theoretical findings will frame a review of empirical studies on technology-supported constructivist classrooms, which will be presented in the following section.

Constructivism in practice: A review of empirical studies

The socio-constructivist environment in which students were confronted might have been too complex to be handled constructively
(Clarebout and Elen, 2001, p. 462)

So far, we have examined the theoretical constructs of constructivism in terms of the similarities and differences between two mainstream constructivist perspectives. Based on the preceding theoretical review, we will review recent empirical studies on technology-supported constructivist-oriented learning environments. The purpose of this review is to find out how well the theoretical constructs have been reflected on in those studies. The goal is to examine my hypothesis that current problems in the unsuccessful use of ICT reside in insufficient reflection of the theories of constructivism, and thus in the inadequate design of methodologies.

To select articles to be reviewed, ERIC and PsychInfo databases were searched with the keywords "constructivis? and technology and (elementary or secondary)". The search was limited to journal articles published in the period of 1999 to 2006. Articles on higher education were removed from the search. The database generated totaled 54 articles. Then, articles dealing with distance education and problems caused by poor access to technology, as well as opinion papers rather than empirical studies, were removed. The final set consisted of 10 articles. A thumbnail of the selected articles is presented in Table 2.

The review was carried out based on the theoretical findings in the previous section, such as preferred theoretical perspective with respect to discipline under consideration, the common notion of crisis in learning, and methodological concerns. Findings suggested that there are three critical discrepancies between theoretical constructs and their actual application in empirical studies; (a) ambiguous theoretical stances of most of the reviewed studies, (b) as a result, inappropriate study design for the nature of domains, and (c) insufficient reflection on theoretical constructs of constructivism with respect to the tasks under investigation. In what follows, we will present these three findings in more detail.

Ambiguous Theoretical Stances and Constructs

Among the ten articles, only three (Churach et al., 2001; Clarebout et al., 2001; Lavonen et al., 2002) explicitly claim their theoretical stances to be either radical or socio constructivism. For the rest of the articles, we inferred their theoretical tendencies based on a close review. For example, although Ioannidou et al. (2004) and Vincent (2001) commonly employed Papert's (1993) LOGO program, the former used it for group projects whereas the latter for individual learning. Therefore, we inferred the former to have adopted a socio constructivist perspective the latter to have adopted a radical constructivist perspective.

This is not to say that educational researchers must explicitly choose a constructivist perspective for their inquiry. In fact, the need for balanced considerations between the two perspectives has been widely recognized by both camps of constructivism (Phillips, 1995; Cobb, 1994; Bereiter, 1994; Longino, 1993). Phillips (1995) in particular criticizes the continued existence of a persistent distrust between the two camps as such one-sided view is unwelcome in pursuing the growth of theories of learning. We cannot ignore individual cognitive changes while actively engaging in learning activities nor can we neglect the surrounding natural contexts that place considerable constraints on knowledge construction and allow us to detect our errors.

In this regard, Windschitl and Sahl's (2002) article presents a nicely balanced constructivist theoretical perspective. The authors used the five characteristics of constructivist classrooms originally developed by Becker and Ravitz (1999) to frame their inquiry. These elements included (a) having students engage in collaborative work, (b) designing activities around teacher and student interests, (c) focusing on student understanding of complex problems and ideas, (d) assessing their understanding, and (e) (teachers') engaging in learning. These characteristics provided the authors with a trajectory that adequately blends the two constructive perspectives and with a lens to trace how technology transforms teaching and learning practices.

Table 2. Outline of reviewed articles

Authors	Discipline/ Technology used	Participants	Theoretical framework/constructs	Methodology	Identified factors for success (if any)
Churach & Fisher (2001)	Science/ Internet and email	431 secondary students in Hawaii	Radical constructivism (explicit)	CLES survey (by Taylor and Fraser, 1991) and classroom observation	Active internet usage and teachers' supportive attitude
Clarebout & Elen (2001)	Multidisciplinary / Intranet between six schools	124 secondary students in Europe	Socio-constructivism (explicit)	Pre-post test	Proper and controlled implementation of the designed environment Difficulties of tasks
Ioannidou et al. (2004)	Science/ Computer simulations	4th and 5th graders	Social constructivism (project-based simulations)	Case study (Protocol analysis of audiotaped classroom discourse)	Redefined curriculum in accordance with constructivist learning principles
Lavonen et al. (2002)	Science / Computer (programming tool)	Thirty four 8th graders	Socio constructivism (explicit; collaborative problem solving)	Case study (Videotaped protocol, critical incident analysis)	Teacher support
Rakes et al. (1999)	Not particular/ Not particular	435 randomly sampled K12 teachers	Radical constructivism	Survey	Professional development
Rice et al. (2001)	Social studies/ All available technologies at the school	A secondary teacher	Unclear	Case study	Belief of administrators and parents
Roberts (2004)	Literacy/ Virtual communities	35 students in Wyoming and 15 in Costa Rica	Socio constructivism (Project-based learning in a virtual community)	Case study	Common language for students to use
Vincent (2001)	Writing/ Computer (MicroWorld)	Five 5th graders in Melbourne	Radical constructivism (Papert's LOGO. but unclear)	Case study	-
Wallace et al. (2000)	Science / Internet	Eight 6th graders in a middle school in US	Socio constructivism	Case study	-
Windschitl et al. (2002)	Multi domains (social studies and math) / Laptop	Three teachers at a middle school in US	Hybrid (explicitly stated in five elements of constructivist classrooms)	Case study using an ethnographic perspective	-

It is important to distinguish between balanced theoretical considerations and ambiguous theoretical stances. For example, one article (Rice et al., 2001) had such unclear perspectives on constructivism that it was impossible to infer a clear constructivist theoretical framework. More seriously, a few studies in the set did explicitly present their theoretical stance either as radical or socio constructivism; however, their actual focus of inquiry did not reflect the theoretical framework they claimed to have adopted. For example, Clarebout et al (2001) explicitly claimed socio constructivism as their theoretical framework; however, in the study the actual constructs that they measured were the development of meta-cognitive strategies. This is not to say that what they looked at was totally inappropriate. Indeed, social interaction supported by network technologies can promote the development of student meta-cognitive strategies. However, unclear explanation on how authors get from networked technologies to meta-cognitive strategies is problematic.

A clear theoretical stance might not be so critical for practitioners such as teachers when promoting constructivist activities in their classroom; however, researchers have a responsibility to provide practitioners with rigorous theoretical bases in promoting such activities.

Inappropriate or Defective Methodology

  As a result of their ambiguous theoretical stances, inappropriate study designs were observed. These included inadequate methodologies for the nature of the domain that studies looked at and the failure to position technologies as a construct in the studies.

  In this set of articles, a case study method was observed in seven studies out of ten. Quantitative methods using surveys and paper-pencil pre-post tests were employed in two of the studies and the rest one used both survey and follow-up observations and interviews.

  Case study methodology is accepted as an appropriate methodology for investigating questions concerning the how and why of contemporary phenomenon in real life contexts (Yin, 2003). Because there are countless factors and incidences to consider in real life settings, a salient framework and thorough analysis informed by a suitable theoretical framework is mandatory for supporting the findings of such research. However, this was not the case with the ways in which the case studies reviewed here were carried out. For example, Roberts (2004) addressed so many issues in her literature review (e.g. technology in education, constructivism, technology accessibility, foreign language learning and multiculturalism, etc.) that it is ambiguous as to what theoretical framework informed her study. Consequently, it is difficult to determine what constructs she used to examine the pedagogical activities in this learning environment and what framework she used to analyze her data. Unsurprisingly, the unit of analysis was also unclear. Although Roberts (2004) mentioned "case data" (Stenhouse, 1978) as a unit of analysis, she analyzed, or more accurately described, interview data instead of cases that students produced.

  Another problem with the case studies is that only one article (Lavonen et al., 2002) reported inter-rater reliability with respect to the data coding and none of them conducted a member check. Consequently, it is questionable whether interview or observation data were properly and faithfully analyzed or the author(s) simply counted on data that seemed to support their hypotheses. For example, Rice et al. (2001) analyzed a massive amount of data that they had collected for over a five-year period including e-mail interviews, participants' course assignments, classroom observations, course plans, and so on and generated four categories using constant comparative analysis. In doing so, they reported no more than the following:

> To produce an accurate presentation of the research findings, as well as to control for researcher bias, data were triangulated across the research team and data sources. (p.215)

It is more important to describe how they triangulated the data than to simply mention what they did to increase the trustworthiness of the research.

  The quantitative studies in this set also have methodological problems. For example, Clarebout (2001) did a factor analysis to identify constructs to include in each of the four scales: epistemological beliefs, instructional belief, meta-cognitive strategies, and task-related knowledge. However, it is unknown from which theoretical framework these scales drew on. Moreover, the reliability of the scales (Cronbach α) for assessing epistemological beliefs and meta-cognitive strategies were only .56 and .62 respectively, which are quite low. Not surprisingly, this study produced poor results. That is, after participating in the project, students' epistemological and instructional beliefs, meta-cognitive strategies, and task-related knowledge declined. Although the authors blamed the poor results on the implementation stage rather than the design stage, they are more likely to be a consequence of the poor scales that did not measure what they were supposed to.

Designed Learning Environments

  Some of the "constructivist" learning environments that the studies investigated were purposely designed, ranging from innovative curricula to computer simulation design programs and huge networks between schools. However, some of the design principles that they applied were appeared to be inappropriate. Constructivist learning tasks do not imply that students are allowed to construct everything for their learning. Rather, they imply that learning tasks be more carefully designed to appraise learners' pre-existing knowledge, and more importantly, to model and scaffold activity in order to help students construct their own learning path.

  In this regard, Ioannidou et al. (2004) provided one of the few good examples of well-designed learning tasks in this set. The authors investigated how 5th and 6th graders model and understand the ecosystem using a computer simulation program. The authors asked students to:

> design imaginary animals which do not actually exist but which *could* live in their environment. The animal design must include adaptations for the animal to survive the temperatures common to its environment as well as to mate and to acquire food. Within each group, students collaboratively work out the predator-prey relationships for their ecosystems. (p. 70)

With clear guidance for creating their own "eco-world", students were so engaged in the task that they referred to their creature in the first person, e.g. "I can eat you" rather than "my animal can eat yours". Because their assumptions about their creatures were constantly tested in the simulation and resulted in a living or dead ecosystem, this learning activity helped students to establish constant re-equilibrium through processes of accommodation and assimilation.

Unfortunately, such well-designed tasks were not always provided in the studies reviewed. For example, Vincent (2001) stated:

> A constructionist environment had been fostered by the participant researcher in the term prior to the study, in particular an environment in which children were encouraged to investigate all possibilities for use of computers in the learning environment, and in which it was acceptable to set problems beyond the minimum tasks proposed by the teacher (p. 244).

This principle of a constructivist learning environment proposed by the author is somewhat misleading. Constructivist learning does not mean that students try to find their way in using learning tools or materials or in performing little tasks proposed by teachers. Rather, teachers must provide students with well-designed tasks that enable them to challenge their existing knowledge and eventually "expand equilibration" in Piaget's term.

Wallace et al. (2000) designed learning tasks that did not sufficiently reflect constructivist learning theories. The authors investigated how students look for and approach science information on the web. To do so, the authors had students generate three questions that they wanted to investigate on the web, which turned out to be problematic with regard to learning processes as well as research itself. Because students did not fully recognize the goals of such activity, they stuck to the original questions and got lost rather than constantly refining their questions so as to become more relevant with respect to constructing their own knowledge around what they were interested in. As a result, students focused on the searching phase instead of on all the stages (e.g. question asking, information gathering and evaluating, and information synthesizing and using). In the discussion, the authors correctly asserted that:

> It confirms research on task that tells us that a complex task in and of itself does not cause complex thinking….It matters what students are asked to do and how tools and techniques to accomplish these tasks are provided. (p.97)

In sum, few of the studies reviewed investigated learning environments that were designed based on the theoretical constructs of constructivism such as the notion of equilibrium by Piaget, ZPD by Vygotsky, or expansive learning cycle by Engeström. Together with ambiguous theoretical stances, insufficient reflection on theories for designing learning environments appears to be a critical factor in explaining the outcomes of studies. Without such theory-based principles of design, constructivist learning environments can easily become merely trendy mumble jumble fads having no effects on student knowledge construction.

Implications for the Effective Integration of ICT into Constructivist Classrooms

In the previous sections, we examined the theoretical constructs of constructivism in terms of radical and socio constructivism. Also, we reviewed ten empirical studies to understand the current trends in the use of ICT to promote constructivist classrooms. Based on differences and similarities between theoretical constructs and empirical findings, we will suggest some key elements in the successful integration of ICT into constructivist classrooms.

Task Design and Motivation

According to Piaget's notion of equilibrium, it is important to provide students with tasks that challenge their prior knowledge scheme. The tasks should be neither too easy nor too difficult. However, in technology-supported learning environments, there can be two different challenges: new technology environments and new types of learning experience or tasks. As pointed out by one of the reviewed studies (Clarebout et al., 2001), it might be too challenging for students to become motivated if they find both the tasks and the environments to be unfamiliar. Therefore, it is necessary for teachers to be aware of the importance of balance between degrees of task difficulty and student motivation in designing ICT supported constructivism activities.

Teachers' Attitude and Professional Development

Related to the first element, teachers' active engagement in student constructivist learning is essential, ranging from the careful planning and designing of curriculum and activities to supportive and flexible attitudes toward student

self-directed learning. This adds credibility to Bracewell et al.'s (in press) findings that a successful teacher attitude was detected as appropriate "release of agency". The research indicates that one of the critical requirements for successful ICT integration into a constructivist classroom is that teachers must be comfortable with relinquishing authority and with distributing responsibilities for learning.

Meanwhile, cultural-historical approaches provide an adequate methodology for investigating teachers' instructional activities associated with their attitudes and beliefs. In fact, there has been an increasing number of studies employing Activity Systems Theory, one of cultural-historical approaches to understand how teachers use ICT to adapt, abandon, and reinvent new practices (e.g. Bracewell, Tung, and Sicilia, 2005; Windschitl and Sahl, 2002). Such research contributes to the effective use of ICT in constructivist classrooms by phenomenologically analyzing how members of such organizations including teachers, students, parents, staffs and administrators collectively overcome classroom crises arising from new instructional practices.

Along the same line, such research contributes to more systematic instructional design in professional development. As a participant teacher of one study in the reviewed set stated, it is challenging for teachers to conceive of "the intersection between the technology, the curriculum, and classroom management without knowing what a laptop-equipped classroom looked like" (Windschitl and Sahl, 2002, p.178). A cultural-historical approach can help instructional designers model and design activity systems in classrooms that take into consideration multiple goals and participants, the nature of tasks, the uptake of tasks, shifts in roles, etc., which are socially, culturally, and pedagogically more complex than in traditional classrooms. Such modeled activity systems in turn make teachers aware of the socio-cultural contradictions between their current assumptions and practices and new practices needed for the effective use of ICT to promote constructivist pedagogical activities.

Administrative Support

Finally, the data or findings from the field also speak to the need for theoretical development. Although it is not mentioned in any of the theories, administrative supports are a critical factor in successfully putting constructivism into practice. This is an obvious example for showing gaps between theory and practice. In other words, without full understanding of nature of administrative work and situations, researchers[1] enormous efforts to design and implement constructivist classrooms with a solid theoretical background will often fail to get off the ground (Windschitl, 2002). Cultural-historical approaches provide possible solutions to the problem by investigating existing historical divisions of labor and cultural rules among members of communities including administrators and teachers in order to understand and model activity systems and to prevent the occurrence of possible problems.

Conclusions

The purpose of this paper was to review key elements that contribute to the successful and unsuccessful integration of ICT and constructivist pedagogical activities into K-12 settings that have been reported in literature. Constructivist theoretical constructs were identified based on literature about constructivist theories. These theoretical findings in turn framed a review of recent empirical studies on technology-supported learning environments to identify key elements in the successful and unsuccessful integration of ICT in constructivist classrooms.

Based on a review of constructivist theories, with particular emphasis on how the nature of knowledge has been conceived in radical constructivism and socio constructivism, three major framing considerations were identified. First, researchers' perspectives on constructivism differ from one discipline to another (Bereiter, 1994; Cobb, 1994). Second, as a learning principle, the construct of expanding equilibrium in Piagetian (radical) constructivism (Piaget, 1970; von Glasersfeld, 1995) and that of the expansive learning cycle (Engeström, 1999) in Vygotskian (socio) constructivism (Vygotsky, 1978) are basically alike. Both imply that learning tasks should be designed to enable students to critically appraise their existing knowledge and to externalize latent discrepancies. Third, together with the previous two findings, different theoretical stances were found to alter methodologies to be employed.

Given these theoretical findings, a set of empirical studies on technology-supported constructivist classrooms was reviewed. The articles were selected based on keyword searches of relevant databases and consisted of ten journal articles from the period of 1999 to 2006. Findings suggested that there were three critical discrepancies between theoretical constructs in theory and practice: first, most of the reviewed studies exhibited ambiguous theoretical stances, second, as a result of the first discrepancy most of reviewed studies employed inappropriate designs for the nature of domains investigated, and third, most of the studies failed to adequately reflect constructivist theoretical constructs in the tasks under investigation. Insufficient elaboration of constructivist theoretical constructs in empirical studies resulted in poor results or no significant effects on constructivist learning. It is suggested that more

thorough methodological concerns are needed to produce trustworthy studies.

  The findings presented three implications for the successful integration of ICT for promoting constructivist pedagogical activities: (a) learning tasks should be designed in a way to constantly challenge students pre-existing knowledge with the help of teachers and other peers; (b) teachers need to be more active in planning and enacting classroom activities. It can be possible with appropriate professional development programs that draw on a more thorough theoretical framework to reveal what technology-supported classrooms look like. Both principles of design for constructivist learning experiences and awareness of possible problems likely to occur in constructivist classrooms are important findings in terms of implications for what to include and how to design professional development programs. Finally, (c) administrative support is a critical factor in the successful integration of ICT into constructivist classrooms.

  Research must inform practice and at the same time, must be inspired by practice. It is our responsibility as researchers to assist and guide such a teacher who "still feels like s/he is teaching things the same way s/he used to" to do their job better in such new and innovative learning environments.

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From Lecture into Hands-on: Improving Instructional Technology Workshops for Faculty Development

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Abstract

In Spring 2006, the Faculty and Curriculum Support Center at Georgetown University Medical Center began a faculty development workshop improvement project to convert instructional technology workshops in large-group lecture format into small-group hands-on workshops to allow the workshop participants to get rich learning experiences and enhance their learning outcomes. This presentation explores the conversion of the workshop format and reveals and evaluates the outcomes of the project one semester later.

Introduction

Since Spring 2003, the Faculty and Curriculum Support (FACS) Center at the Georgetown University Medical Center has provided faculty with instructional technology workshops, which have taught basic skills of software applications for web and multimedia development and played an important role in faculty development in the medical center. For the first two semesters since the workshops began, the primary goal of the workshops was to make as many faculty members as possible attend the workshops. The workshops were held in a lecture format at a classroom with 20 stations. The software applications were installed only on the instructor's station and the workshop participants just watched the instructor's presentation. They used their stations only for viewing example files and browsing web sites the instructor presented. Despite recognizing the disadvantage of the workshop format and its classroom setup, FACS held the workshops at the classroom to accommodate more number of participants at a time. This made the workshop instructors have difficulty in making the workshops fully meet the participants' expectations.

After the workshops have been fully implemented for two years, FACS has started to concern about the quality of the workshops rather than the number of workshop participants. From the workshop participants' feedback collected for last two years, FACS found that what they most wanted was hands-on training, which would have allowed them to apply software for themselves and try out the skills they learned during the workshop sessions. This was a very critical point especially for teaching workshops on multimedia.

FACS had a small computer lab with 3 PC stations with all the web and multimedia applications for the workshops, such as Photoshop, Dreamweaver, and Flash, and used the lab for technology consultation, one-on-one training, and working on faculty projects. To overcome the shortcoming of the lecture-format workshops, FACS let the workshop participants know it would provide them with one-on-one training sessions for their hands-on learning experience at the computer lab after the workshops on their request. This, however, did not work as designed. Almost no one signed up for any one-on-one sessions. Even though they could get hands-on experience, they did not want to spend another time to learn the same skills they thought they had already acquired at the workshop.

Another factor to discourage the workshop participants to get opportunities for skill practice after the workshops was the separation between the workshop classroom and the computer lab. A while after the workshops, its participants would easily forget what they learned if they did not apply their skills to a project or practice the skills. Although FACS provided a computer lab to support their skill application or practice after the workshops, most of them did not seriously recognize the availability of the service and facility for the support. Since the workshop was not held in the computer lab, it was difficult for FACS to make them familiar with the resources for the support. Moreover, for those who preferred self-learning to one-on-one, there was no other learning assistance available than class handouts. That was another obstacle to make it difficult to review and refine their skills after the workshops.

Methods

In Spring 2006, FACS changed the workshop classroom and format to meet the workshop participants' expectations and enhance their learning outcomes. It moved the workshop classroom from a large-group classroom to a renovated small computer lab, changed the workshop format from lecture to hands-on, and made the online tutorials available to them. The primary goal of this project was to allow them to get rich learning experiences. Its secondary goal was to let them recognize its support service and facility available to them to encourage them to use the resources.

Workshop classroom design
- FACS had a computer lab (Fig. 2) with 3 PC stations for supporting faculty projects and providing technology consultation and one-on-one training sessions. It renovated the computer lab installing one more PC station, a LCD projector, and a whiteboard to convert the lab into a web/multimedia training classroom.
- It moved its workshop classroom from a classroom (Fig. 1) with 20 PC stations for large-group teaching to the renovated computer lab (Fig. 3) with 4 PC stations for small-group hands-on training classes. While the multimedia software applications were installed only on the instructor's station in the large classroom, they were installed on every station in the lab.
- It installed an electronic whiteboard device, Mimio Xi, to make the class teaching more interactive and easy-to-follow. It allowed the workshop participants to pay attention to their instructor as well as the instructor's activity.
- It placed the instructor's station behind the participants' stations (Fig. 3) so that he can easily see their learning activities and watch their progress through their stations' monitors. This allowed him to confirm that every participant is following his instruction without getting lost during the class.
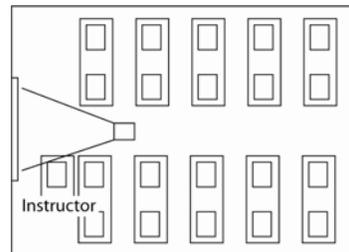
Figure 1 The classroom for large-group lecture-format classes
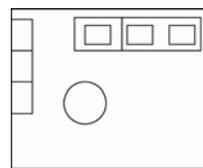
Figure 2 The computer lab before the renovation
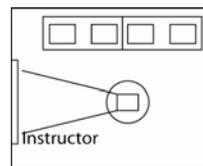
Figure 3 The renovated computer lab for small-group hands-on classes

Workshop design

- Converting the lecture-format workshops into the hands-on workshops, FACS redesigned the workshop sessions adding more numbers of examples and practice materials to the workshop instruction.
- It extended the workshop time from 50 minutes to 60 or 80 minutes to allow the participants to spend more time for practicing skills.
- The instructor stayed at the classroom to answer the participants' questions on the skills they learned or the problems in their projects as long as they wanted after the workshops ended.
- Converting the large-group workshops into the small-group workshops, it limited the class size to 4 participants in maximum. It offered two times more numbers of the workshop sessions because of the small class size.
- It provided online tutorials containing screen capture videos to help them review the skills they learned at any time they wanted. It also provided downloadable practice files.

Results

FACS implemented the workshop improvement project in Spring 2006 and produced the outcomes of the successful conversion between Spring and Fall 2006. The outcomes were drawn from the findings from the participants' feedback on the workshop evaluation form and FACS Center's faculty support data. The evaluation form was asked to be submitted at the end of the workshops and the support data was recorded by the FACS staff at the time of the service provided. FACS initially set up the project's target outcomes after the successful conversion as below:

Workshop evaluation feedback

- Increase of the number of the workshop participants who made positive feedback on the two workshop evaluation questions below:
  - Were your expectations coming into this session met?
  - How likely is it that you will use something that you learned today?

Faculty support data

- Increase of the number of faculty members asking FACS for consultation in applying technology to their teaching or research
- Increase of the number of faculty members asking FACS for one-on-one training at the FACS computer lab
- Increase of the number of faculty members using the FACS computer lab for their projects
- Increase of the number of faculty members asking FACS for supporting their long-term projects on developing their course materials

The participants' feedback from the workshop evaluation and the FACS Center's faculty support data between Spring and Fall 2006 were compared with the ones between Spring and Fall 2005, when the lecture-format workshops were still held in the large-group classroom.

- The percentage of the workshop participants who selected "Exceeded" on the question about the level of their satisfaction on the workshops was increased. The percentage of the workshop participants who selected "Very likely to use" on the question about the usefulness of the skills learned in the workshops was also increased.
- There was an increase in the number of faculty members asking consultation and one-one-one training. There was, however, no increase in the number of faculty members' requests to support their projects. Although the impact of the revised workshops was not strong enough to affect the whole faculty community's acknowledgement of technology, it was evident that the workshops have been improved regarding the aspect of hands-on training.

The target outcomes that FACS initially expected to get from the project were intended to be interpreted quantitatively. After the projects were completed in two semesters, FACS found more valuable issues in learning attitudes and environments than in the increase of the numbers. Majority of the findings

were acquired from the participants' comments in the workshop evaluation and the interactions between the participants and the instructor in the classes. The most noticeable responses in the evaluation were their comments directly mentioning the "hands-on" format of the workshops. This clearly reflected how successfully the project's objectives were achieved.

Findings

The small-group (4 participants in maximum) class in a small classroom (14 ft x 15 ft) supported the hands-on workshop format. It allowed the participants and the instructor to get active interactions with each other. The interactive whiteboard system, Mimio, installed in the classroom made the class more active. Since it allowed the instructor to control his station on a projected screen, the participants could pay attention to him as well as his instruction. The electronic whiteboard was effective in the classroom which was small enough to let the instructor and the participants get closely together. The active interaction helped the instructor easily recognize each participant's skill level and learning progress during the class. It also helped the instructor establish personal relationship with the participants even after the workshops. More participants than before stayed after class to ask questions, discuss about their own projects or arrange consultation sessions or one-on-one sessions as follow-up. This played an excellent role to introduce FACS computer lab to faculty and encourage them to use the FACS Center's support service.

Participants preferred building up their own skills to receiving information through presentation or demonstration sessions in a class. Learning the skills by practicing following their instructor's instruction in a class allowed them to realize what they could do with the skills for themselves as well as how the skills actually works. This was the mostly mentioned factor to make them feel satisfaction about their learning in the workshops. Properly selected examples and well designed practice files were the key to the successful practice in the classroom without sacrificing time for teaching. Practicing in a class also helped them get their confidence on their ability and encourage them to try to use the technology and to take more advanced classes or other related classes. For those who wanted to review or practice their skills even after the workshop, FACS created online tutorial videos and made them available. From the feedback of the workshop participants who tried the tutorial videos, FACS found that motion screen capture videos helped them better understand instructions and more easily learn skills than screen capture still images would.

The small-group class format required FACS to offer two times more number of classes than in the previous years. Providing more variety of workshop schedules could allow faculty to avoid schedule conflicts. That eventually increased their chance to find the classes they could attend, while this required the workshop instructors to spend more time to teach the workshops than before. In addition to the increase in the number of the classes offered, the expandable class time was another key element for the successful workshop. Even after the class ended, the instructor expanded class time for answering to participants' individual questions or helping their skill practices as long as they wanted. That was one of the major elements to make their learning experience rich and eventually make them satisfied with the workshops.

Issues

The small-group class format required more number of classes to be offered and more staff time for class preparation and teaching. While the staff time had to be increased about two times more than the one in the previous semesters, the number of the participants was not increased that much. It was, however, noticeable that the participants' satisfaction was much greater than the one in previous years. It is said that the efficiency in the class productivity was not much high, but the quality of the classes was upgraded.

Even though the class size was for a small group of participants, there was still a difficulty to deal with participants in different skill levels. The hands-on training format of the workshops made that difficulty more serious. While an instructor was able to easily recognize their skill levels in that classroom setup, it was still hard to keep a balance of two different skill level groups if the gap between the two groups was too big. If the instructor spent too much time for taking care of a participant during the class, that would affect the class time for all other participants. For the efficient class management, the instructor had to ask those who had a difficulty during the class to stay after the class or arrange a meeting for one-on-one training later.

Most of the classes were 50 minutes long. Hoping that more faculty members could attend the classes, FACS put all of them in the time slot, 12:00 PM – 12:50 PM. The class time was good enough to attract them but not long enough for hands-on training. The classes were divided into two or three short sessions to fit the classes into the class length. This actually made some faculty unable to complete the

series of the classes on a topic because of their schedule conflicts. Some participants suggested that the classes could be two hours long, 1st hour for instruction and 2nd hour for practice. FACS adopted the suggestion and set up a plan for a pilot study to investigate the new hands-on workshop format in Spring 2007. In the instruction session, the instructor would allow participants to do guided practice following his step-by-step instruction, and, in the practice session, he could provide small projects to let them practice for themselves. The practice session could be optional so that only those who want it could stay after the instruction session.

The workshops were designed and organized mainly according to the software applications, such as PowerPoint, PhotoShop, Dreamweaver, and Flash. This workshop design would restrict them to a specific software application and make them lose their chance to see other options or alternatives to accomplish an objective. It would prevent them from getting a holistic view in integrating technology into teaching. Focusing on a specific software application and its tools would be an effective way to give them a solution to a specific problem but not to encourage them to get more fundamental understanding so that they can apply the skills to other projects or easily understand other software tools and find more creative ways to apply the tools to solve their problems. Based on this notion, FACS has been planning another pilot project to design new workshops based on multimedia tasks rather than software applications and to add them to the existing workshops.

Summary

The FACS Center's effort to improve the instructional technology workshops for faculty development by converting the large-group lecture-format workshops to the small-group hands-on workshops was rewarded with more learning activities created in the workshop classes as well as an increase of the workshop participants' satisfaction rate. Instructor's step-by-step instructions for guided practice, the increased skill practice time, the classroom setup for active interactions between an instructor and participants, and the online tutorial videos were the key elements of the workshop improvement project to help the participants get rich learning experiences. While more staff time was required to teach and manage more number of workshops, the quality of the workshops was greatly improved. Converting the FACS Center's computer lab to the multimedia training classroom and using the classroom for the workshops made the FACS Center more visible to the faculty so that the faculty members could easily recognize its support services and facilities available to them. Raising more issues on designing and managing multimedia training workshops for further projects, this project led the FACS Center a step closer to the creation of successful technology workshops for faculty. The workshop and its classroom design and the findings of this project will help academic institutions or departments who either plan to provide faculty development workshops on instructional technology or who wish to improve their current workshops and faculty support services.

Supporting Teachers' Assessment Goals in Constructivist Educational Materials: Lessons from Alien Rescue

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Abstract

New computer-based educational materials grounded in a constructivist perspective of learning assume fundamental changes in classroom instruction. Designers must therefore support teacher learning while also enabling teachers to make modifications to meet their students' needs in ways that maintain fidelity of implementation. The study reported here examined teachers' assessment goals as they implemented Alien Rescue. Implications for the design of educative components to support teacher learning and local adaptation of constructivist programs are discussed.

Researchers have long expressed concern about the modifications teachers make to curricular materials, pointing out that such changes have the potential to become "lethal mutations" (Brown & Campione, 1996, p. 291) that undermine an instructional approach to the point where it is no longer effective. Such concerns have become more pressing in recent years as innovations in the design of education materials have drawn not just on new conceptions of learning but also on new technologies. In order to support the implementation of these materials, two new design principles have been advocated in recent years. First, researchers have argued that educational materials that embody new approaches to teaching and learning must support *teacher* learning in addition to student learning (Ball & Cohen, 1996; Davis & Krajcik, 2005). Such materials are referred to as *educative*, and are designed to support teachers in understanding how learning is expected to occur within the program and how implementation is likely to affect student outcomes. Second, given that teachers are responsible for fitting curricular materials into the contexts in which they work, Barab and Luehman (2003) argue that designers should consider ways in which to allow for and support teachers' "local adaptations." This presents a considerable challenge, in that designers must create materials that are flexible enough to be effective under a range of conditions while structuring support so that the integrity of the design is maintained.

The study reported here examined one aspect of teacher practice – assessment – for its impact on the implementation of a technology-based program informed by a constructivist perspective on teaching and learning. Research suggests that the assessment practices commonly used in K-12 environments are consistent with theories of learning that dominated education in the early part of the 20th century, but are at odds with the new conceptions of how people learn that have emerged from the constructivist perspective (Shepard, 2000). As teachers attempt to implement constructivist materials,

their assessment practices are likely to influence their decisions. Designers of such materials must find ways to support teacher learning about effective assessment practices that are consistent with the theories of learning underlying these materials while simultaneously supporting teachers' efforts to fit novel materials into their curriculum. Such an objective must start with an understanding of the goals and beliefs that guides teachers' decisions. In this study, we examined teachers' implementation of Alien Rescue, a 3-week science module, focusing on the research question: What were teachers' reasons for their assessment practices while implementing Alien Rescue?

Methods

Ten 6th grade science teachers were interviewed twice, once before implementing Alien Rescue and again after implementation. Observations were also conducted in five teachers' classes, and the results were used to formulate additional questions for the second round of interviews. The interviews and field notes were transcribed and analyzed using the constant comparative method (Lincoln & Guba, 1985), including extensive member checking to support the trustworthiness of the results.

Results

Seven categories emerged from the data, with each category providing a reason for multiple assessment practices used by teachers during their implementation of Alien Rescue. Each of the following reasons underpinned multiple practices and were offered by a majority of the teachers in this study.

Preparing Students for Standardized Tests

Foremost among the goals that drove teachers' assessment decisions were pressures related to students' performance on standardized tests. In order to prepare students for statewide standardized tests, the district in which this study was conducted had recently implemented a policy of semi-annual benchmark testing. These benchmarks tests were developed by the district to reflect the types of items on the new state exam that students take in 5th and 10th grades, namely multiple choice items, some of which examine higher order thinking. Teachers were offered training on the development of multiple choice tests that include questions representing different levels of learning, including higher-order, problem-solving items. In addition to the benchmark tests, teachers were expected to work together at the campus level to develop 9-week tests to administer to all the students at their school. In order to prepare students for these campus, district, and state-level tests, teachers felt it was important to use a multiple choice test as a summative assessment of every unit, even for PBL. In turn, they prepared students for these tests through the use of a variety of regular tasks that required students to respond to multiple choice items, such as the warm-ups, worksheets, and quizzes teachers used in Alien Rescue.

Promoting Productivity

Also at the forefront of factors driving teachers' decisions about assessment practices was the goal of maximizing student productivity. Teachers were concerned that without direction, students would either engage in unproductive tasks or become frustrated and disengage from the program entirely. To forestall this, teachers applied two strategies.

First, teachers supplemented Alien Rescue with a variety of resources that helped to *structure* students' work. For instance, the primary reason teachers cited for giving students paper-based notebooks was that, unlike the electronic notebook in Alien Rescue, the paper-based notebook provided headings that structured the problem so that students did not waste time trying to figure out what types of information they should look for. Second, teachers used grading practices as an *extrinsic motivator* to encourage students to stay on-task. For example, teachers gave grades for participation to discourage off-task behavior. Interestingly, teachers tended to argue that these practices were necessary only for some of their students. For example, several teachers argued that note-taking is a difficult skill, one that could be overwhelming for children of average and below average ability level. Similarly, teachers all agreed that students were highly motivated during Alien Rescue, but they still they felt that extrinsic motivators were necessary "just in case" less capable or interested learners were unproductive.

Adjusting Class and Teacher Activity

Both the observations and interviews provided ample evidence that teachers used their interactions with students formatively, that is, to modify both whole group discussions and their own activity. Teachers relied less on graded activities, such as notebooks, worksheets, and quizzes, to make these decisions. Teachers saw a disconnect between the ungraded practices they used formatively to assess student understanding and the practices that resulted in grades, but they did not see this as problematic. In general, teachers saw great consistency between their ungraded assessments of individuals and how they performed on graded activities and products.

Promoting Excellence

The teachers who participated in this study all argued that a major goal of both their teaching and assessment was to help students produce high quality work, and they felt that a strength of PBL was that it emphasizes quality over quantity. However, though this was a goal valued by all teachers, it was one that they promoted only through their ungraded assessment activities. For example, teachers used their informal interactions with students to encourage deeper level thinking and better quality products, but none of the teachers generated any grades from these interactions. In fact, some of the comments teachers made suggest that they believe grading would be counterproductive to their efforts to promote excellence.

Teacher Accountability

Teachers cited the expectations of both parents and administrators as impacting their assessment practices in three ways. First, teachers believed that both administrators and parents expected report card grades to be based on numerous grades over the course of the 6-week marking period. Though teachers said there was currently no requirement in the district or in their schools for a minimum number of grades, several of them said there had been such requirements in the past. They believed that if a grade were challenged, they would need to show that it was based on a variety of products, including materials they could use to generate "daily grades." Of course, this perceived expectation did not determine what teachers chose to use to generate grades, but it did establish a need for *something* that could be graded. Second, teachers felt pressure from both parents and

administrators to show that grading was objective. Teachers also cited objectivity as a reason to justify the use of a multiple choice test and argued that one of the advantages of using any type of rubric was that it was more objective than assessing a product holistically. Most teachers felt objectivity was important in grading, equating it with "being fair," but some felt that the pressure to be objective negatively influences their teaching and ability to use PBL as intended. Finally, teachers felt pressure to modify assessment practices so that learners with special needs would receive passing grades. Teachers adopted practices they believed were needed for students with special needs, then applied them to all students. In this case, this meant that grades for all students are likely to reflect a combination of effort and achievement. Teachers felt that this could be problematic in that grades did not necessarily reflect students' level of competence relevant to the standards, but saw it as unavoidable, "just a problem with grading period. The nature of the beast."

Practicality

Practical considerations guided the decisions teachers made about assessment. Most notably, concerns about the *time* needed for data collection and grading led teachers to use certain practices and avoid others. For example, a major reason offered by most teachers for using multiple choice tests was that they were easy and fast to grade. Likewise, a common reason teachers offered for using quizzes and giving participation grades was that, as one teacher explained, "it's something that's easy to grade and put in the grade book." *Ease of access* was another practical consideration for teachers. Teachers did not assess either students' probes or electronic notebooks because doing so required students to print these artifacts. This could overwhelm their printer, and if students forgot to print, then teachers would have to locate these artifacts on students' hard drives. However, for the most part, teachers did not see a need to assess these artifacts. They believed they were getting the information they needed about students through other products (such as worksheets, warm-up activities, and quizzes), and that these other products were more easily accessible.

Consistency

Creating consistency in assessment practices across the school year was at least a consideration for teachers. For example, one of the reasons teachers cited for continuing to grade participation during Alien Rescue, even though it was not needed for motivational purposes during the program, was that it was something they used during the rest of the year. As a second example, teachers explained that one reason for giving students a multiple choice test at the end of Alien Rescue was that students expected it because they had such tests at the end of other units. Goals other than consistency provided the primary reasons for teachers' choice of both of these practices, and several teachers commented that consistency in assessment practices was not a driving factor in their assessment decisions, but they believed that students were more comfortable and performed better when assessment practices were familiar and used throughout the year.

Discussion

Based on the results of this study, we suggest four design guidelines. The first two aim to support teachers in modifying a PBL program to address what they perceive as the

needs of their own students within their local class and school context. The second two address educative goals for programs like Alien Rescue.

Embed multiple-choice questions within PBL activities

We argue for this course of action with trepidation because it is a prime example of a practice that is inconsistent with the social constructivist paradigm in which PBL is situated. However, given the pressures created by high stakes testing, it is the adaptation most teachers are likely to make themselves if it is not provided within the program. PBL programs can offer teachers control over number of items presented, topics addressed, and level of difficulty, and even let them individualize these decisions based on their perceptions about students' needs. Having the items developed by designers offers several advantages. First, the program can retain control of timing of the presentation of items, for instance, presenting a given multiple choice item only after students have accessed the section of the program that presents information on it. In this way, these items would follow, not drive, student activity. Second, designers can involve assessment experts who are more likely to develop valid objective items capable of encouraging higher-order thinking. This can relieve teachers of the responsibility for developing these items, a task that teachers in this study found difficult. Well-chosen items may actually help students to recognize topics pertinent to solution development rather than focusing them on the acquisition of discrete, decontextualized facts. Finally, the data gathered on student performance on these items can be presented to teachers by the program along with suggestions on how to address misconceptions and learning needs.

Provide modifications and scaffolds within the program that teachers can assign to individual students based on special needs

In this study, teachers made modifications to the program for all students that were based on the perceived needs of only a few. Given teachers' concerns that PBL is too challenging for some students, allowing teachers to provide greater structure and support for some may make it unnecessary for teachers to modify the program for all students. The program can even be designed to provide information to teachers about which students appear to be floundering. For instance, in Alien Rescue, data on the notes recorded, tools accessed, and probes launched can allow teachers to assess student productivity quickly. By comparing learners' patterns to those of students who have been successful with a program in the past, it may be possible for the computer to alert teachers to which students may need support, allowing teachers to target individual students for help rather than providing unnecessary extrinsic motivators and structure for the entire class.

Present research findings on motivation and teaching practices, especially the impact of grades on intrinsic motivation

The use of extrinsic motivators, particularly grades, is so entrenched in K-12 culture that a combination of convincing arguments, research-based evidence, and alternative practices is necessary to help teachers consider how new approaches such as PBL interact with student motivation. Educative components can present explanations of PBL and its effect on students' motivation as well as research findings on the impact of extrinsic

motivators on intrinsic motivation. The assessment tool itself can avoid supporting practices that may undermine intrinsic motivation while supporting practices that focus on enhancing the quality of students' work. Developing convincing arguments capable of supporting teacher change will be an important focus of our future design and research efforts.

Emphasize the value of student reflection on their process and solution through self and peer assessment

Engaging students in reflection on the tasks they perform and in assessment of the products they develop may enhance their problem-solving process and their standards for quality work. Given teachers' reluctance to dedicate time to engage students in formative assessment, we plan to build scaffolds for it directly into Alien Rescue. The goal here would be to make formative assessment a seamless component of students' process and relieve teachers of at least some of the responsibility for guiding it. At the same time, we plan to develop educative components that present research-based knowledge about engaging students in formative assessment (Black & Wiliam, 1998) that help teachers to understand its potential benefits and how to facilitate it effectively.

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Guidelines for Mentoring Graduate Students in Best Practices for Teaching Online Courses

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The purpose of this research project was to open discussions among faculty and graduate students about the importance of mentoring graduate students to teach in distance education, specifically online environments, and what that mentoring should look like in terms of content and relationship. The purpose of this research is twofold. First, there is a need to open discussions among faculty and graduate students about the importance of mentoring graduate students to teach in online learning environments through modeling behaviors and mentoring while they are fully involved in the teaching of an online course. A subsequent purpose was to develop guidelines that other faculty and graduate students can utilize as they engage in the mentoring relationship which focuses on the diffusion of best practices for online learning The research questions included (1) What does the mentoring process look like, (2) What are the major processes and pedagogies related to teaching in an online environment that graduate students need to be mentored about, and (3) How do graduate students perceive the notion of transferring their experiences as a student in an online course environment to teaching in an online course environment? The results of this study, including emerging themes, offer implications for the mentoring relationship as well as the development of guidelines for mentoring graduate students in best practices for online learning.

Background

In education, a critical piece of primary and secondary school teachers' training is being mentored during their student teaching by someone with experience to give feedback (Ingvarson & Kleinhenz, 2003), support (Cameron-Jones & O'Hara, 1997), help, and orient them to the struggles of a new teacher (Schreiver, 1999). In academia, the mentoring relationship can help graduate students make the transition from undergraduate to doctoral work and prepare them for their future careers (Austin, 2002). For the protégé, a mentoring relationship might provide networking opportunities and important contacts, guidance on coursework and opportunities, experience, and safety (often political) through the protégé's graduate career. A longitudinal study of individuals working in post-graduate careers found that there were significant, lasting differences between students who were protégés and those who were not in areas such as career planning and socialization (Chao, 1997). For the mentor, the benefits of the mentoring relationship may include work towards service requirements, and rekindling excitement about teaching (Gaia, Corts, Tatum, & Allen, 2003).

Research on mentoring, particularly at the graduate level, is limited. Johnson and Huwe (2003) point out "most graduate programs do not collect data regarding mentoring of their own students" (p. 9) because it's difficult for prospective students in a program to evaluate it based on mentoring, and mentoring varies across disciplines, making assessment and comparison complex. Some data on mentoring in academia comes from the field of psychology (Johnson & Huwe, 2003). One study found that of eight hundred responses from psychologists around the United States, two thirds had a mentor, and ninety-one percent of those mentored viewed it positively (Clark, Harden, & Johnson, 2000).

From the literature on mentoring, which has a strong emphasis on mentoring pre-service teachers, we know that mentors' roles can vary greatly. A popular mentoring model divides a mentor's responsibilities into two parts, career functions and psychosocial functions (Kram, 1983). Career functions include sponsorship, exposure, coaching, protection, and challenging assignments. Psychosocial functions are role modeling, acceptance and confirmation, counseling, and friendship. Modeling might include asking a protégé to observe a specific professional task like teaching or presenting, and helping them practice it themselves (Johnson, 2002). A more specific mentoring model, proposed by Anderson and Shannon (1988) is based on historical and current mentoring models. Their model includes five attributes: the process of nurturing, the act of serving as a role model, the five mentoring functions (teaching, sponsoring, encouraging, counseling, and befriending), the focus on professional and personal development, and an ongoing caring relationship (Anderson & Shannon, 1988, p. 40).

Another important distinction for this study, as defined by Burlew (1991), is the distinction between primary and secondary mentoring relationships. A primary mentoring relationship is long-term, lasting the length of

the protégé's experience at the school and beyond. Secondary mentoring relationships are shorter, usually relating to a specific task. The current study will describe a specific secondary mentoring relationship in which the protégés were coached in how to teach an online course under the tutelage of an experienced online teacher who acted as a mentor.

Learning to Teach, Learning to Teach Online

It's common for instructors who have never taken or taught an online course to be asked to convert an existing course to an online format, or to teach an existing online course. In fact, it is not uncommon for a graduate with little to no teaching experience to be asked to teach a class within their discipline (Darling & Earhart, 1990; "Some universities shift future professors' focus to teaching", 2006). The assumption about teaching has traditionally been that if you possess the content knowledge then you can teach the content (Darling & Earhart, 1990); similarly, an assumption is made that teaching online and face-to-face are basically the same, though instructors may be asked to learn new technology. However, technology is only one of the differences between the two classroom formats. "For academics to successfully make the transition to become online teachers or learning facilitators, they must do more than develop new technological skills. Online development and delivery requires new pedagogical approaches, challenging previous practices with regards to assessment, group interaction and student/teacher dialogue" (Ellis & Phelps, 2000, p. 27). Online instructors also have different roles, or perhaps more precisely, different strategies, approaches, and emphases than instructors in traditional classrooms (Goodyear, Salmon, Spector, Steeples, & Tickner, 2001; Kulski, Boase-Jelinek, Pedalina, Quinton, O'Connor, 2002), with the general categories identified as: pedagogical, managerial, social, and technical (Berge, 1995). However, online instructors are challenged in playing the above roles, especially the pedagogical and social roles (Shrivastava, 1999). Moreover, research shows that effective online learning depends on how online instructors develop, design, and facilitate teaching and learning activities, including the provision of support for learning activities (Berge, 1995; Liu, Bonk, Magjuka, Lee & Su, 2005). Given these distinctions and research findings, it is presumed that the task of developing and teaching an online course would require different and/or additional training (Barker, 2002, Bennett & Marsh, 2002).

A recent article from CNN.com ("Some universities shift future professors' focus to teaching", 2006) discusses a shift to teaching from research as a focus at some universities as the scarcity of academic jobs continues. Accordingly, some universities are taking teacher-training more seriously to not only enhance their own undergraduates' education but also to increase their graduate students' chances of employment in academia. The article also describes how some universities, including Washington, Colorado and Michigan have developed centers that train and mentor teaching assistants. However, according to a recent survey, only about one-half of 4,000 doctoral students from 27 universities required students to serve as teaching assistants. A doctoral candidate who was interviewed for the article had the following to say in terms of the necessity of being able to teach, "How do you handle a racial comment that targets another student? How do you manage classroom tension?".("Some universities shift future professors' focus to teaching", 2006). The researchers believe that this is compounded with a lack of online teaching experience and knowledge, as the response to these questions would differ depending upon course format, traditional or online. If Berliner's (1986) pedagogical model is the basis for training graduate assistants, and includes two domains: (1) knowledge as subject matter and (2) knowledge of organization and management of classrooms (in Darling and Earhart, 1990), then the researchers propose that there should also be consideration for an additional layer—course format.

In response to this challenge, colleges and universities have developed curriculums and programs to educate instructors on how to teach online (Salter & Hansen, 1999, Prendergast, 2004). For example, some graduate programs encourage students and instructors to attend Brown Bags and other informal sessions to learn more about teaching online, while another program promotes a team of mentors to aid with technological concerns (Gray & McNaught, 2001). A common online professional development approach to train faculty to teach online is "some combination of workshops, tutorials, and technical support", but this approach fails to integrate pedagogy and technology and ignores the relationship between the two (Koehler & Mishra, 2004, p. 8). In fact, the literature reveals a gap in the training of instructors in pedagogical approaches and limited opportunities for them once they arrive in academia (Darling & Earhart, 1990; Kember & McKay, 1996, in Louie, Drevdahl, Purdy & Stackman, 2003). As such, we now must consider the additional obstacle of a lack of teaching experience in online courses and how it impacts our graduate students as they enter the market. Given this, it is the responsibility of graduate programs to allow graduate students the experience of teaching online with the assistance of a mentor who is an expert in best practices for online courses for the following reasons (1) with the ever-growing number of online courses a new instructor may find that they are expected to teach online, (2) because it is different from traditional

teaching in terms of pedagogical, managerial, social, and technical aspects, and (3) to be able to offer graduate students not only the confidence but the marketability of having this experience.

Methods

This research study stems from a constructivist paradigm (Patton, 2002), specifically a socio-cognitive theoretical framework (Bandura, 1977), and employs a collaborative self-study methodology (Louie, Drevdahl, Purdy & Stackman, 2003) to study the mentoring process of two graduate students by a faculty member in the design, development and instruction of an online course. The basis of the self-study was a discussion between the mentor, Jennifer and the first graduate protégé, Hans. Working together in the Fall of 2004 on a research project related to social aspects of online learning, a discussion arose that pertained to Hans' plans to work in the academy upon graduation and the types of experiences that would prove beneficial to him as a graduate student. We decided that Hans should have some experience with teaching in an online environment as it varies considerably from the traditional classroom. At that point, fall 2004, we began meeting occasionally to discuss what this experience would look like in order to provide Hans with a meaningful experience. After several discussions we decided that Hans would not serve as a teaching assistant, but rather a co-instructor, providing him with the possibility of having more authority and input; we decided we would devise the experience as the course progressed. The second mentoring opportunity arose following my (Jennifer) satisfaction and reflectiveness with the first experience combined with Ann's interest in obtaining experience in teaching this particular course online. The self-study evolved from the process by which we engaged in, the process of determining the areas where protégés felt they needed guidance.

The collaborative nature of this approach not only allowed the graduate students/protégés to develop their online teaching and development skills but also allowed the faculty member/mentor to reflect on her online teaching beliefs and practices. The literature on collaborative self-study discusses the benefits of this type of research including social support, a culture of reflectiveness resulting in higher level discourse, and increase chances that faculty will create more generalizable knowledge (Louie, Drevdahl, Purdy & Stackman, 2003). It is the final benefit that is often overlooked by self-study research but is a major focus of our research (Louie, Drevdahl, Purdy & Stackman, 2003; Clandinin & Connelly, 2000).

This particular study utilized a process model of collaborative self-study which emphasizes three main phases: (1) *the assessment phase*, where researchers evaluate self-readiness, access to collaborators, and defining a focus with academic discourse, (2) *the implementation phase*, where researchers select data collection and analysis methods while assuring validity ; and (3) *the dissemination phase*, where researchers share not only their results but implications for a more generalizable audience (Louie, Drevdahl, Purdy & Stackman, 2003). It is the final phase that is often overlooked by self-study research but is a major focus of our research (Clandinin & Connelly, 2000; Louie, Drevdahl, Purdy & Stackman, 2003).

The validity for this research lies in the dependability of our study design (ongoing field texts consisting of narratives, e-mails, and conversations); the authenticity of our study design (the reflection of our own viewpoints and the evolution of practices and beliefs based not only our own reflections but the reflections of our team members), and of course, the triangulation of the multiple sources which we refer to as field texts (Patton, 2002, pg. 546). Validity of socially constructed research, such as this study, is embedded in the credibility, transferability, dependability, and confirmability of a study (Lincoln and Guba, 1986, in Patton, 2002, pg. 546.).

Role of the Researchers

Three researchers participated in this study: the faculty member/mentor and two graduate students/protégés. The faculty member/mentor has over 6 years experience designing, developing, and teaching in online environments and several additional years with experience as a student in online courses. The first graduate student/protégé, Hans, was mentored during the spring 2005 semester during the course. Hans had taken two online courses prior to teaching the course involved in this research (from instructors other than the mentor for this study). He had previously taken the course serving as the focus here, offered in a traditional format by the mentor of this study. In addition, Hans received independent study credits for his role in the co-teaching of the course in the spring of 2005. The second graduate student/protégé, Ann, was mentored during the spring 2006 semester for the same course as Hans. Ann had previously taken one online course prior to co-teaching the course that serves as the focus here, which happened to be the same online course taken with the mentor of the study. As a protégé, Ann helped co-instruct as partial fulfillment of doctoral fellowship requirements.

The mentor and protégés met weekly over the course of the semesters of their involvement with the course as well as for additional sessions following the semester to discuss course design, facilitation, assessment, students

learning, content, and teaching experiences among other things. The researchers also frequently engaged in discussions via e-mail throughout each week related to the practices and processes related to the course. Finally, the researchers met throughout the research process, with Ann becoming part of the project during her semester of involvement, spring 2006.

Research Context

The context of the study that served as a basis for the mentoring relationship was an online, graduate level course, Integration and Management of Computers in Education, and occurred during the spring 2005 and the spring 2006 semesters. At the beginning of the course, there was a single face-to-face meeting that served as an orientation to the course and the online format. Students were expected to complete several required course projects and activities on an individual basis including (1) an Instructional Integrated Project, (2) a Case Study (e.g. apply a solution to a practical, realistic problem that may be encountered in the application of technology into the classroom or business environment.), and (3) an Exemplary Technology Educator Vision (pre and post course). Students were also encouraged, but not required, to work with a peer for the Issues Project (which was based on a topic of the students' choice and included a literature review and an online discussion lead during the course).

The course participants in the online course for the spring 2005 version of the course included 15 graduate students. Eight of the participants were administrators (e.g. technology directors, curriculum directors, principals, assistant principals) all of which were also former teachers; an additional four participants were also current or former teachers. Seven of the doctoral students belonged to a cohort program in educational administration. Fourteen of the students were pursuing a graduate degree (5 at the masters' and nine at the doctoral level); one student was a post-baccalaureate. Ten participants were female and five were male. Of the fifteen students, two were international students. Student evaluations for this course indicate that students thought the course and the instructors performed well. Moreover, two important indicators of good teaching practices online, facilitation and feedback, were measured by questions indicated in the table 1 and indicate that students rated them on average as very good.

Table 1. Course Evaluations, Spring 2005

Responses to Course Evaluation (n=12)		
*Ratings based on scale of Excellent (5) to Very Poor (1)		
Overall I would rate this course as:	4.25	12
Overall I would rate these instructors as:	4.58	12
The amount of facilitation provided by the instructors was satisfactory.	4.17	12
I received prompt feedback from the instructors when I had questions or needed clarification.	4.5	12
Adequate feedback is provided to guide my progress in this course (e.g. assignments, discussions)	4.0	12

The course participants in the online course for the spring 2006 version of the course included 18 graduate students. Eleven of the participants were administrators (e.g., curriculum directors, principals, assistant principals) all of which were also former teachers and belonged to a cohort program in educational administration; an additional two participants were also current teachers. Seventeen of the students were pursuing a graduate degree (four at the masters' and thirteen at the doctoral level); one student was a post-baccalaureate. Ten participants were female and eight were male. Of the fifteen students, two were international students. Student evaluations for this course also indicate that students thought the course and the instructors performed well (see table 2.). Similar to the spring 2005 course evaluations, students for spring 2006 also indicated a high degree of satisfaction in regards to facilitation and feedback from instructors.

Table 2. Course Evaluations, Spring 2006

Responses to Course Evaluation (n=13)		
*Ratings based on scale of Excellent (5) to Very Poor (1)		
Overall I would rate this course as	4.10	
Overall I would rate these instructors as	4.33	
The amount of facilitation provided by the instructors was satisfactory.	4.10	
I received prompt feedback from the instructors when I had questions or	4.75	

needed clarification.		
Adequate feedback is provided to guide my progress in this course (e.g. assignments, discussions)	4.10	

The sixteen week course was broken up into learning modules, each covering several weeks, and defined by a particular overarching topic: why integrate technology, how to integrate technology, distance learning, management of technology, and future trends and issues. Each week students were required to respond to one or two discussion questions (threaded discussions), with the timeframe of a week, comprising the initial student response as well as required responses to peers.

Data

The data for this study was collected over an 18-month period, and culminated in what the researchers refer to as field texts. Field texts, as defined by Clandinin & Connelly (2000), are different forms of texts that can include autobiographical writing, journals, field notes, etc. that are interwoven throughout the whole study (pg. 116). For our purposes field texts included mentor observation notes, informal journal reflections by the protégés, conversations (face-to-face and via e-mail), mentor's journal, and protégés reflective papers following their involvement with the course. The purpose of the final reflective papers from the protégés was to allow them to reflect on themselves as educators, in terms shifting teacher beliefs, and as professionals involved in distance education. Journals kept by teachers are considered a valuable data source as it "acts a narrative technique and records events, thoughts, and feelings that have importance for the writer" (Anderson, Herr & Nihlen as cited in Mills, 2003 p. 67). The data was analyzed using the constant comparative method (Glaser & Strauss).

Field Texts

The field texts were kept by the researchers throughout the span of the course and were comprised of notes that detailed topics and questions the mentor and protégés discussed at weekly meetings. The field texts also included semi-structured narratives written by the mentor and protégés that examined issues related to assumptions and practices that were utilized within the course. Finally, the field texts included the ongoing electronic dialogue between the researchers as the course progressed.

More specifically, the field texts looked to expectations of what the mentor would focus on modeling for the protégés, teaching beliefs and assumptions on the part of both researchers, and unexpected outcomes that came about as the course and the mentoring process unfolded. For example, situations related to experiences that the protégés had not had the opportunity to consider as a possible area for mentoring. Specifically, the protégés were responding to the following overarching topics in his field texts related to teaching in an online environment: assumptions about teaching online, what they were looking for as protégés, what they received mentoring about, course design (assumptions and observations), implementation of the course activities (assumptions and observations), and class management (assumptions and observations). The mentor was responding to her beliefs and assumptions about online learning, specifically her previous experience with online learning (as student and instructor), how she learned/adapted to new environment (as student and instructor), attitude and perceptions toward online learning (as student and instructor), what she had planned going into the experience to mentor the protégés about, what she felt she had mentored the protégés about, what she felt the protégés challenged her about in terms of beliefs and assumptions, how she went about developing and designing a course and why, her perception of the instructor's role in discussions and the course in general, and her experience mentoring graduate students in this area.

Limitations

This research is based on the personal experiences, teaching and instructional beliefs of the researchers, all of whom reside in an Educational Technology program situated within a College of Education, and therefore results may differ from other disciplines. An additional limitation to the research results from the fact that the protégés were not fully involved in the course development as typical course constraints existed, including previous versions of the course, it had to meet program requirements, and it needed to align with the appropriate ISTE standards. However, the topics and discussion questions allowed for some flexibility and the protégés were involved in development of those areas. Moreover, the course design was discussed between mentor and protégés, with the mentor stressing that while her practices stem from experience and research findings about best practices for online learning, there are

also many other factors that go into course development, such as personal instructional strategies, instructors' experiences and observations, and course content.

Initial Results

The Mentoring Process: Establishing the Power Relationship

During the process of defining our roles practices and procedures for the course and the mentoring process, we began by clarifying our assumptions about the power relationship. The first theme deals with this power relationship between the mentor and protégé. Specifically, we looked at how power was experienced and how was it shared within this specific relationship. The power relationship movement in mentoring is gravitating toward "democratic" or shared power structure (Gunn, 1995; Darwin, 2000). Darwin (2000) posited that this type of mentoring allows the mentor and protégé to "share intellectual and emotional resources" (p. 208). A shared-power structure using a "developmental network perspective" proposed by Higgins and Kram (2001) indicated that preparing individuals for the world of work requires developing skills to work in a network capacity of mentorship instead of relying upon one mentor as a superior source of knowledge. This study investigated shared power in the mentor/protégé relationship in a democratic structure to prepare the protégés for the world of work in an online course.

The power was initially shared by the mentor through the elevation of the status of protégés from teaching assistants to co-instructors. This decision was not a presumptive one; in fact, it was an outcome of the process whereby the mentor and protégés defined their roles. The protégés were treated as equals in the facilitation of the course and presented to the students within the course as a co-instructor, both at the initial meeting and throughout the course. The process of defining our roles and power in this relationship unfolded over the weeks preceding the start of the course and the first several weeks of the course. After the identification of roles overall, the mentor and protégé began to work on the characterization of those roles and what they would entail in the context of the course contents.

During this characterization the protégés were allowed much flexibility in shaping their roles as co-instructors, only taking on as much in course facilitation as they felt comfortable with and selecting specifically the course content areas they would oversee as instructors. In the end, this specific process resembled a balanced expertise: by providing the flexibility to the protégé and allowing him/her to define their role as co-instructors (e.g. being allowed to choose which course content topics they felt comfortable in overseeing) and in doing so they were allowed to focus on their role and the level of content expertise for the facilitation of that course content and, more specifically, facilitation of those discussion topics and projects for grading.

Related to this was the process of Peer Observations, wherein the protégés observed initially (during the first several weeks of the course) as the mentor facilitated discussions within the course. Accompanying this process were discussions between the mentor and protégés, focusing on how to facilitate and reasons for specific facilitation processes, leaving room for the protégés to experiment to some degree (without taking away from the rigor of the discussions or the course). Moreover, during the times when the protégés were serving as instructors and facilitating the discussions, the mentor had the opportunity and time to observe the protégés' practices. This allowed for further discussions between the mentor and protégés about what worked, what didn't work, possible reasons for these perceptions and best practices. Finally, the reflective practices employed informally by the mentor and protégés allowed the researchers to reflect on the effectiveness of the necessary components in a mentoring relationships such as these.

Dispelling Myths About Teaching Online: Changing our Beliefs

The results from the field texts indicate that there is much that can and should be done to help our graduate students learn the art of teaching online, especially as it is likely they will find themselves teaching online if they enter academia. For example, Hans had expressed his assumptions about teaching online prior to the experience itself. As Hans, a protégé, explained:

> I think initially I thought that online learning would be much cleaner and easier to manage because it would be in digital form, everyone's comments there up on screen to see. I also thought it would take less time to manage as a course than a traditional course, (or the same time, because of my reading about online courses) or at least it would be more convenient, because I could do most of the work from home and had fewer time constraints. I found that it was not that simple. If I thought it would take less time than a

traditional course, I found that it may have taken more. In a regular class everyone can talk, take turns speaking about a topic, asking questions. The speech comes out, it's analyzed in my mind and if I don't understand I ask them to say it again, or vice-versa, but it all happens so quickly. Online everything took longer. It took longer to read the posts, read people's emails, answer their questions, try to make myself clear about what I meant, clear up confusion, and gather the resources. Even with everything inside of WebCT, it felt like the class began to sprawl out, with all of the posts and emails.

Similarly, the mentoring relationship and reflective practices embedded served to allow the mentor to revisit her beliefs and assumptions.

Jennifer, the mentor, wrote:

I think that sometimes we as instructors tend to fall into a rut in terms of teaching practices and activities we engage in, whether it is face-to-face or online teaching. I also think, based on speaking with other instructors that most of us tend to teach the way we are taught, to some degree at least. Having other opinions and insights about tools and activities made me step out of my own comfort zone and learn to use new tools and set up group discussions and activities differently. As a previous student of online learning I know that those experiences as a student were valuable, but I also had to realize that in the world of online courses expectations and emerging technologies are evolving. Given this, I was able to have discussions with the protégés about what might enhance the students' learning, making it more effective and efficient. This also came into play in terms of course organization. In my mind, the online course home page in WebCT was very intuitive, but not everyone saw it that way.

In the end the protégés found that there was much more to consider than they imagined while the mentor was reminded of what students' expectations were in terms of organization and online activities.

Communication and Presence in Online Environments

The researchers, as any instructors of online courses would do, looked to the best methods for getting their presence across. The mentor, Jennifer, has been conducting ongoing research into the social aspects of online learning, including social presence; therefore, this topic was one that was sure to arise. Jennifer, the mentor, wrote:

Given my previous experiences as a student in online courses I had come away with several ideas about how to make a course better, more interactive both in terms of activities and discussion, how to make each student feel comfortable in an online environment. Most importantly, I learned that the presence of the instructor is of utmost importance in terms of not only student satisfaction but potentially student outcomes; students want adequate and prompt feedback. I feel that this area of online teaching is one of the most important yet I also find that it is the one that perhaps takes the most practice. Related to this is act of helping your students understand and embrace their own presence as a classroom management strategy. In other words, if students are aware of their presence they can disagree with a peer online, yet do so without coming across as being hostile, a common complaint. Moreover, I think it takes practice as you shift from a student in an online discussion to an authority figure, such as an instructor. Your persona, and therefore your presence, also needs to shift.

Hans, a protégé, wrote:

Confusion is not as easy to dispel online – you can't do the quick Q+A that usually leads to resolution of a problem. Also, I was much more aware of the limitations of my own writing. I tried to be much more clear than usual – I almost never put up a post without editing it and re-reading it at least once, making changes to try and maintain a friendly, open, knowledgeable online personally…I feel so much more comfortable doing classes where I feel I can tell whether a student gets it or not by looking at their faces or gauging their reaction time. That's much more difficult online – it's the difference between having a discussion about something using the natural people skills one has developed over the years, and teaching class by writing short letter to each student and reading all of theirs.

Ann, a protégé, wrote:

The biggest challenge for me in shifting from teaching face-to-face (F2F) for decades to being a co-instructor for the first-time in an online class was dealing with the lack of the nonverbal cues (which I so heavily rely upon). I use nonverbal cues constantly to help get across my points with gestures, actions, and expressions in the F2F classroom. I also carefully observe the nonverbal cues of my students to help determine how I can facilitate the learning environment better. It was like having your hands-tied when functioning in an online discussion! Jennifer [my mentor] helped alleviate my anxieties about communicating without the class by conveying it was a process that would improve with time. By serving as a co-instructor, she provided me with the shared power necessary to get the "real feel" for how other pedagogical methods and strategies can be used to find out what normally would be gained through nonverbal cues.

By providing the opportunity to discuss prior to developing and teaching their own online courses, the protégés left the experience feeling more prepared in terms of techniques and what to expect in terms of presence and the role it plays in an effective course.

Managing the Online Course: Not What One Would Expect

Course design and management calls for variations on traditional techniques and methods. Anyone who taught online has probably come to realize that students in those courses tend to need very explicit guidelines and expect immediate attention. The mentor and protégés discussed these issues both in advance and as they arose during the course.

Hans, a protégé, wrote:

Helpful guidance on practical online course management was invaluable. Questions came up that I hadn't thought about before teaching – when so many posts are written a week, how often would I go in and look at them? My mentor suggested twice a week, spaced out. Another question comes with that one – when I go into the discussion boards, how strongly do I make my presence known? How many posts do I reply to? If I reply to every one, then it may be expected every week, even if it's not required. In addition, depending on how the students view the instructor, it may be seen as the final word on the topic (so often comments had to take into account the content of the previous comment and deliberately drive the discussion forward with another question). Another thing I hadn't planned on was how long it would take to compose discussion posts and emails – just so I was sure I was clear, positive, and not taken the wrong way. As far as the design goes, this course took an interesting approach in engaging the students as facilitators on a discussion – after the first few weeks the discussions questions and control of discussions was given to a pair of students, who selected the readings for the week based on a topic of interest to them. So, while the mentor modeled for me initially, we moved to modeling for the students.

Ann, a protégé, wrote:

Managing people is usually not a problem for me. But, as I began the online teaching adventure, I wondered, "How can the content be best organized to make it user-friendly and intuitive?" "Also, how can we get students to focus on the content from the beginning of a module with a particular starting point?" My protégé role allowed me to observe a section Jennifer uses to accomplish both focus on the content-at-hand and provide an intuitive, user-friendly interface. The first document in the module is called "Something to Think About". Another thing she used within each module as well, as in the syllabus, is a module assignment list. These two items will definitely be part of online courses I design, because they are beneficial to the learner and help the learner see tasks as more manageable.

Jennifer, the mentor, wrote:

It has taken me much practice to learn what works best for the students in terms of feedback and presence and how they fit in with the class management and design. As Hans explained about setting the guidelines into place about selecting specific days we would post, when to expect to hear back from us, and even

explaining what we perceived our role in the discussions to be, these techniques can help an instructor and the students keep their sanity. I also know that each class is different and will have different days they are active on. When it comes to discussions I tend to wait a few weeks as I delineate their patterns and then revise the days I'll be part of the ongoing discussions. For example this semester my students are not posting until the fourth day of seven for the most part, whereas in other courses that wouldn't hold true. I want to be there when I am most needed, to be effective. Keeping a line of communication open to the students is very high priority for me.

Perhaps one of the biggest lessons learned by the two protégés was that it is okay, even necessary, to say to students, "This is what you can expect and I will not be in the course 7 days a week." Similarly, protégés learned that there is no way to please all of the students in each course, something that appears more transparently in online courses. Online students tend to be more free with their comments, both positive and negative, perhaps due to the space provided by the medium.

Implications

Through the analysis of the field texts, the practices and processes for mentoring a graduate student in pedagogical practices for online learning several themes emerged, both pedagogical and procedural. Following are eight guidelines developed by the mentor and protégés for others interested in this process. While a mentor or protégé could use the guidelines, they are phrased mainly for the mentor.

1	Pre-Assumptions	Discuss pre-assumptions about teaching in an online environment. What are the myths and the realities?
2	Expectations	Discuss expectations with protégés about what they want/need from the experience, mentor may provide additional possibilities.
3	Power Relationship	Based on the protégés needs, establish the power relationship, preferably prior to beginning the experience so that the power relationship and balance will be evident to the students (e.g. they will see the protégé as an authority figure versus a peer).
4	Designate course roles	After establishing expectations and roles (power relationship), designate what roles the mentor and protégé will have within the course (e.g. designate content/topics to be developed, grading responsibilities, leadership roles for activities).
5	Model Instruction	Mentors should begin by modeling their instructional techniques and methods for the protégés. The modeling process should also be discussed so that the protégé doesn't only see what is being taught and how it is being taught, but why it is being taught in a particular manner.
6	Discuss Best Practices in Course Management	From early on in the experience it will be important for the protégés to have a grasp of course development (e.g. lead time for developing modules, organization and the need for multiple drop spots), course management (setting online hours, setting guidelines for students in terms of activities and especially online discussions, clearly outlined student expectations.
7	Reflection and Discussion	Both the mentor and protégé should keep an informal journal that records expectations, things to discuss, reasoning behind particular practices, and questions arising form the process. It will be important for the mentor to allow the protégé to feel comfortable asking questions such as "why did you do this" and take it as a learning point rather than criticism.
8	Challenging Beliefs	As the experience progresses, discussion that focus on not only the changes of the protégés beliefs but also insights provided to the mentor are invaluable. Part of the mentoring process should be that all parties are coming away with more knowledge and expertise.

Implications are broad, especially as the number of online courses continues to grow, and the number of faculty being asked to teach online parallels that growth. Graduate students headed for a profession related to teaching/instruction should posses the confidence and ability to teach online and it is the responsibility of graduate programs to provide real-world experiences for them, just as they would be engaged in similar experiences with teaching in traditional classes. Obviously there are some limitations to this approach, especially as many faculty are considered novices themselves in the area of online teaching, and the opportunities for mentoring graduate students in teaching online courses are narrow. However, providing such opportunities does help both mentors and protégés to be better instructors as they reflect on the process. How often do we as instructors implement an activity without fully considering the implications of changing the tool or modifying the activity, thereby making it more effective? This process simply asks us to revisit our reasons for doing so.

Just as student teachers are not able to "to begin to develop their new body of practical professional knowledge until they enter the classroom" (Furlong and Maynard, 1995), graduate students do not develop their practical teaching experiences until they enter the classroom—and this includes not only traditional classrooms but online "classrooms" as well. It appears the online teaching environment, as discussed earlier often new to the graduate student protégé, requires guidance and support, which is well documented in teacher education as we prepare K-12 teachers (Cameron-Jones & O'Hara, 1997). Furlong and Maynard, who base their conceptualizations of learning to teach on Schon's work (1987), provide us with insight into mentoring student teachers, a strong parallel to graduate students' learning to teach. In their mentoring process they describe coaching through a reflective approach, one in which the mentor takes on several roles: the mentor models appropriate strategies (e.g. rules, routines, establishing authority), the mentor coaches students in their teaching competencies (e.g. provides feedback, facilitates reflection-on-action), the mentor serves as a critical friend (e.g. observes student/protégé, re-examines instructional design), and the mentor serves as co-inquirer (e.g. partnership teaching) (Furlong & Maynard, 1995, p. 181). Moreover, as Furlong and Maynard explain, it is important for mentors to flexible in adapting to individual protégé's needs and levels (1995, p. 180). In fact in collaborative teaching, where the protégé is involved in the planning, teaching and evaluation of the lesson, the protégé has the opportunity to model the teachers' [mentor's] teaching at a level of great detail (Furlong & Maynard, 1995, p. 180). Similarly, examples of basic mentoring activities provided by Anderson and Shannon (1988) include demonstrating teaching techniques to a protégé, observing the protégé's classroom teaching and providing feedback, and holding support meetings with the protégé (p. 41).

Finally, the guidelines provided may also have applications in other settings, including teacher education or business, or other areas in which a mentor and protégé would work closely together. The content, in this case teaching in an online environment, might be replaced with other complex, time-consuming processes. For example, in education, processes such as dealing with parents or student discipline, or in business, complex business practices such as managing client accounts and projects. The important cyclic steps of defining roles and examining their duties, and creating or revising desired outcomes still apply to these scenarios and the clarification of roles and outcomes may ease the transition to more professional status for the protégé.

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Knowledge Construction through Social Interaction in Computer Conferencing Systems

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Introduction

Computer-mediated communication (CMC), specifically computer conferencing, has captured the interest of educators and psychologists especially in developing collaborative and participatory learning communities to promote higher-order conceptual learning and analytical thinking skills, and to support social construction of knowledge (Curtis & Lawson, 2001; Harasim, 2000; Kanuka & Anderson, 1998). Computer conferencing has the capability of creating flexible communication patterns (Berge & Collins, 1996), removing time and space restrictions, promoting self-reflective dialogues (Harasim, 1993), and creating a (discussion) forum for the construction of knowledge in the teaching and learning process (Heller & Kearsley, 1996; Henri, 1992).

Computer conferencing can provide intellectual on-going discussion focusing on a topic or relevant concepts within the course. In addition, it allows the learner to participate in-depth discussions by checking references, referring back to preceding topics and taking any amount of time to prepare a detailed comment or argument. Furthermore, computer conferencing can be used to facilitate group project work and encourage interactive participation and interpersonal collaboration between instructor and learners and among learners.

Computer-mediated conferencing, in particular asynchronous online discussion, is becoming increasingly a common instructional strategy in higher education because of its potential to support social interaction, collaborative learning, knowledge building, and critical thinking. Despite its popularity, there are few theories and limited amount of empirical evidence for the claims made about the potential benefits of this medium (Henri, 1992; Mason, 1992; Gunawardena et al., 1997; Garrison et al., 2001). There is still a lack of clarity of the dynamics of online discussion and how it may be utilized to foster students' cognitive development (Hara et al., 1998) There are few theories and little empirical research on what online collaboration or social interaction is and should be; how online discussions promote learning experience, in particular, higher-order thinking and knowledge construction. Thus, in support of research, this study was undertaken to scrutinize the patterns of student interaction taking place in online discussions and to examine the co-construction of knowledge among them. In addition, the study was aimed at guiding researchers and educators in the design and utilization of the efficiency of CMC that could increase collaboration and support learning.

Research Objectives

The adoption of computer conferencing for learning is still relatively under-researched. In spite of considerable research interest in this area, there still remains a need for examining the best use of the richness and efficiency of exchange provided by CMC content. It is important to have a better understanding of the potentials of CMC in learning experience. The primary objective of this study was to analyze the value and quality of the asynchronous online discussion for learning experience and knowledge construction through social interaction. Specifically, the aim was to investigate:

- the social participation and interactive patterns in asynchronous online computer conferences characterized by explicit, implicit, or independent interaction
- whether the interactive nature of CMC exchange support and encourage the development of knowledge and practice of higher-order thinking skills through collaborative learning process
- pedagogical factors that may have influence on the level of knowledge building and the type of collaborative learning discourse

Theoretical Framework

The important assumption of constructivism is that knowledge is actively constructed based upon unique set of experiences and beliefs. In constructivism, knowledge is always under construction as a cumulative history of interactions in authentic and meaningful contexts. Radical constructivism, a form of constructivist theories, claims

that knowledge is the individual cognitive process of the human mind, or the function of cognition that serves the organization of the experiential world. The world is constructed in minds through the construction of personal realities or experiences. The other prevalent position in constructivist learning theories–social constructivism- claims that learners obtain knowledge and make sense of their experiences through communication, or language, as they explore new perspectives and communicate their understanding with others (Jonassen, et al., 1995; Hein, 1991; McGuire, 1996; Warschauer, 1997). From a social constructivist viewpoint, learner is actively acquiring the knowledge through language in social experiences. Vygotsky (1978), most often associated with social constructivism, emphasized the effect of social experiences that occur over time in a contextual and situated synthesis on knowledge construction. In other words, knowledge is constructed through social interaction and interpersonal communication based upon interpretation of information and learning experience within a context.

Computer conferencing or online discussions can be used to encourage interactive participation and interpersonal collaboration between instructor and learners and among learners. Collaboration among learners enhances the quality of learning and formulates a deeper understanding of the content. Jonassen et al. (1995) notes that "learning is necessarily a social dialogical process in which communities of practitioners socially negotiate the meaning of phenomena" (p.9). However, designing and maintaining a learning environment (e.g., asynchronous online discussions) in which knowledge is constructed through social negotiations is challenging. It is essential to understand the way interactive discussions through computer mediated communication support the co-construction of knowledge.

Gunawardena, Lowe, & Anderson (1997) developed an Interaction Analysis Model - serves as the theoretical framework for this study- to specifically examine "the negotiation of meaning and co-construction of knowledge in collaborative learning environments facilitated by computer conferencing" (Gunawardena et al., 1997, p. 397). Interaction Analysis Model is based on constructivistic conceptions of learning. Gunawardena et al. (1997) addresses two kinds of knowledge creation that take place in any shared learning experience, the "individual" and the "social." They recognize the interdependence of both the individual and social construction of knowledge in their model. They developed this model from a constructivist perspective by using the metaphor of a patchwork quilt block to describe the significance of interaction. Within this model, the notion of interaction in a computer-mediated conference is defined as the production of new knowledge and/or the understanding of new meaning. The model proposes a five phase evolution of knowledge construction: Phase I) sharing/comparing of information; Phase II) discovery and exploration of dissonance or inconsistency among ideas, concepts or statements; Phase III) negotiation of meaning/co-construction of knowledge; Phase IV) testing and modification of proposed synthesis or co-construction; Phase V) agreement statement(s) /applications of newly-constructed meaning.

Methodology

Context

The data for this study were collected over a 14-week semester from an online master's course offered by the college of education at a large Midwestern U.S. university, designed for K-12 teachers and other educational practitioners. The course management tool, WebCT, was the main course component and primary communication medium among students. Discussion board of WebCT was utilized for the majority of class work and learning experience of students. Participation to weekly discussions at least three times was required. The conference transcripts of three main discussion topics were selected for this study to analyze the shared learning experience through online discussions of WebCT.

Subjects

There were 15 students enrolled in the course. Two were undergraduate students, eleven of them were masters, and two of them were doctoral students. 60% of the students were working full time, 33.3% were working part-time and 6.7% were not working. The majority of students were adult learners with an average age of 29 and 73% of them working as a teacher or an educator in different fields such as elementary school computer teacher, secondary school English teacher, social studies teacher, community college instructor, and higher education dean at a community college. 36% of the students had never taken a distance education whereas 43% of them took more than one distance course. Therefore, the majority of students were experienced in learning at a distance.

Data Collection & Analysis

In this study, quantitative and qualitative research methodologies were conducted. For quantitative modes of inquiry, survey was conducted to collect demographic and descriptive data. The survey was completed by 14 of 15 students giving a return rate of 93.3%. Additionally, for the first research objective on social participation in computer conferencing, descriptive statistics such as the number and length of student postings contributed each discussion topic were calculated. Moreover, in order to understand the underlying patterns of interaction in the structure of the course, Howell-Richardson and Mellar's (1996) interaction maps that provide visual representations of electronic conferencing, and Henri's (1992) criteria related to message interactivity (i.e., explicit, implicit, or independent statements) were combined to create conference activity graphs to illustrate the flow of the discussions and the direction of the postings. The unit of analysis for those was selected as the "unit of message".

For qualitative part, interview and content analysis methodologies were conducted. The course instructor was interviewed to obtain background information about the course (i.e., learning objectives, design strategy, and assessment) and her perceptions on student learning experience. Content analysis was chosen as the main methodology of this study to analyze the computer conference transcripts to examine the co-construction of knowledge in computer conferencing. All participant names were replaced with pseudonyms in conference transcripts to assure the confidentiality. To answer the second research question, the content of the messages of three discussion topics was coded based on Gunawardena et al.'s (1997) interaction analysis model using computer assisted qualitative data analysis package, Atlas.ti.

According to Gunawardena et al. (1997), a message as a whole embodies a student's cognitive activity and contribution to the construction of knowledge. Thus, they used the complete messages in discussion forum as the unit of analysis. However, the unit of message did not fit in this study because some messages contained very little information; others contained three or more distinct ideas, comments, complex arguments or hypotheses addressing different concepts or questions raised during the discussions. Therefore, the unit of analysis was selected as the unit of thematic (meaning). Henri (1992) justifies this type of unit of analysis by arguing that "it is absolutely useless to wonder if it is the word, the proposition, the sentence or the paragraph which is the proper unit of meaning, for the unit of meaning is lodged in meaning" (p. 134).

Gunawardena et al.'s framework was slightly modified to make it more relevant and apparent for coders. It was also modified because of the differences between thematic unit of analysis and complete message unit of analysis used by Gunawardena et al. (1997). The primary coder analyzed the data according to this framework on three separate occasions to validate the coding procedures of the modified model. Descriptive rules along with examples for the coding process were explained to two other coders in a training session. Then, two coders analyzed a portion of the data (10% of total) independently. The final inter-coder agreement was 85%.

Findings & Discussions

Participation Results

Overall participation results in the course are as follows: Students posted a message on the discussion forum per week approximately 2 times. In order to post a message, they spent 25 minutes on average. In addition, students replied to 2 messages on average in a week.

Table 1 below provides an overview of participation levels for each discussion topic area. In term of the discussion topic, Online Educator, 7 out of the 15 students contributed to the discussion in about one-month period. The average number of posts per student was 2. For Attitude, 8 out of 15 students in the class participated in the discussion in about three-month period with an average number of 2.4 posts per student. 7 out of 15 students contributed to the discussion topic, Assessment, in 40-day period. The average number of messages per student was 2.6.

Table 1. Participation by Topic

Discussion Topic	Discussion Period	Total # of students participated out of total # enrolled	Total # of messages	Total # of instructor messages	Average # of posting per student	Total # of words
Online Educator	September20-October19	7 of 15	14	0	2	2266
Attitude	September18-December6	8 of 15	19	0	2.4	1941
Assessment	November2-December10	7 of 15	18	4	2.6	2441
Total/Average		22/7.3	51/17	4/1.3	2.3	6648/2216

Findings revealed that the level of overall participation in the course and the participation to three discussion topics was low. The statement made by a student to an open ended survey question described clearly the learning environment in terms interaction and participation: "I need people to respond to questions/comments." However, it is found that students were in control of the flow of discussions, in other words, they dominated the discussions, not the instructor. This is most likely because of one of the course goals: to create a constructivist and flexible online learning environment for students to develop cognitively demanding knowledge by interacting with their peers. The instructor was purposefully providing a learner-centered context in which students were in charge of their own learning by responding to others critically and thoughtfully. It is also found that instructor's contribution to discussions made no such difference in terms of the participation level of students.

Interaction Patterns

In discussion topic- Online Education, the discussion was quite straightforward, every student responded to the previous comment. It was found that student postings were more explicit and directly referred to others in their content when there was a starter and facilitator in online discussion. In discussion topic - Attitude, every message was connected either explicitly or implicitly. Unlike in Online Educator, some postings were referenced by more than one student. It was also found that students began to pay attention to multiple threads as the discussion progressed and the discussion became more continuous and engaging especially in the later stages. In comparison to Online Educator, there was a synergistic interaction among students in Attitude.

The Assessment was the only topic of the three, which had a teacher presence (see Figure 1). Instructor posted a prompt to start the discussion and contributed with three other messages during discussion: her second message was another prompt that was just posted after the first one supporting the previous one with explanations, examples and resources where students can find information. The other postings of instructor were initiating prompts such as "Now it is another person's turn to answer a question" or "Also think about informal assessment for your ILO Orientation, what and how?" All posts of the instructor were coded as Phase I (sharing/comparing of information). Overall, her role can be described as a triggering role because of providing background information that culminates a question.

Discussions in the Assessment topic mainly followed the questions or comments posed by key participants. In this discussion, the key participants were the instructor and Barbara (see Figure 1). Especially, Barbara played a role of a facilitator by providing arguments, resources, examples, and responds to others. She also acted as if a summarizer of the messages which gave more structure to the discussion and made it more engaging. For instance, Barbara (#11) not only implicitly responds to others who made comments about her previous posts but also explicitly responds to a peer by making statement of agreement, sharing more information, and finally asking more initiating questions to carry on the discussion.
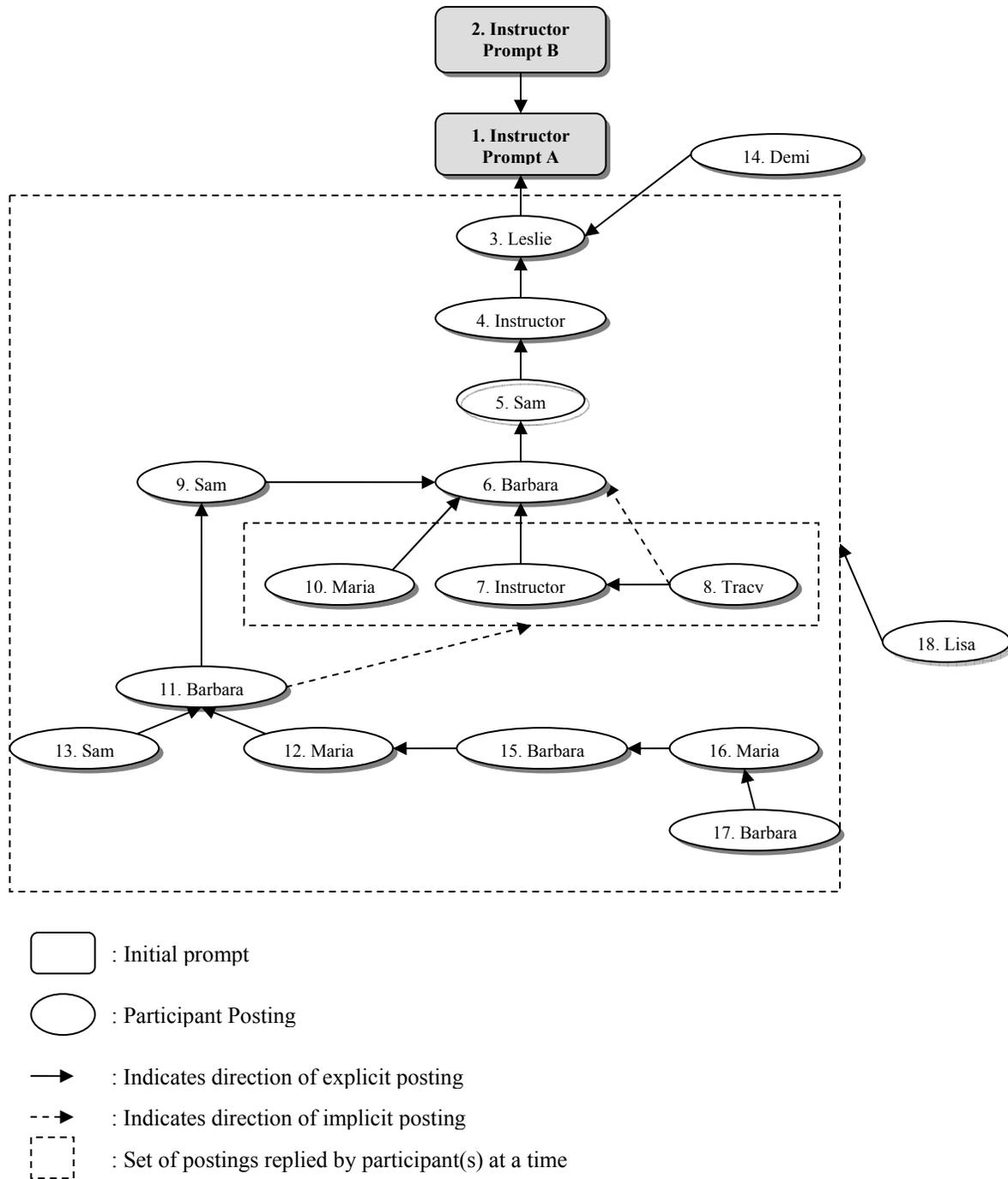
Figure 1. Interaction Pattern of Discussion Topic – Assessment

Knowledge Construction Phases

The analysis of data gathered for the content analysis showed that the predominance of messages fell into the first phase of co-construction of knowledge: sharing and/or comparing of information (see Table 2). For instance, the message below, which was coded at Phase I, exemplified two types of statements. Maria, in her message, provides background information citing a resource along with her personal opinion, observation and

reflection. Later, message concludes by asking questions to trigger a discussion in order to obtain group consensus on the new information. This is an example for the early process of social negotiation of knowledge construction.

As I was reading chapter 3 it struck me that probably the most important thing in a distance program, according to McVay is, "the student's ability to obtain information and research materials." (McVay, 54) [PHI/A] She discusses a scenario where 3 students are taking a distance course: 1 in a rural area, 1 in the Australian Outback, and one at a University campus. [PHI/A] Our situations do not mirror McVay's theoretical situation, [PHI/A] but we are all spread out; [PHI/A] some of us at ISU and some of us in rural areas--while some of us are just so busy that it's as if we're in the Outback. [PHI/A]

From the Library Support for Distance Education, one of the important principles they believe should be incorporated into DE is, "Empowerment of students to access information and to perform their own research on a self-service basis." [PHI/A]

The reason why I bring this point about empowerment up is because in my opinion it is vital that students participating in DE already have good research skills and then they also need access. [PHI/A] So, who is responsible #1 to make sure that students (of all ages) have the research skills,[PHI/D] and #2 who will make sure that students have access (not as a product of students shelling out lots of cash)? [PHI/D]

There is so much research on equity in access that I'm sure some of our professors have had a hand in researching. [PHI/A]What are everyone's thoughts? [PHI/D]

Table 2. Knowledge Construction Phases by Topic

Topic	Phase I		Phase II		Phase III		Phase IV		Phase V	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Online Educator	106	72	12	8	20	13	9	6	1	1
Attitude	46	40	23	20	30	26	16	13	1	1
Assessment	123	82	2	1	18	12	6	4	1	1
Total/Average	275	66	37	9	68	16	31	8	3	1

On the other hand, several exchanges showed evidence of movement from Phase I to higher phases. Of the three discussion topics, Attitude had the highest percentage of Phase II (20%), Phase III (26%), and Phase IV (13%). The evidence of higher phases was observed, in particular, when the discussion became more engaged and interactive as it progressed. For instance:

Leslie (#13): The mentor is also the person that could give the DE student that social benefit. [PHIII/A] If the mentor acts as an advocate for the student, perhaps gets to know them more on a personal level, then the DE student might be more apt to have a good attitude about the class, even when the class work get rough. [PHIII/D]

But, even the students with the best attitudes can lose motivation and start feeling insecure. [PHII/A] If there are good people supporting the program (teacher, mentor, counselor, parent community), the students will have a much better chance of a successful learning experience. [PHIII/D] So, in many ways the DE program is only as good as the people that support it. [PHIII/E]

Barbara (#15): Tying in attitude and the cultural differences we have been discussing I am wondering if some cultures would do better with attitude. [PHIV/A, B] I am thinking specifically of Asian countries where the martial arts are taught. I am currently taking Taekwondo and positive attitude and perseverance are two of the tenants that are taught. [PHIV/C]

In the example above, we see how a discussion develops from Phase III (sometimes iteratively, from Phase III back to Phase II) when Leslie integrates and synthesizes the information through co-construction of knowledge to

Phase IV when Barbara tests the proposed synthesis against both received fact as shared by others and her existing cognitive schema as well as her experience.

It was interesting to find out that although there was no teacher presence, discussions moved from early phases to later phases. Therefore, it is possible that meaningful, critical, and reflective discussions can occur without the presence of an instructor. This indicates that computer-mediated conferences can promote social construction of knowledge and collaborative learning in a constructivist learning context.

Overall, the findings showed that knowledge construction took place in early phases of interaction analysis model by Gunawardena et al. (1997). Higher cognitive skills and analytical thinking abilities such as metacognitive activities were observed little in the discussions. There are number of reasons for little presence of higher phases of knowledge construction. One reason is that although the primary medium for the course is discussion forum, no guidance or structure was established for discussions. This might have prevented students to concentrate on a topic in order to make critical reflections and provide thoughtful comments in a timely manner. The recommendation is for instructors to structure discussions in a way that students will have a common set of rules for discussions including participation requirements, certain dates for initial posts, certain discussion topics, and description of the length and the quality of messages.

Another possible reason for the little presence of higher phases of knowledge co-creation is because of the lack of a facilitator or a moderator. Findings revealed that students developed knowledge and critical thinking skills at higher levels when there was strong model of a facilitator. In addition, it was also observed from interaction maps that the meaningful remarks made by a facilitator promoted the quality and quantity of interaction among students. The second recommended instructional strategy for instructors is to be an active member in discussion and play a role in guiding students toward higher levels of learning. According to Hara et al. (1998), the discussion moderator "is a key player in determining the depth of dialogue and overall knowledge generation processes." (p. 28). Gunawardena et al. (1997) also point out that the moderator "is open to conceptualizing the learning process as joint construction of knowledge and negotiation of meaning." (p. 428).

Conclusion

Understanding the experience of learning and the overall pattern of knowledge construction that emerges from computer-mediated conferencing assists educators to acquire intended and worthwhile learning outcomes. This study explored the dynamics of learning community at a graduate level course facilitated by computer-mediated conference in terms of two main concern areas: interaction patterns and knowledge construction through social negotiation among students. Using Gunawardena et al. model (1997), co-construction of knowledge was found primarily at the first phase as a result of students' conversation. On the other hand, several exchanges showed evidence of movement from Phase I to higher phases. The findings show that a lack of structured, organized discussion and the absence of a moderator may have contributed to these results.

The analysis of data revealed that knowledge construction through social interaction took place. Students built on others' contributions to co-create knowledge. However, this learning experience could be optimized to increase the participation level and obtain high phases of Interaction Analysis Model (Gunawardena et al., 1997). One of the students expressed a need for participation in discussion forum as quoted below,

> I think it's important to establish a comfortable forum for student discussion. For me to participate, it's important that I feel that: a) I have something meaningful to contribute, b) I can post those reflections in a non-threatening environment, and c) my reflections serve a meaningful purpose (i.e. they contribute to my learning and the learning of others in the class and are not simply posts for the sake of having us post to the discussion board).

Rich instructional systems and learning experiences can be designed by understanding how knowledge is constructed and distributed in CMC environment. Further research is needed in understanding how students develop cognitively demanding knowledge through computer conferences. What are the factors and pedagogical strategies that affect higher-order thinking skills and knowledge construction in a collaborative online learning environment? Does online discussion as a component of a blended learning environment promote social construction of knowledge? There remain many questions and areas to be further investigated. These studies will help us understand the richness and potential of computer conferencing in learning experience.

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Electronic Databases, Accreditation, and Assessment

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Abstract

Accrediting bodies, such as the National Council for the Accreditation of Teacher Education (NCATE), strive to improve the quality of teacher preparation programs. Through assessment-based analysis of institutional practices, NCATE accredits institutions of higher education that successfully address six Unit Standards. Although all the NCATE Standards are important, this article is focused on aspects and issues surrounding Standard 2, Assessment and Unit Evaluation. It is the intention of the authors that their experiences with the NCATE accreditation process will help other institutions develop their own system, with an understanding of what will make it a worthwhile endeavor. What follows is a combination of guidelines for building the assessment system, lessons that we learned, and words of wisdom about the overall process of accreditation.

In the current educational climate of the "No Child Left Behind" Act and significantly increased standardized testing, many states within the United States are mandating that institutions of higher education involved in the preparation of future teachers be accredited by national or state recognized accrediting agencies. Some of these accrediting bodies include the National Council for the Accreditation of Teacher Education (NCATE) and the New York State Board of Regents and the Commissioner of Education. This move toward accreditation has necessitated the in-depth examination of all teacher education programs and education faculty professional development.

Accrediting bodies, such as the National Council for the Accreditation of Teacher Education (NCATE), strive to improve the quality of teacher preparation programs. Through assessment-based analysis of institutional practices, NCATE accredits institutions of higher education that successfully address six Unit Standards, which include: 1) Candidate Knowledge, Skills, and Dispositions, 2) Assessment System and Unit Evaluation, 3) Field Experiences and Clinical Practice, 4) Diversity, 5) Faculty Qualifications, Performance, and Development, and 6) Unit Governance and Resources. In addition, the various teacher education programs within an academic institution must also meet the program standards within their respective professional associations. The process requires comprehensive curricular reviews to determine the extent of compliance with the individual national associations (National Council of Social Studies, National Council of Teachers of English, National Society for Teachers of Mathematics, National Science Teachers Association, for example). Each organization has a series of standards that define the goals and objectives for teachers and teacher candidates. Designing or redesigning teacher preparation programs from standards subsequently aligned to assessment is a vastly different undertaking than designing programs from a curricular base, which is what has traditionally been done in teacher education (Pankratz, 2004). Since viewing teacher education through a standards assessment lens rather than through a curricular lens is a somewhat new initiative, it can prove at times to be quite challenging.

To better understand the NCATE accreditation process, it's important to understand some terminology used by the agency. As accreditation efforts help to ensure that the education programs within an institution of higher education meet the needs and expectations of the entire professional community, it's important to define that community and its constituents. According to the NCATE Glossary of Terms, the Professional Community is comprised of "full- and part-time faculty (including clinical faculty) in the professional education unit, faculty in other units of the college/university, P-12 practitioners, candidates, and others involved in professional education" (NCATE, 2006). Essentially, the community includes all stakeholders that play any type of role in a teacher preparation program.

Within the Professional Community lies the Professional Education Unit (PEU). The Unit is defined as "the institution, college, school, department, or other administrative body with the responsibility for managing or coordinating all programs offered for the initial and continuing preparation of teachers and other school personnel, regardless of where these programs are administratively housed" (NCATE, 2006). At most institutions, the PEU consists of faculty from a variety of areas of academic study. These can include English Language Arts, Foreign Language, Mathematics, Sciences, Social Studies, Fine Arts, Business and Economics, and of course, programs within education. In addition, school districts also play an important role in preparing teacher candidates, both as affiliates who support education programs and as consumers who rely on the institution as a source of quality educators, administrators, teacher resources, and professional expertise. The most essential members of the Professional Community include teacher education candidates, who interact with all of the other members of the Professional Community, influencing and being influenced by all of the previously mentioned groups.

It is in conjunction with, and with the cooperation of these aforementioned groups, that institutions of higher education attempt to address the six Standards outlined by NCATE. Although all the NCATE Standards are very important, this article is focused on aspects and issues surrounding Standard 2, Assessment and Unit Evaluation. It is the intention of the authors that their experiences with the NCATE accreditation process will help other institutions develop their own system, with an understanding of what will make it a worthwhile endeavor. What follows below is a combination of areas in which we were successful, lessons that we learned, and words of wisdom along the lines of "if we knew then what we know now."

First and foremost, is important to have the administration at your institution fully supportive of the accreditation effort. In general, this is not difficult to acquire as most administrations realize the criticality of accrediting their colleges, schools, and/or divisions of education. (In some states, accreditation by a federally or state-recognized accrediting body is required!) However, while verbal support from administration for accreditation is often forthcoming, it is important that money, release time, and most importantly, institutional cooperation also be given.

Monetary support is essential for many of the initiatives that need to be undertaken to achieve accreditation. It is likely that a dedicated "NCATE Coordinator" will need to be hired – or at least given release time – to organize this significant undertaking. Many aspects need to be organized for the accreditation process, including data collection, subcommittee formation, and cooperation from other areas of the university such as administration, the arts and sciences, and media services. As well, writing the final institutional report is an enormous job and clearly needs to be facilitated by one individual so that the document, likely put together by various individuals or groups, reads as if written in one voice. These are merely a few of the vast responsibilities of an NCATE Coordinator and this individual needs to be compensated by the institution in some regard.

Another undertaking that requires monetary support is data collection for unit assessment purposes in order to provide data, or evidence, that students are attaining goals or objectives supported by the institution's conceptual framework. Often institutions do not consider the cost of mass mailings of instruments such as alumni or employer surveys, but for larger institutions, these could number in the thousands for any individual survey. As well as mailing costs, photocopying, paper, envelopes, and return envelopes, also add to overall costs. Further, once these instruments are returned, analysis of the data takes place and in one form or another, this also costs money. If these instruments are electronic, then the development of web-based surveys could necessitate purchasing specialized software or paying a programmer/developer. If survey instruments are hardcopy, then data analysis needs to be done by hand. While a committee chair or professor could do this, it is advisable to hire a research assistant to complete this extensive, and often times tedious, work. As this type of data collection is meant to be a continuous, sustainable endeavor it is important that a position or part of an individual's workload be dedicated to this task and supported at the outset of undertaking accreditation. However, it is strongly advised that an electronic data-gathering/data-analysis interface be adopted. This is preferable not only because it is a more efficient way to work with necessary data, but it also facilitates the dissemination of gathered data to the involved parties, i.e. program chairs, directors of student teaching, deans, etc. It is key that these various groups or individuals communicate easily and have access to candidate information as they progress through the various teacher preparation programs.

Other monetary expenses may come in the form of course release or extra service pay for faculty or staff. While often institutions give faculty the assurance that work on the accreditation effort will count as scholarship or service work, to the rest of the professional communities, that doesn't count for much in terms of an individual's professional profile. As well, accreditation can be the whole of an individual's service work and then some. It is important that faculty working on the accreditation effort sacrifice neither their scholarly activities, nor the entirety of other service work, to accomplish this monumental task. It is therefore important that they be given time or other compensation to complete work associated with NCATE accreditation.

The writing of the institutional report is a difficult endeavor at best and involves the cooperation and collaboration of many diverse parties and individuals. It takes an individual who has a certain amount of seniority within an academic institution, as well as one who has substantial experience with the NCATE process. It's best if the individual coordinating the writing of the report is the NCATE coordinator and/or senior faculty. If this individual prefers to pass the writing or editing of the Institutional Report on to a faculty member who may be a better writer, that can work also, however the organizing and managing of the report needs to remain in the hands of the NCATE Coordinator. The reason for this is that the information for many aspects of the report need to be culled from administration, institution-wide committees, personnel in charge of university resources and governance, faculty in the arts and sciences, as well as faculties and committees within education. Within normal institutional operations it is quite difficult to coordinate all these sources of information, not to mention trying to do so under a deadline. Only an individual with some clout in the university could feasibly do this with any success and expediency. Not to mention that only a long-standing member at an institution would know where to go for needed information without having to spend extra time researching such resources. Clearly, it's unadvisable to leave accreditation solely to junior faculty, although certainly they can play important and necessary roles within such an effort.

To that end, it is important that the whole or the majority of accreditation responsibilities not fall to untenured faculty. Unfortunately, more often than not, untenured faculty are the ones who are given various accreditation jobs to complete without having the proper knowledge or support to accomplish them. It is senior (tenured) faculty who should be working on the various accreditation initiatives and reports, as they are the ones who are able to most efficiently and effectively complete this work. Senior faculty has knowledge of the institution's resources, human or otherwise, to enable them to implement necessary initiatives or acquire needed information quickly. Specifically, facilitating the acquisition of assessment data, the discussion with the involved faculties of data-driven conclusions that may modify professional practice, and most importantly, the writing of the institutional report, should all be undertaken by dedicated, tenured faculty members.

Before you enter into the accreditation process, it is important to remember not only the items discussed above, but also the following set of guidelines. These guidelines will assist in creating an overall approach to accreditation with not only an eye on the beginning stages, but also the continuing processes, sustainable initiatives, and final outcomes. They facilitate an overall view of accreditation in more or less a linear fashion, and assist in making it a much more effective and efficient process. The recommended guidelines for NCATE accreditation are as follows:

1. Create your conceptual framework with an eye heavily trained on performance-based outcomes and assessment. Make it a collaborative, group effort, involving members from all areas of the professional unit (NCATE, 2000). Critical to the accreditation process when defining the framework is the involvement of faculty from the Arts and Sciences. Input from all these groups and individuals will ensure a well-rounded and representative work including philosophies and ideologies from all professionals involved with teacher candidate preparation.

2. Define your objectives from your conceptual framework. Make them clear and straightforward. The group that created the conceptual framework is generally the best group to create the objectives.

3. Form a different committee to create assessment outcomes. While the group that created the conceptual framework and resulting objectives can also create the assessment outcomes, it is better for a group with a fresh perspective to do this. It will be easier for them to align the assessment with the objectives without the confounding nuances of the conversations that surrounded the creation of the conceptual framework and objectives. Be sure to include representatives from all teacher certification programs, field placement and Arts and Sciences. It is also crucial to the assessment effort to ask that a representative from Institutional Research or Alumni Affairs sit on the committee as well. This is important because the assessment effort is larger than teacher education candidates attending university. Data collection may also extend to alumni, employers, field supervisors, parents, P-12 students, and community members.

4. Define your assessment outcomes from your conceptual framework objectives. Make them performance-based and behavioral. It's important that they are written in terms that are measurable rather than general or vague. This is essential when defining dispositional outcomes, which are often hard to identify. It is helpful to thoroughly research this area in order to understand the difficulties of measuring dispositions quantitatively.

5. Since unit assessment involves all teacher certification programs, it is important to bring the assessment outcomes that the committee created to all faculty members involved in the accreditation effort. This can be accomplished either through assessment committee representatives bringing the outcomes to their home departments or having a large general session where all faculty could attend and the outcomes could be

presented, discussed, modified, and hopefully, adopted. It is important that this step occur because NCATE accreditation is not meant to be simply a "paper chase." It is meant to be a process that promotes systemic change within teacher education and preparation. In order for this to occur, all individuals concerned with teacher preparation and accreditation need to be involved in decision-making, either in a large group or small committee. This allows faculty and members of the academic unit to take ownership of the accreditation process and any changes resulting from it. As well, when all are involved in decision-making, each individual is able to discuss, and thereby promote, the goals, frameworks, outcomes, etc. that are adopted by the unit at large. This promotes an institutional culture in which constituents are informed and invested in accreditation, making the process less of a set of hoops to jump through but rather, an opportunity to reflect upon and improve how teacher education candidates are prepared.

6. It is also important not to forget that unit assessment involves the assessment of unit operations as well as assessment of degree-granting programs. Unit operations encompass activities such as the evaluation of advisement and student teaching placements. It also involves the review and evaluation of the assessment system as a whole and an institution's conceptual framework. Ordinarily, a university or college has evaluation measures already in place for areas like academic advisement so it is only a matter of obtaining the necessary information from the appropriate office and documenting the process. For endeavors such as assessing conceptual frameworks or assessment systems, new procedures may need to be developed, implemented and documented.

7. Once the academic unit has adopted the assessment outcomes, align them to both the Special Professional Association (SPA) standards for each degree-granting program. In this way, when the assessment outcomes are subsequently aligned to existing data collection instruments, the instruments measure both assessment outcomes and SPA standards. Also, it is more than likely that modification of the instruments will be necessary to better measure the outcomes. In addition, some of the outcomes may not be assessable with the current instruments.

8. Create instruments, processes, or programs to measure the remainder of the assessment outcomes. Be sure to have a mixture of both qualitative and quantitative measures for the overall collection of outcomes. More than one assessment measure for any one outcome is desired, but not required. Be sure that the assessment measures or processes that are put into place are sustainable, reasonable, and manageable in terms of an overall assessment program. If unreasonable assessment procedures are established, it is likely that data will not be able to be collected over time and therefore candidate change, growth and improvement in attaining the knowledge, skills, and dispositions put forth in the conceptual framework will be impossible to track.

9. It is especially crucial to have input from members of the PEU from P-12 environments throughout the assessment process, but especially in steps 7 and 8. It is with their help that manageable instruments will be created and adopted, and ultimately implemented. If the P-12 constituents are a part of this endeavor from the outset, they will feel invested in the conceptual framework, assessment system, and the accreditation effort as a whole. Without their cooperation, much needed evidence will not be gathered nor will the conceptual framework be promoted to all facets of education candidates' experiences.

10. Align data collection instruments and evidence to the Four Transition Points outlined by NCATE. It is fine to have more transitions, gateways, or checkpoints than those that are reviewed by the national accrediting body, but it is important that there are not less than four. The four transition points NCATE examines are 1) entrance into education programs; 2) entry into student teaching, internship, practicum; 3) exit from student teaching, internship, practicum; and 4) exit from education programs. Divide these four transition points into initial and advanced certification programs as both types of certification must be accounted for at each point. Be clear what types of assessments are gathered and reviewed at each transition point. Create rubrics or descriptors of acceptable performances/scores/etc. for each assessment at each point. State with what body, office, or person, the transition points are tracked for each candidate and how successful transition from one point to the next is communicated to necessary individuals (i.e. program chairs, unit assessment chairs, deans, etc.).

11. Investigate and adopt efficient data collection measures and procedures. Create electronic databases and programming routines to extract standardized test data and other demographic data that may be available for assessment use. Be sure answers to your surveys can be compiled and analyzed electronically. Web-based instruments that export into programs such as Microsoft Access, Microsoft Excel, or SPSS are preferable. As well, server space that is common to all stakeholders in the PEU should be attained to house these databases. If that is not an option, create surveys that are answerable in Scantron format so that the hardcopies can simply be run through a machine and answers aggregated and data tabulated. Using entirely

hardcopy data collection instruments is not viable for sustained data collection. A full-time research assistant would need to be hired to input and analyze data from numerous candidate surveys, employer surveys, and/or alumni surveys. This is especially pertinent if you have large population of pre-service teacher candidates. You may find, initially, that your institution has a multitude of data already, but collected in a variety of places and databases. It is important to bring this information together in one place in order to make analyses more efficient and to facilitate the communication of important information. The ability to link all of the data collection measures and databases will be an issue that should be addressed at the planning stages of your Assessment System.

12. Prior to beginning any data collection, attain approval or exemption from the Use of Human Participants examining board at your institution. This is a critical step in ethical assessment and data gathering processes. To utilize all the data that you will likely need in your assessment, such as GPAs, curriculum codes, perhaps gender, ethnicity or age, you will need to attain this type of permission from your university.

13. Begin data collection. Be specific about when you would like surveys or information returned from your various participant populations. Include cover letters that explain the accreditation process and the importance of responses with surveys to potential employers or alumni. Be sure that supervisors or professional development educators are aware of candidate deadlines for returning data collection instruments. This will help to avoid updating "finalized" data.

14. Input and analyze incoming data as soon as it is returned. Procrastinating on this effort merely leaves piles paper and many computer files lying around with the potential for getting lost or misplaced. It is also critical to analyze data immediately so that timely conclusions and decisions about improving professional practice can be made and implemented.

15. Be sure to aggregate and disaggregate incoming data. Aggregated data is useful for assessment committee, unit, and administrative purposes. Disaggregated data is more useful to individual degree-granting programs as well as departments in the arts and sciences that prepare teacher education candidates with specific academic concentrations. Both aggregated and disaggregated data must be efficiently disseminated to the appropriate programs, governing bodies, and offices so that conclusions can be drawn about professional preparation of teacher education candidates. These types of data can also be used as evidence during an NCATE site visit. It is therefore, imperative that all data collection instruments are designed so as to identify a variety of anonymous, demographic information (such as degree program, arts and science concentration, year in university, etc.). These demographic data will also assist in linking all gathered information together and analyzing it for trends across programs, concentrations, gender, etc.

16. Once data collection measures have been are in place, measures of fairness and consistency should be ensured. If standardized tests are being used, reliability and validity information can generally be obtained from the testing companies. When "homegrown" surveys are in use, true statistical validity and reliability testing may not be an option. It is exceedingly difficult to validate self-made questionnaires so other measures of ensuring fairness and consistency should be implemented. One example would be to assemble a small committee of individuals not involved in the original alignment of "homegrown" instruments to conceptual framework outcomes. This ad hoc committee could then examine each of the instruments and document whether they do or do not align to certain outcomes based on specific criteria. Granted, this is not a way to ensure validity or reliability in the statistical sense, but it is taking a step toward ensuring fairness and consistency and that is all that NCATE requires. (In fact, when reviewing NCATE documentation, they do not use the terms "validity" and "reliability." Instead, their exact language is "fairness" and "consistency.")

17. As an assessment committee, distribute the aggregated and disaggregated data to chairs of the education departments, chairs of the arts and sciences departments which participate in teacher education, chairs of the NCATE standards committees (if your institution has those), members of a unit governing body and other involved stakeholders. This can take a vast amount of time to organize initially, but with the help of a graduate assistant or work-study student, the process can progress much more quickly. It is also helpful to include a detailed, explanatory cover letter with your data, explaining the instrument(s) from which is was obtained, the purpose for obtaining the data, and how it was analyzed. Once the data is properly organized and the cover letter created, it is simply a matter of making photocopies and doing (mostly) inter-office mailings.

18. Allow some time for departments and committees to review the aggregated and disaggregated data and to draw conclusions based on the data analysis. What does it indicate about the professional practice within in the programs? Do areas need to be modified? Do certain aspects need to be recognized and praised for their success? Questions such as these should be carefully considered and discussed.

19. Once smaller groups have had a chance to review the data, each should decide upon recommendations to make to the overarching unit-governing group regarding modifications to teacher candidate preparation. Since professional practice is being assessed as a "unit," the recommendations made by one group or committee effect all the education programs and must be discussed, decided upon, and adopted as a whole. If not, it is not "unit" assessment.

20. If the larger unit-governing group accepts recommendations for the modification of teacher preparation by program, or as a whole, then the revisions must follow the normal institution process, or "lines of authority," for programmatic changes. This usually involves the completion of standard institutional forms, acceptance by various curriculum committees, university governing bodies, and ultimately, the signature of the university or college president and/or provost.

21. Recommendations to modify professional teacher educator preparation need to be put into practice in a timely manner. These recommendations can include omitting specific application procedures because they are redundant, raising or lowering required GPAs or standardized test scores, or emphasizing the use of scaffolding in teaching throughout the teacher preparation programs. Modifications can be of a minor, more administrative nature, or more far-reaching into education courses and/or field experiences. Whichever the case, it is important to discuss modifications to teacher preparation as a large group and come to mutually agreeable conclusions. Otherwise, modifications or changes in practice will only be done by a few, rather than reaching across the unit. As well, a timeline for larger changes to be implemented may be needed so that involved individuals can work on and institute initiatives in a manageable way.

22. Assess modifications using reliable and valid data gathering techniques (surveys, focus groups, pre-tests and posttests with a spectrum of stakeholders). In some cases, be sure to allow enough time for a new initiative or program modification to take hold in the institution before assessing it. Assessing a modification too early can result in skewed data and an inaccurate perception of the success or failure of the change. Similarly, assessment of a modification too late can result in the propagation of an unsuccessful or even harmful change much too long. The nature of the program modification, as well as input from initiative implementers and candidates, will likely dictate when to assess a change to the professional preparation of teacher education candidates.

23. Continue to communicate data-driven recommendations and improve the professional preparation of teacher education candidates.

24. At the time of this writing, for institutions having NCATE accreditation visits in the Fall of 2003 or later, at least three years of data or evidence of candidates attaining goals outlined in the conceptual framework is required. It is also worth noting that institutions having their site visit at this time or later need to have their assessment systems in place and operational. No longer is an "assessment plan" acceptable for accreditation. Now any plans must be put into place and evidence of its successful operation must be exhibited.

25. Once an assessment system has been established and is in use, and other areas of the NCATE Standards are also progressing, schedule a "mock visit" with a consultant who is well versed in the process of NCATE accreditation. The sooner before an actual on-site visit that this "mock visit" occurs, the better. It is likely that, no matter how hard an institution has worked at the Standards, the consultant will find areas that need improvements and modifications. The more time given an institution to make these required changes, the better for all concerned. Making modifications to the Standards, especially the Assessment System, under a tight time frame is at best difficult and at others, not possible at all. A "mock visit" scheduled at the earliest time an institution is ready is best.

Although accreditation should be a positive process meant to reflect and improve upon the professional practice of teacher-education institutions, the process often evolves into something quite the opposite. Rather than building collegiality and creating a collaborative, efficiently functioning unit, the process of accreditation can seem like "just one more thing" that is often pushed onto the shoulders of the unfortunate (or untenured!). If you see emotions, tempers, and stress levels running high the closer it gets to your site visit, be assured that this happens at many institutions. The important thing to remember is that, although accreditation is a serious process, it's best not to take yourself too seriously as you go about getting ready for a site visit. Many jobs and/or duties associated with accreditation are equally difficult and time consuming. It's important to remember that you're not "the only one" and to be gentle with both yourself and your colleagues when it comes to deadlines, work to be done, and scouting about for necessary information. As natural as it is to feel the stress of this process, take care to give compliments and support to your colleagues. It will not only improve the overall atmosphere of your unit (which is quite critical during an accreditation visit), but it will also help to keep the process in perspective and, hopefully, to feel the value of what it is that you and your colleagues are doing.

Finally, do not forget your candidates. The reality of the situation is that this process is for the betterment of their professional preparation. They too are stakeholders will be learning about the process. It is important to keep open dialogue with these members of the educational community and when doing so, to keep a record of any discussions because they add to the assessment and the overall improvement of degree programs.

As we stated in the beginning of this article, accreditation is a process that is meant to improve the quality of teacher preparation programs. This is achieved through cooperation, collaboration, reflective and thoughtful practice, and performance-based assessment measures that drive improvements in current practice. Periodically, this can seem to be a prolonged and stressful activity, but given enough time to engage in the process effectively, accreditation can be a very positive activity. It is also often helpful to listen to the voices of those who have previously been through and learned from this process. Hopefully this article has value and helps to improve the quality to teacher preparation programs by facilitating the accreditation effort for institutions of higher learning.

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Aggregated Approaches to Identifying Community and its Constituent Elements in Formal Blended Learning Environments

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Abstract

This paper describes a variety of methods, techniques and procedures combined to determine whether an online learning community exists, to isolate its constituent characteristics and understand interactions among them, and build a dynamic model of an online learning community. It presents analysis of data from a three-year research program on virtual learning communities, including user perceptions of community (sense of community indices); interaction analysis (density, intensity, reciprocity) content analysis (transcripts, interviews, and focus groups), paired-comparison analysis (Thurstone scaling) and community modeling techniques (Bayesian Belief Network analysis).

Introduction

This paper describes a set of approaches used to measure and understand the characteristics of community discussed in greater detail in Schwier and Daniel (2007). The categories of analysis included identifying a sense of community, isolating characteristics of community, comparing characteristics of community, and building a dynamic Bayesian Belief Network Model of a community. The procedures of the analysis involved eliciting summative judgments by participants, identifying variables constituting a virtual learning community and making paired comparison to determine the relative importance of the various characteristics. Finally, we used the data to construct a computational model from the data—one that not only represents the interrelationships among variables, but that can also be used to project the effect on the community when its constituent elements' values are changed as a results of new evidence. This paper presents in the general the key results of the studies undertaken. For detailed description of the studies and methods employed and the findings see Schwier and Daniel (2007).

Research Context

Our analyses draw on data generated over three years of online communication among groups of graduate students in Educational Communications and Technology as they participated in seminars on the foundations of educational technology and instructional design. Each offering of the classes spanned an entire semester or academic year. The classes were small graduate seminars with enrolments from six to thirteen students, and each class met primarily online, but with monthly group meetings. While most students were able to attend the group meetings regularly, every class cohort had members who participated exclusively or mostly from a distance. Given the blended nature of all of the classes, we confine our conclusions to similar environments, and emphasize that these results cannot be generalized to environments that are entirely online, or entirely face-to-face. However, the methods employed in the studies can be extended to study similar learning environments. Measures employed to determine whether a community existed among the students include; content analysis, focus groups, and interviews to ascertain sense of a community index and intensity of interaction; paired comparison using Thurstone scaling to determine relative importance of the identified characteristics of virtual learning communities; and Bayesian Belief Network for building a dynamic computational model and evidence-based scenarios to query and update the model.

Sense of Community Indices

In gross sense, to determine whether a community existed, we employed the "Sense of Community Index (SCI)" (Chavis, undated), a classic instrument employed broadly in the field of community psychology (Chavis & Wandersman 1990; Chipuer & Pretty, 1999; Obst & White, 2004). The Sense of Community Index (SCI) measures

an individual's psychological sense of community. We administered the SCI at the beginning and end of a year-long course, and ran a simple T-test on the data to see if there was any change in measures of the group's sense of community by the end of the course. The T-test results suggested a significant positive growth in the sense of community scores from the beginning to the end of the course (p< .01). Though, the reliability of SCI is often questionable, despite its long use, we anticipated using the Classroom Community Scale (CCS) proposed by Rovai and Jordan (2004). The classroom community scale is similar in format and intent to the SCI, but it boasts a higher reliability estimate for the full scale (Chronbach's alpha = .93) and the subscales (connectedness = .92; learning = .87), partially attributable to the higher number of items on the scale.

Density and Intensity of Interaction

Fahy, Crawford and Ally (2001) proposed several useful measures of describing interaction collectively called Transcript Analysis Tool (TAT). The TAT includes methods of measuring density, intensity and persistence of interactions in transcripts of online discussions. We drew on their recommendations and extended some of them to analyze interactions in our data, particularly transcripts of asynchronous discussions. We explored how individuals in the class were connected to each other using density as measurement proxy. Fahy, Crawford and Ally's (2001) defined density as "the ratio of the actual number of connections observed, to the total potential number of possible connections." Given by the formula: Density = 2a/N (N-1), where "a" is the number of observed interactions between participants, and "N" is the total number of participants. Density is a measure of how connected individuals are to others in a group, and the idea is that a higher degree of connection is a positive indicator of community.

For our own calculations, we included only peripheral (voluntary or additional) communications between people by eliminating all instances of required postings and responses. We felt that peripheral interaction would provide a stronger measure of community, given that required communications among students might inflate the actual density value. In the case of one of our groups, we discovered a density ratio of .78, suggesting that 78% of the possible connections were made. Density = 2(122)/13(12) = .782. Although there are no baseline data to make judgments about the existence of community, this level of density did seem to suggest a strong level of connection among participants.

Fahy, Crawford and Ally also recommend considering measures of intensity to determine whether participants are authentically engaged with each other, not merely carrying out their responsibilities in a course. They argue that it is a useful measure of involvement because it involves measures of persistence and dedication to being connected to others in the group. One measure of intensity is "levels of participation," or the degree to which the number of postings observed in a group exceed the number of required postings. In this case, students were required to make 490 postings as part of the course requirements, and they actually made 858 postings, yielding a level of participation ratio of 1.75. Another important measure for the purpose of understanding community was Fahy, Crawford and Ally's "S-R ratio", a formula to measure the parity of communication among participants. We referred to this as a measure of "reciprocity", and we felt that truly engaged groups who form communities will exhibit high degrees of reciprocity. Details of our analysis are reported in Schwier and Daniel (2007).

Characteristics of a Model of a Virtual Learning Community

Building on previous model of virtual learning community (see Schwier, 2001), we had identified fourteen characteristics of community that grew out of the theoretical model, from the analysis of interactions among participants, from a content analysis of transcripts of communication among community participants, and from interviews and focus groups. While the process to this point was disciplined at each step, the intention was to draw out characteristics that might be important in formal virtual learning communities; the purpose was not to validate or compare the relative significance of any of the characteristics. The next step in the process was to try to determine the relative importance of the characteristics that were drawn from these various sources. We had a good sense of what were many of the characteristics that comprised the communities we observed, but we did not have any reliable information about which characteristics were important, which were trivial, and which might be more important than others. Figure 1 presents the characteristics observed for the definitions of the variables (see Schwier & Daniel, 2007)
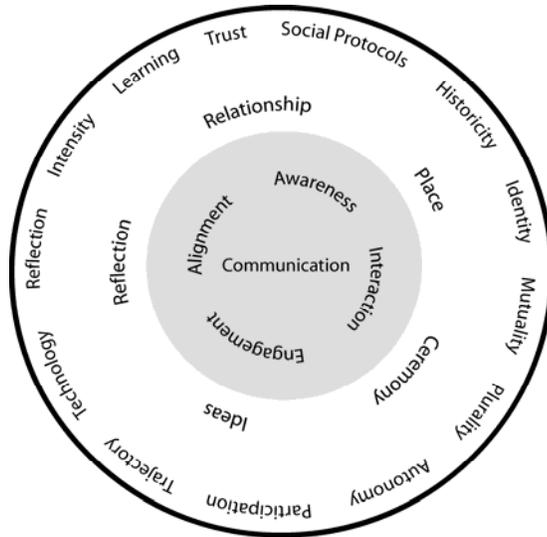
Figure 1. Characteristics of a virtual learning community (Schwier, in press)

To address this question, we developed a paired-comparison treatment that asked participants to compare each characteristic of a VLC to every other characteristic and choose the characteristic they believed was more important to the community. Twenty-three students who had completed their coursework volunteered to participate in the study. The fourteen characteristics were compared against each other, resulting in 91 paired-comparisons in the treatment. Authorware Professional™ was used to develop the treatment, and the treatment was administered on Windows-based PC workstations. In the design of the treatment, care was taken to avoid response bias and contamination from fatigue by presenting each pair in random order and by alternating the upper-lower orientation of each characteristic in relation to the characteristic against which it was being compared. After completing the comparisons, participants were asked to describe how they made their decisions generally, and if there were factors that influenced their decisions.

Thurstone Analysis

In order to discriminate among the variables, Schwier & Daniel (2007) developed a paired-comparison treatment that required participants to compare each characteristic of a VLC to every other characteristic and choose the characteristic they believed was more important to the community. This was based on Thurstone's method of paired comparisons, a method of analysis that generates a scale ranking and scale points among variables that can be used to plot a visual representation of distances between and among variables.

Thurstone (1927) postulated that for each of the items being compared and among all subjects, a preference will exist, and that for each item the preference will be distributed normally around that item's most frequent or modal response. A person's preference for each item versus every other item is obtained, and the more people that select one item of a pair over the other item, the greater the preference for, or perceived importance of, that item, and thus the greater its scale weight. Thurstone's Law of Comparative Judgment circumvents potential ceiling effect problems by forcing individuals to rank items two at a time rather than all at once (Manitoba Centre for Health Policy, 2005). Given the results of all possible paired comparisons of the variables under study, scale values can be plotted on a line to provide a graphic illustration of the relative value of each variable, represented by its relative distance from the other variables (the greater the distance between any two variables on the scale, the greater the differences between those two variables).

The scale is descriptive, and there are no post-hoc tests available to identify significant differences among variables. But the scale values provide a convenient metric for assigning initial weights to variables in modeling exercises. In the study of the fundamental variables of virtual learning communities, Schwier and Daniel (2007), compared each VLC characteristic with the others, following procedures outlined by Misanchuk (1988). The data were then converted into a line drawing that depicted differences between elements along a line. Greater differences

were shown spatially as larger distances between points on the line. The outcome of the comparison and the ranking of the variables are shown in Table 1.

Table 1. Thurstone Scale Rankings and Scale Points for Each of the Fourteen VLC Characteristics.

Characteristic	Thurstone Scale Ranking	Thurstone Scale Point
Trust	1	0.7341
Learning	2	0.5806
Participation	3	0.3182
Mutuality	4	0.2671
Intensity	5	0.2425
Social Protocols	6	0.1852
Reflection	7	0.1523
Autonomy	8	0.0155
Awareness	9	-0.0785
Identity	10	-0.1939
Future	11	-0.2474
Technology	12	-0.5033
Historicity	13	-0.7309
Plurality	14	-0.7701

As a result of this analysis, we were able to obtain measures that could be used to understand the association and interplay of community characteristics in a VLC, and we could also use the Thurstone Scale points to assign weights to these characteristics when we attempted to construct a dynamic model of virtual learning communities. Reviewing the results, it is apparent that there are at least three clusters of characteristics. Trust and learning were considered by the participants to be the most important characteristics of a VLC. A large cluster of characteristics gathered around the mean scale point, and while they differed from each other, we treated them as a group because of their central position relative to the other points. Technology, historicity and plurality were ascribed much lower status than the other characteristics, and one might argue as a result that they should be eliminated from the model entirely. After reviewing comments, it was apparent that even those characteristics that were positioned at the low end of the Thurstone scale still had a role to play in the construction of community, however marginal that influence might be.

We were also reluctant to eliminate characteristics at this point in the research because we are still gathering primary data from new groups. Our confidence in the relative positions of these characteristics, and ultimately our judgments about their inclusion in a model of VLC, will grow as our analysis continues. At what point will we be satisfied that we've identified the important characteristics and measured their relative importance? Probably never, given that VLCs are dynamic environments that are also situated in particular learning contexts. But we will continue to gather data to develop and refine models, and our tools and the sophistication of our observations will mature over time too.

Building Models of Online Learning Communities

Bayesian networks, Bayesian models or Bayesian belief networks (BBNs) can be classified as part of the probabilistic graphical model family. Graphical models provide an elegant and mathematically sound approach to represent uncertainty. BBN approach combines advances in graph theory and probability. BBNs are graphs composed of nodes and directional arrows (Pearl 1988). Nodes in BBNs represent variables and directed edges (arrows) between pairs of nodes indicate relationships between variables. The nodes in a BBN are usually drawn as circles or ovals. Further, BBNs offer a mathematically rigorous way to model a complex environment that is flexible, able to mature as knowledge about the system grows, and computationally efficient (Druzdzel & Gaag, 2000; Rusell & Norvig, 1995).

Bayesian networks can be used to model probabilistic relationships among variables. In some cases, their graphical structure can be loosely interpreted as the result of direct causal dependencies between variables. In domains with many causal relations, such as in medical diagnosis (symptoms cause diseases), human experts are usually able to express their domain knowledge in the graphical structure of the network. For example, in a model

for medical diagnosis, the parameters of the network are the conditional probabilities of effects given the state of their direct causes.

Bayesian Belief Network (BBN) techniques are increasingly being used for understanding and simulating computational models of complex social systems. BBN models enable reasoning when there is uncertainty (Pearl, 1998). They combine the advantages of an intuitive visual representation with a sound mathematical basis in Bayesian probability. The motivation to build the Bayesian model of a virtual learning community is to be able to perform a number of simulations and observe the influence of variables in the model with the goal of determining and understanding the relationships among these variables that are critical to learning in communities.

The first step in building a BBN is to identify key variables that represent a domain (Druzdzel & Gaag, 2000; Pearl, 1988; Rusell & Norvig, 1995). The variables identified in our model are drawn from an analysis of online transcripts, interviews and email traffic that were subjected to grounded theory analysis, and the identified variables were then subjected to a Thurstone analysis to identify their relative weights. The motivation to build the Bayesian model of a virtual learning community is to be able to perform a number of simulations and observe the influence of variables in the network with the goal of determining and understanding those variables that are critical to virtual learning communities as well as their interactions in the processes of learning. In building the model, once variables were identified, the second step involved mapping the variables into a graph (see Figure 2) based upon coherent qualitative reasoning.

Druzdzel and Henrion (1993) proposed a transformation of a causal Bayesian network into a qualitative probabilistic network (QPN), in which the relation between two adjacent nodes is denoted as positive (+), negative (-), null (0) or unknown (?); there are also relations that involve more than two nodes, such as positive or negative synergies. The main advantage of QPN's is that they simplify the construction of models, because they do not require the elicitation of numerical parameters; as a consequence, their main disadvantage is the lack of precision in the results, especially because very often the combination of "positive" and "negative" influences leads to "unknown" relations. The motivation for this approach is based on the fact that people usually reason in qualitative terms.

In our case, we used the Thurstone analysis as a starting point to identify relative positions of variables of virtual communities, and we then used qualitative reasoning to subjectively identify those variables that are of interest and influence in the model and isolate those that are less likely to have an impact on the overall performance of the model. We caution the reader that our reasoning is based on our teaching and research experience into virtual learning environments, and it may contain epistemological, contextual and personal bias. However, the initial precision of the relationships among variables is less important to developing a model than is the identification of key variables that was accomplished by using the grounded theory approach mentioned earlier. Precision is built by tuning the model and observing how variables interact over time and across contexts in the BBN. In other words, a BBN is built iteratively, and as the number of iterations increase, the model is tuned to render an increasingly accurate network of relationships among key variables

In this study, we used qualitative reasoning to infer causal relationships among the variables identified in the study, resulting in relationships among variables that could be charted. For instance one can qualitatively and inductively reason that in virtual learning communities, participation and learning are essentially variables whose interactions are mediated by another technology as another variable, (i.e., it is hard to imagine learning online without any participation and equally participation is often mediated by technology), and therefore, technology is assigned to be a parent of participation. Similarly, participation can influence awareness in various ways, which in turn can lead to the development of trusting relationships. Since awareness can contribute to trust and distrust, trust is set to be a child of awareness.

Furthermore, one can reason that technology influences awareness in different ways. For example, imagine a learning environment in which each individual has a profile (electronic portfolio) and the information is made available to others in the community; this can create sense of awareness about who is who, or who knows what, in that community. Similarly, technology may influence intensity in a weak positive manner. For example, poor technology might have negative outcomes on engagement. In other words, people might not be willing to use technology that does not work well for them, or they find awkward to use.

Extending this type of qualitative reasoning resulted in the BBN shown in Figure 2. In the model, those nodes that contribute to causality align themselves in "parent" to "child" relationships, where parent nodes are causes and child nodes are effects. For example, trust is the child of mutuality; awareness and intensity, which are in turn children of participation and technology (see Figure 2). The criterion for determining causality among the variables is a reflection of our qualitative reasoning process (soft data), which can be validated using empirical evidence (hard data).
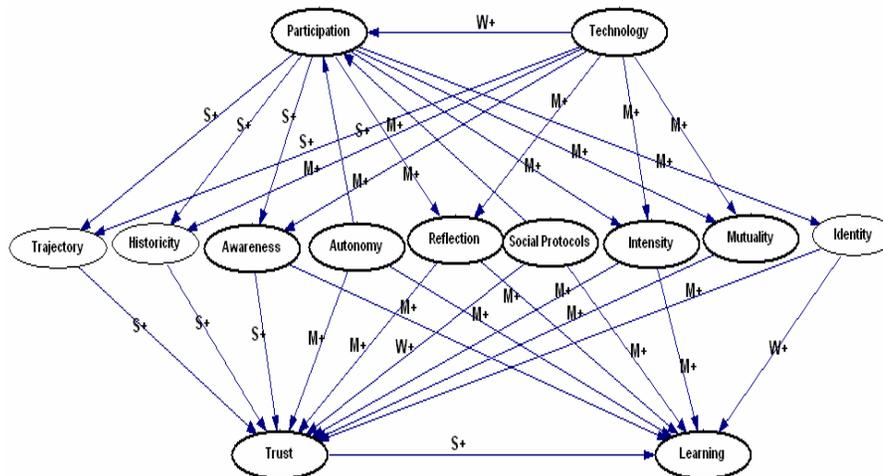
Figure 2. BBN representation of relationships among virtual learning community variables.

The third step in building the model involved assigning initial probabilities to the network. In general, BBN initial probabilities can be obtained from domain experts, secondary statistics or they can be taken from observations and subjective intuition. It is also possible that initial probabilities can be learned from raw data. In addition to learning prior probabilities, it is sometimes necessary to examine the structure of the network. In our case, the initial probabilities were obtained using approached discussed in Daniel, Zapata-Revera and McCalla (2003) and the structure and the degree and strength of influence among the variables was determined by examining the distances between the variables of virtual learning communities along the Thurstone Scale. This approach enabled us to cluster those variables that were closely aligned on the Thurstone scale and use weighted threshold values (Daniel, McCalla, & Schwier, 2005) to generate the conditional probability table. The relationships and the degree of influence among the variables were further described qualitatively. In the results of Thurstone scaling, those variables that cluster around the mean scale point was observed were given high degree of influence.

Generating the Conditional Probability Values

The initial conditional probabilities were generated by examining qualitative descriptions of the influence between two or more variables and the strength of their relationships in the model (Daniel, Zapata-Rivera, McCalla, 2003; Daniel, McCalla, & Schwier, 2005). Each probability describes the strength of relationship. For instance, various degrees of influence among variables are represented in the model by the letters S (strong), M (medium), and W (weak). The signs + and - represent positive and negative relationships. The elicitation of the initial probability approach for the variables was based on the approach discussed in Daniel, Zapata-Revera and McCalla (2003), but the strengths of the relationships and the influence of each variable was based on the results of the Thurstone scaling and the relative positioning of each variables along the scale. For instance, technology was ranked to be last and so it carries a threshold probability value of 0.6 and the symbol weak (W+) was assigned to it. The sign means that there is some kind of influence, but because of its low ranking along the scale, the influence is a weak one.

The probability values were obtained by adding weights to the values of the variables depending on the number of parents and the strength of the relationship between particular parents and children. For example, if there are positive relationships between two variables, the weights associated with each degree of influence are determined by establishing a threshold value associated with each degree of influence. The threshold values correspond to the highest probability value that a child could reach under a certain degree of influence from its parents, i.e. assuming that Participation and Technology have positive and strong relationships with Awareness, evidence of good technology and high participation will result into a conditional probability value of 0.98 (i.e., Awareness=Exist). This value is obtained by subtracting a base value (1 / number of parents--0.5 in this case with two parents) from the threshold value associated to the degree of influence (i.e., threshold value for strong = 0.98) and dividing the result by the number of parents (i.e., (0.98 - 0.5) / 2 = 0.24). Table 3 lists threshold values and weights used in this

example. The value α = 0.02 leaves some room for uncertainty when considering evidence coming from positive and strong relationships.

Table 2. Threshold values and weights with two parents

Degree of influence	Thresholds	Weights
Strong	1-α = 1 - 0.02 = 0.98	(0.98-0.5) / 2 = 0.48 / 2 = 0.24
Medium	0.8	(0.8-0.5) / 2 =0.3 / 2 = 0.15
Weak	0.6	(0.6-0.5) / 2 =0.1 / 2 = 0.05

Daniel, Zapata-Revera and McCalla (2003)

This assumes that participation and technology have positive strong relationships with awareness and there is evidence of positive participation and technology in a particular community. Given these assumptions, weights will be added to the conditional probability table of awareness every time participation = high or technology = good. For example, the conditional probability value associated with awareness given that there is evidence of participation = high and technology = good is 0.98. This value is obtained by adding to the base value the weights associated with participation and technology (0.24 each). Table 4 shows a complete conditional probability table for this example.

Table 3. An example of conditional probability table for two parents with strong, positive relationships

Participation	High		Low	
Technology	Good	Bad	Good	Bad
Awareness Exists	0.98	0.74	0.74	0.5
Awareness Does Not Exist	0.02	0.26	0.26	0.5

The calculation of the various states of the relationships among the three variables (awareness, participation and technology), and their corresponding values used in Table 3. Given below:

$P (Awareness= Exist \mid Participation= high \& Technology= Good) = 0.5 + 0.24 + 0.24 = 0.98$
$P (Awareness= DoesNotExist \mid Participation= high \& Technology= Good) = 1 - 0.98 = 0.02$
$P (Awareness= DoesNotExist \mid Participation=High \& Technology= Bad) = 1 - 0.74 = 0.26$
$P (Awareness= Exist \mid Participation= Low \& Technology= Good) = 0.5 + 0.24 = 0.74$
$P (Awareness= DoesNotExist \mid Participation= Low \& Technology= Good) = 1 - 0.74 =0.26$

Querying the Network

Querying a BBN refers to the process of updating the conditional probability table and making inferences based on new evidence. One way of updating a BBN is to develop a detailed number of scenarios that can be used to query the model. A scenario refers to a written synopsis of inferences drawn from observed phenomenon or empirical data. Druzdzel and Henrion (1993) described a scenario as an assignment of values to those variables in Bayesian network which are relevant for a certain conclusion, ordered in such a way that they form a coherent story—a causal story which is compatible with the evidence of the story. The use of scenarios in Bayesian network is drawn from psychological research (Pennington & Hastie, 1988). This research shows that humans tend to interpret and explain any social situation by weighing up the most credible stories that include hypotheses to test and understand social phenomena. In Bayesian terms a hypothesis is the assignment of a value to a discrete variable or group of variables. Although a scenario can describe all of the nodes a model, it is more reasonable to include only the nodes relevant for a certain situation. If there is a certain focal hypothesis, say for instance H, selected by the user, the relevant nodes are those that affect the posterior probability of H given the observed evidence e. Otherwise, the relevant nodes are all those whose probabilities depend on e. The explanation of the model therefore, consists of showing the evidence (i.e., the scenarios that are most compatible with the hypothesis and those that are incompatible with the hypothesis.

Furthermore, updating a BBN using scenarios is an attempt to understand the significance of various relationships among variables in a network. Based on the results of Thurstone scaling we have observed a large cluster of variables around the mean scale point. These were then chosen to construct the Bayesian Belief network. Although, the variables obtained in the earlier analysis can be treated as a group because of their central position relative to the other points, it is difficult to measure their individual importance relative to others in the same cluster or in other clusters in the VLC model. We build simple scenarios to further infer their relative influence and significance to learning within the network. The approach described in table 3 uses both qualitative and quantitative data in building the Bayesian Network to model imprecise and nebulous domains (Daniel, Zapata-Revera & McCalla, 2003). In addition, the probability distribution enables us to query the model and observe changes as they propagate to generate new posterior probability values (**P**), which we can then use to make logical inferences about the state of the model from changes in its variables. For example, imagine a community where there is reasonably high level of participation among individuals (e.g., p=0.98), and a high presence of mutuality, implying learners are constantly engaged in reciprocal relationships through exchanging messages, sharing experiences, stories, information and knowledge. Querying the model (presented in figure 2) with this scenario reveals increased learning with a posterior probability value of P (l=0.763).

Another scenario we employed to tune the model involved a formal virtual learning community in which an effective level of participation guided by explicit social protocols was observed. In addition, individuals were constantly engaged in open discourse (mutuality), and the issues were addressed in both depth and breadth (intensity). Further, assuming that there is a high intensity in discourse encouraged individuals to reflect deeply on the issues being discussed. Results of querying the model using this scenario revealed a higher probability of learning p (l=0.779) with a significant difference of 0.016 compared to the probability of learning in the presence of effective participation and mutuality alone. This result is intuitively appealing, given interview data that suggested that a combination of these factors encouraged depth in the discussion and in learning (Schwier & Daniel, 2006).

In practice virtual learning communities should encourage freedom of expression, mutual respect and they should value diversity. Building on the notion of individual freedom in a virtual learning community, we were interested in observing the impact of autonomy on trust and learning, given effective participation and good technology. Autonomy seems to be very influential; the network revealed higher probability of trust P (t=0.924) and correspondingly high probability of learning P (l=0.794) when autonomy was elevated.

Given the central importance of trust as a prerequisite condition of learning, we were interested in understanding the impact of all the variables on trust and learning. In this scenario all the variables in the first layer (technology and participation) and second layer (mutuality, intensity, social protocols, reflection, autonomy and awareness) in the model were set to their highest probability values. This scenario increased the values of posterior probabilities of trust (P: (t=0.944) and learning (P: l=0.810). This result suggests that the variables in the network can collectively have considerable and yet varying effects on trust and learning, depending on differing scenarios.

Although the results of the Thurstone analysis ranks trust to be the most important variable in a virtual learning community, our analysis suggests that when trust is associated directly with learning, but without the positive influence of its parent variables (mutuality, intensity, social protocols, reflection, autonomy and awareness), the probability of learning remains low P (l=0.629). This result holds even in the presence of good technology and effective participation. Previous research has emphasized the value of trust in enhancing the sense of a community. Prusak and Cohen (2001) suggested that trust enables people to work together, collaborate, and smoothly exchange information and share knowledge without time wasted on negotiation and conflict. In virtual learning communities however, we argue that without mutuality, intensity, social protocols, reflection, and awareness; the impact of trust on learning may be minimal.

Based on different experiences, experts' knowledge, intuition and hunches, a large number of scenarios can be developed to query this model. Querying the model using logical scenarios, whether based on empirical data or experts' experiences, offers a disciplined method of examining the cumulative effect of making changes anywhere in the network and also for speculating about how any particular change can alter the values of related variables. The BBN is still, at its core, a tool for speculation, but over time and as data are added to inform the variables and their interrelationships, the network can be "tuned" to provide robust and precise ways to make decisions about how to support learning in virtual learning communities

Conclusions

The most important point in this paper is not the specific methods we chose to perform the analyses. A host of other tools are available to researchers, and they can be used to generate related but different interpretive angles on data (e.g., social network analysis tools). Of greater significance is that the methods flow from definition to analysis to prediction, so they have some intuitive and practical appeal. We recognize that we are at the beginning of learning about how to understand online learning communities, and so we make no claims that these methods represent a definitive set of tools for that job, but we think that considering the full cycle from definition to modeling is important. Much of the research to date that examines online learning communities looks closely at only a few variables, and much of the literature is highly speculative. We think that there is a need to systematically isolate features of communities, try to determine their relative importance, and then build models that can be used to test inferences in new environments and inform the science of design in online learning.

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Enhancing preparation of school library media specialists through the use of professional development reflections, post-degree questionnaires, and media coordinator interviews.

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Programs that prepare school library media specialists face many challenges in the current climate. Despite the large body of evidence of the considerable benefits of strong school library media programs situated at the center of each school's learning community (e.g. Lance, Welborn and Hamilton-Pennell, 1993), we appear to be constantly fighting to maintain our position. We see funds being cut, media center budgets being taken out of the media centers, a lowering of media staffing levels, or the elimination of media specialist positions. We see pressure put on media specialists to act as computer repair workers, as software troubleshooters, as technology police, and as baby sitters. Under these circumstances it is a constant battle to maintain the integrity of our programs and at the same time keep them relevant to the world in which our graduates will work.

Where do we invest our limited preparation time? In traditional library preparation courses such as cataloging, reference, and selection? In preparation for teaching information literacy and classroom management? In technical courses for media center management or for technical support of networks and software and hardware troubleshooting? In advocacy and education of principals and teachers, school boards, legislators, and parents? And how do we strike a balance among these disparate areas that both upholds our professional standards and at the same time gives adequate preparation to our students to enable them to walk into a media center and perform this exacting job to a high level. This paper will discuss some of the ways in which one master's level initial preparation program in school library media in a large urban setting endeavored to take stock of program strengths and weaknesses.

The program in question, based in the college of education of a large urban research university, has a substantial 35 year history of producing well-qualified media specialists, prepared to a high standard in their field. The State of Georgia has until recently used the Praxis II Subject Test (Media Specialist) as its certification exam, and has the second highest required passing score in the nation (620 points, with only Maryland and Oregon requiring a higher qualifying score of 630 points.) During the last five years for which data are available, the program has a 100% pass rate, with the majority of the students achieving scores in the 660 – 750 range. (Georgia State University, 2006b).

Five years ago the program was at a low ebb from a staffing point of view. Several retirements had reduced the full time faculty to two in number. In common with many other programs, including those in library science, recruitment of new faculty proved to be a major hurdle, and several faculty searches were concluded unsuccessfully. The program continued to be staffed by two full time and six adjunct faculty until a catastrophic illness reduced the full time faculty to one person. At this point an aggressive recruiting campaign was mounted and three highly qualified faculty members were appointed, with a fourth joining the faculty two years later.

During the first year of the new faculty's appointment, the department in which the program was housed was slated to conduct its seven year internal review. In preparation for this the faculty began a review process where all program offerings were studied both individually and as a whole and compared with national and state standards. At this time the State of Georgia Professional Standards Commission used the American Library Association/American Association of School Librarians standards for the prep of school librarians (ALA/AASL 2004) as the basis for certification. The standards of the Interstate New Teacher Assessment and Support Consortium (INTASC) were also considered, where appropriate. Several courses were changed in light of this review, some substantially, others less so, with some outdated content being removed to make way for increased emphasis on technology integration and the teaching of information literacy. More emphasis was added, for example, to the study of electronic resources and networked information systems in the basic reference services class. Several classes such as that in instructional collaboration began not only to require the use of electronic presentation and communication, but to teach presentation techniques and basic public speaking. Although a field based internship is required of students, many smaller field experiences were added to all courses to strengthen the practical elements of the program, as part of this standards-alignment process.

Although these program changes were the result of thoughtful consideration by faculty from teaching the courses, of recommendations from the external reviewers at the end of the departmental review, and of planning in light of professional standards, they had not been examined in light of the students or the workplace. Accordingly three major assessments were planned to gauge the effectiveness of these changes and to seek additional areas for program improvement. The first of these involved students currently in the program, the second students who graduated within the last 12 months, and the third media coordinators in the school systems served by our program.

Over the last few years teacher education programs have recognized the importance of reflective writing on professional development. This program has now instituted a Professional Development Reflection as part of its continuing assessment. Each semester students are required to complete a reflection on their learning experiences throughout the semester. The reflection covers all coursework attempted that semester, as well as all field experiences. Students are encouraged to look across their coursework to identify common themes, to see each course as one part of a complex whole, to identify areas where they feel well prepared, as well as areas of weakness. This has led to students developing a stronger framework into which the various course elements can be fitted as each course is taken.

An analysis of the available reflections shows some interesting trends. As students have worked through successive semesters, the depth of their professional reflections deepens, and they are more able to put their learning into a suitable context. The increase in the number of field experiences has enabled students to see more media centers in operation and more media specialists at work, and this has enabled them to develop a more realistic perspective of the current role of the media specialist, and the common difference between how the role of Teacher-Librarian is described for example in Information Power (1998) and that commonly found in many schools where the media specialist is viewed simply as non-professional support staff. It has also given them more relevant criteria by which to judge their own learning and preparedness to enter the profession, and reflections suggest that the students are increasingly aware of the complexities of their chosen profession and their level of skill attainment.

The use of these professional development reflections for program evaluation is only just beginning to be realized. Initially the faculty thought the reflections would identify areas that were lacking in the curriculum, but this has proved to be case only on a very limited level. Despite the number of field experiences, students are not always in a position to know what they do not know, especially at the pre-service stage. Some of the procedures or practices viewed in the media centers have turned out to be special requirements or practices of individual school systems, rather than more generalizable best media center practice, and while valuable for students to observe, are not necessarily suitable for inclusion in the professional preparation program. (It may also be the case that the many curriculum revisions that were made as part of the initial internal review strengthened the curriculum to the point where the major gaps had already been identified and filled.)

However the value of these reflections lies, for evaluation purposes, in seeing how the students are reacting to changes made to curriculum and how they are developing professionally and assimilating their new knowledge. To a large extent this use depends on a long term look at the professional development reflections, and the program is only now completing its first year of student reflections. One area for improvement in the reflections that has been identified is the idea of having the students use professional standards as the basis for their reflections. Rather than simply reflecting on what they already know, the standards will give students a stronger framework to the reflections, and better guidance as to the final goals of the program. Another area of improvement in this process is to encourage new graduates to continue their professional reflections and to share that information with the program. The reflections of new media specialists as they adapt to life on the job will yield a better picture of areas where students feel well-prepared and those where additional preparation is necessary.

Of particular interest is the difference in reflections among the various types of students in the program. The Georgia Professional Standards Commission (2006) does not require that media specialists hold teaching certification, so there are three major categories of students within the certification program: certified teachers seeking to add a media specialist qualification, public librarians seeking to become certified for school media centers, and those from outside either education or librarianship seeking initial certification as school media specialists. The majority of students fall into the first category, so it is only gradually that we will be able to see a truer picture of the needs of the other two categories of students.

The original plan for this program evaluation called for an online questionnaire of graduates of the program within the previous 12 months based on the ALA/AASL standards and the Praxis II Subject Test (Media Specialist), with a corresponding questionnaire to county media coordinators. At the time of planning these were the standards and the certification test accepted by the State of Georgia and required by the university for degree and certification program purposes (Georgia State University 2006a). However, with effect from January 2006, Georgia adopted its own set of professional standards for the preparation of school media specialists (Georgia Professional Standards Commission, 2006), at the same time announcing a new series of certification tests, the Georgia Assessment for the

Certification of Educators (GACE) and the withdrawal of the Praxis II series in most fields. It seemed pointless to proceed with questionnaires based on standards that were no longer governing preparation programs within the state, or on assessment tests that may have a different focus from those originally planned as the basis for the evaluation instruments. These parts of the evaluation are now in preparation, although some delay is still expected as the GACE tests will only be administered for the first time in late fall 2006. Both faculty and students from the program were involved in the development and field testing of this new test, but we will not have a clear picture of the actual emphasis of the test and how it assesses the various sub areas. In contrast to the Praxis II Subject Test (Media Specialist which has five concentration areas (program administration; collection development; information access and delivery; learning and teaching; and professional development, leadership and advocacy), the GACE test has four (information access and delivery in the library media program; information literacy skills; collaboration and leadership in the library media context; and library media program administration.) It is not yet clear whether changes in curriculum will be required to meet the expectations of this new test, but evaluation will be conducted as soon as is practicable.

As the world of the media specialist changes and increasing demands are made on the profession, it is imperative that initial preparation programs ensure they are producing graduates who are not only skilled in the traditional librarian aspects of the job, not only prepared to teach information literacy as a teaching professional, but who are also competent, flexible professionals who are capable of creating and running school media programs that function as the instructional center of the school. Only by continuous assessment of program content and presentation can faculty monitor program effectiveness and serve both students and school districts to maximum effect.

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Bridging Theory and Practice Using New Tools and HPL

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Abstract

This paper features one of the most dynamic instructional models used in higher education in recent years. Synthesizing aspects drawn from the STAR Legacy cycle and the VaNTH model, an instructional design model is conceptualized, graphically portrayed, and illustrated by example. The latest tools available to online learners -- conference management systems -- are integrated and demonstrated using two sample activities from one Educational Technology foundations course and one Instructional Systems Development course. Lessons learned of this joint effort are also outlined.

Introduction

An ongoing problem for educators is to find meaningful ways to keep learners actively involved in an instructional task. Keeping students involved has been labeled "active learning." While most educators see the inherent value in having the student involved in active learning, most educators would also readily agree that designing and implementing instruction that meaningfully engages the learner is no trivial undertaking for learners of any age. In the present paper, we would like to briefly introduce the "How People Learn" model and exemplify the learning model using two sample activities from two graduate courses from a completely online Education Technology program. We conclude this paper by reinforcing major aspects of the implementation of the model and addressing some of the challenges we encounter in a real learning context.

STAR Legacy Cycle

There has been significant progress made in the last couple of decades in determining what is involved in the learning process, and how educators can go about creating and implementing engaging instruction for learners. A seminal book in this area entitled, *How People Learn*, is authored by Bransford, Brown, and Cocking (2000). The book has become a highly regarded tool for helping educators of all stripes design instruction based upon proven principles of how to meaningfully engage learners. *How People Learn* (HPL) has been used to create a cycle, or framework, coined the STAR Legacy (Software Technology for Action and Reflection) cycle (Schwartz, Brophy, Xiaodong, & Bransford, 1999). This framework is a useful guide for designing instruction that is intended to actively engage the learner. The cycle comprises a sequence of six consecutive components: Challenge, Generate Ideas, Gather Multiple Perspectives, Research & Revise, Test Your Mettle, and Go Public.

The cycle can be further modified to include specifying course objectives and designing meaningful challenges based upon those objectives. The guideline then becomes the following steps, taken from a hybrid model, a.k.a., VaNTH, developed by a consortium of several of the engineering research centers from some of the leading universities in the United States. (see http://www.vanth.org/).

1. Identify course objectives – these are statements of what a student will know and do after instruction. Students see how knowledge is applied.
2. Design challenges for instruction – these are statements that pose a complex goal to the students. You, as the instructor/facilitator, need to develop interesting challenges that engage students in a process of inquiry that requires them to apply the desired concepts beyond simple manipulation of mathematics, for example.
3. Generate ideas – this step provides students with the opportunity to explore what they currently know about the challenge. This includes their naïve concepts or models of the domain and will provide a baseline or pre-assessment of what they know about the challenge.
4. Multiple perspectives – these are statements by experts describing what they see in the challenge. Their comments provide insights into various dimensions of the challenge, but do not provide a direct solution to the challenge. Students can compare their initial thoughts with the experts.
5. Research and revise – this component provides a series of learning activities, such as simulations, lectures, homework, labs, and readings, designed to help students focus on the important dimensions of the

challenge. These activities are designed to help the students make a link to the original challenge aforementioned.

6. Test your mettle – this assessment method provides students the opportunity to apply what they know and evaluate what they need to study more. It also allows the students to reflect on how well they've learned the content and to evaluate if they are ready to Go Public, which is the next step, with what they know.
7. Go public – this is the final assessment of what students know at the end of the module. This assessment could be a presentation of the content.

While this model has been shown to be one of the effective models for developing instruction, it has not lent itself to the design and development of online instruction. There are possibly several significant barriers that prohibit this model from being used in the development of online instruction. However, the most apparent obstacle is easy to discern. The VaNTH (Star Legacy) model is predicated upon a collaborative effort of learners who engage in a significant amount of interactivity. One can easily visualize this type of model being used not only for instructional purposes in more progressive classrooms around the country, but also in any workplace that requires teams of employees to conceptualize and solve complex problems. But the challenge in implementing this model in designing and implementing online instruction seems, at first glance, overwhelming, when one considers the simple fact that according to an article, *The Halo Effect*, published in the December issue of The Economist magazine in 2005 (Katzenberg, 2005), currently 90% of all online instruction is asynchronous and therefore not conducive to the ongoing dialoguing the VaNTH model (or Star Legacy Cycle) requires.

Practice

Regardless, we managed to adopt the Star Legacy cycle and incorporate it into the activity design in the first two required courses in our Educational Technology graduate program. Even though both classes emphasize more (approximately 70% of the final grade) on the cultivation of individual competencies for being a successful Educational Technology graduate, we decided to integrate a cooperative project into the course requirements for the following reasons. Our current curriculum design stresses individual achievement. Workforce situations for our graduates require our students routinely work in authentic, collaborative situations. The other reason we perceive the need for students to engage in collaboration to solve a common goal is to assist our students in fulfilling one of the criteria, simply called "Collaboration," required in the development of an electronic portfolio project -- a graduation requirement.

The Star Legacy model is introduced in the beginning of the class in a synchronous class meeting. Prior to the cooperative project, students in both classes are able to get accustomed to the learning model in biweekly Horizon Wimba Group Exercises. Two weeks before the due date of the cooperative project, an email is sent to the class to reinforce the concept of the Star Legacy model.

Both classes are facilitated in Blackboard, a course management system: one is the foundations course, and the other is the instructional systems development (ISD) course.

The foundations course is intended to provide a broad overview of the ideas that form the basis of the field of educational technology. While this course is not entirely a review of the latest technological advances, this introductory-level course does present an overview of the media applications, instructional approaches and design processes used in creating performance technology solutions. The concepts covered are generally applicable to both public and higher education, and various forms of corporate and non-profit training endeavors. The textbook adopted is authored by G. L. Anglin (1995), entitled, *Instructional Technology: Past, Present, and Future*. Figure 1 below lays out the framework for applying the Star Legacy model in the foundations class.

Overview

One primary purpose of Project 3 is to assist you in conceptualizing and demonstrating how learning occurs in a non-co-located (virtual or distributed) group setting. Your group is expected to proceed with functionality and collaboration in accordance with the Star Legacy model (see http://iris.peabody.vanderbilt.edu/slm.html).

Objectives

By completing this collaborative project, you will be able to:

1. Practice working in a collaborative situation in which direct group contact (F2F) is not appropriate for any of a number of reasons. Your group is encouraged to use a variety of tools to develop and present your group project.
2. Present to the class either an example of a group plan for an application of the principles of educational or instructional technology to a specific problem, or to present your group's findings on some topic we have or have not covered in the text.

Further details of these two objectives are translated into three presentation options below.

Presenting Your Findings

We use Horizon Wimba Live Classroom and its capabilities for linking our presentation format. Your group uses this conference management system to meet with the rest of the class and to present major aspects of your group effort as you guide us through it in 20-30 minutes. We do not want an information dump during the presentation. That is, present major aspects and save all the rest of the details for your online document.

Posting Your Document File

After the URL of your Project 3 is retrieved, a group representative is expected to post the URL to a designated forum, titled Project 3 URLs, 24 hours before the scheduled presentation.

Working With Your Group
Your group meets primarily in a designated Horizon Wimba Group Deliberation Room. Each group meeting must be archived for the instructor's future references. It is highly recommended that you follow the Star Legacy model and meet through audio conferencing and other features, like application sharing, in Horizon Wimba. You are advised to start this planning as early as possible and do your part first.

Your team may want to determine who is responsible for what information. To do so, you need to take all it can to get to know your teammates. After knowing each other's knowledge, skills, and attitudes, you as a team may start the division of labor. You can select someone to act as moderator for the group during the online discussions and presentations. One way of presenting the group's findings is to assign individuals to be responsible for determining who the intended audience will be, what resources will be required, and what assessment activities will be necessary to conduct. Everyone in the group can contribute to the research (conceptual background) as well as diagnosing, designing, and developing the assessment activities. Each individual will be responsible for presenting their portion of the work during the presentation. Do your part first and do it well.

After the oral presentation, each group or individuals is expected to define and / or defend group work by posting revised work under the initial posting before the last class day for a better grade.

Presentation Options

For your collaborative project you may select one of three options:

Option 1: Determine a problem members of your group may share and demonstrate knowledge as to how some sort of application of educational or instructional technology could help alleviate that problem. You may want to provide a history of the problem, and describe how the use of technology has been used to help remedy the problem in the past, present, and possibly in the future. Please include a conceptual framework (research) of your problem. The problem need not be thought of as having a negative connotation. Your group may see merit in how distance education can be used to boost the number of students enrolling in AP Spanish literature classes, for example, or how cafeteria staff can use

various media to increase nutritional awareness of students, or look at ways to provide training to librarians in searching remote databases. Your group need only develop a PLAN for developing an instructional solution to that specific problem. This plan is to be produced in a webpage format.

The plan should:

- State an educational or instructional problem and how and why that problem is defined as such
- Describe characteristics of who the intended audience will be
- Provide a list of necessary resources (including skills, personnel, hardware, cost analysis, etc.)
- Describe activities, and appropriate means of assessment,
- Provide a conceptual background to the educational or instructional problem (do some research)
- List bibliographic citations to relevant print and non-print materials

Option 2: Your group can also select a topic we have covered (or will soon cover) from the text. Your group can present more recent information pertaining to that topic, and/or how developments in education and society at large have vindicated, or nullified, predictions made in the text from ten years ago. Your presentation is expected to be a webpage format. The presentation Web site should:

- Present the content for your presentation
- Outline relevant research in the field
- Provide links to supporting Web sites (i.e., research studies, examples of applications, etc.)
- List bibliographic citations to relevant print and Web-based materials

Option 3: Your group comes up with its own topic that we have not considered and make a proposal for your topic. For example, you might look at legal and political considerations of implementing DE professional certifications, or what a typical school looks like in the year 2020 according to futurists. This option is also presented in a webpage format and it should:

- Present the content for your presentation
- Provide a conceptual background to the educational or instructional problem (facts, figures, real-world examples, research studies--do some research)
- List bibliographic citations to relevant print and Web-based materials

Click the link attached below for a sample of Project #3.

Figure 1. The Cooperative Project task in the foundations class.

In the follow-up course, the design course (or ISD course), the goal of this course is for the learners to be able to design and develop the best instruction possible. To attain that goal, the class systematically proceeds through a series of modules, each with specific objectives. By completing these modules successfully, the students are expected to demonstrate the following three skills and conceptual knowledge:
- Identify the theoretical, experiential, and critical perspectives in instructional design as it is applied to a variety of educational settings,
- Design, develop, implement and evaluate instruction for a specific group of learners, in a specific environment,
- Work collaboratively with other instructional designers in a distributed environment, working together to achieve specific instructional objectives for a distributed audience.

A textbook, titled *The systematic design of instruction,* by Dick and Carey in 2004 is used as the class text. Figure 2 below lays out the framework for applying the Star Legacy model in the ISD class.

Overview

This Cooperative Project is your opportunity to demonstrate competences (skills and knowledge) and to develop dispositions you have acquired in the course. As you can tell, there is a certain flexibility for you

and your group to present any current issues pertaining to ISD. Please be advised that you are not requested to develop the actual course/lesson/session, but please tell us something new and exciting. A suggested list of topics is provided at the bottom of this page.

One primary purpose of Cooperative Project is to assist you in conceptualizing and demonstrating how learning occurs in a non-co-located (virtual or distributed) group setting. Your group is expected to proceed with functionality and collaboration in accordance with the Star Legacy model (see http://iris.peabody.vanderbilt.edu/slm.html).

Objectives

By completing this group project, you will be able to:

1. Practice working in a collaborative situation in which direct group contact (F2F) is not appropriate for any of a number of reasons. Your group is encouraged to use a variety of tools to develop and present your group project.
2. Present to the class either an example of a group plan for an application of the principles of educational or instructional technology to a specific problem or your group's findings on some topic we have or have not covered in the text after reviewing empirical sources.

Presenting Your Findings

We will use Horizon Wimba Live Classroom and its capabilities for linking our presentation format. Your group will use this conference management system to meet with the rest of the class and to present major aspects of your group effort as you guide us through it in 20-30 minutes. We do not want an information dump during the presentation. Those major aspects are expected to presented using a multimedia presentation file (e.g., *.ppt, *.html, *.swf, or others). That is, present major aspects and save the rest of the details for your online document.

Posting Your Online Document

Your entire group effort (i.e., the online document) is to be submitted in a Web format (e.g., *.doc or *.pdf) and stored in the Komodo server. After the URL of your Cooperative Project is retrieved, a group representative is expected to post the URL to a designated forum, titled Cooperative (Group) Project, 24 hours before the scheduled presentation.

Working With Your Group

Your group meets primarily in a designated Horizon Wimba Group Deliberation Room. Each group meeting must be archived for the instructor's future references. It is highly recommended that you follow the Star Legacy model and meet through audio conferencing and other features, like application sharing, in Horizon Wimba. You are advised to start this planning as early as possible and do your part first.

Your team may want to determine who is responsible for what information. To do so, you need to take all it can to get to know your teammates. After knowing each other's knowledge, skills, and attitudes, you as a team may start the division of labor. You can select someone to act as moderator for the group during the online discussions and presentations. One way of presenting the group's findings is to assign individuals to be responsible for determining who the intended audience will be, what resources will be required, and what assessment activities will be necessary to conduct. Everyone in the group can contribute to the research (conceptual background) as well as diagnosing, designing, and developing the assessment activities. Each individual will be responsible for presenting their portion of the work during the presentation. Do your part first and do it well.

After the oral presentation, each group or individuals is expected to define and / or defend group work by posting revised work under the initial posting before the last class day for a better grade.

Suggested Presentation Topics

For your cooperative project you may choose any of the following topics or the like:

[Practices]

- Professional development [for the 4th grade mathematics teachers] in my school: A Dick and Carey Model
- The instructional design of a concept-mapping lesson for the 3rd grade teachers
- An after school program on reading techniques: Recommendations for practitioners
- Design of job aids for customer representatives in a Fortune 1000 company
- Adoption of a decision support system: An e-Learning lesson from a multinational company
- Communication training for Boeing's X45 unmanned jets' operators/controllers using a virtual environment

[Theories: Models]

- The Kemp Model
- The Gerlach and Ely Model
- The Bergman and Moore Model
- The ASSURE Model
- The Interservice Procedures for Instructional Systems Development Model
- The Diamond Model
- The 4C-ID Model
- The ARCS Motivational Model
- Electronic Performance Support Systems (EPSS)
- Human Performance Technology (HPT)
- d-Learning, e-Learning, and m-Learning

Figure 2. The Cooperative Project task in the ISD class.

Both activities above are facilitated using Horizon Wimba Live Classroom, a conference management system. The conference management system is integrated into the Blackboard system (see Figure 3).
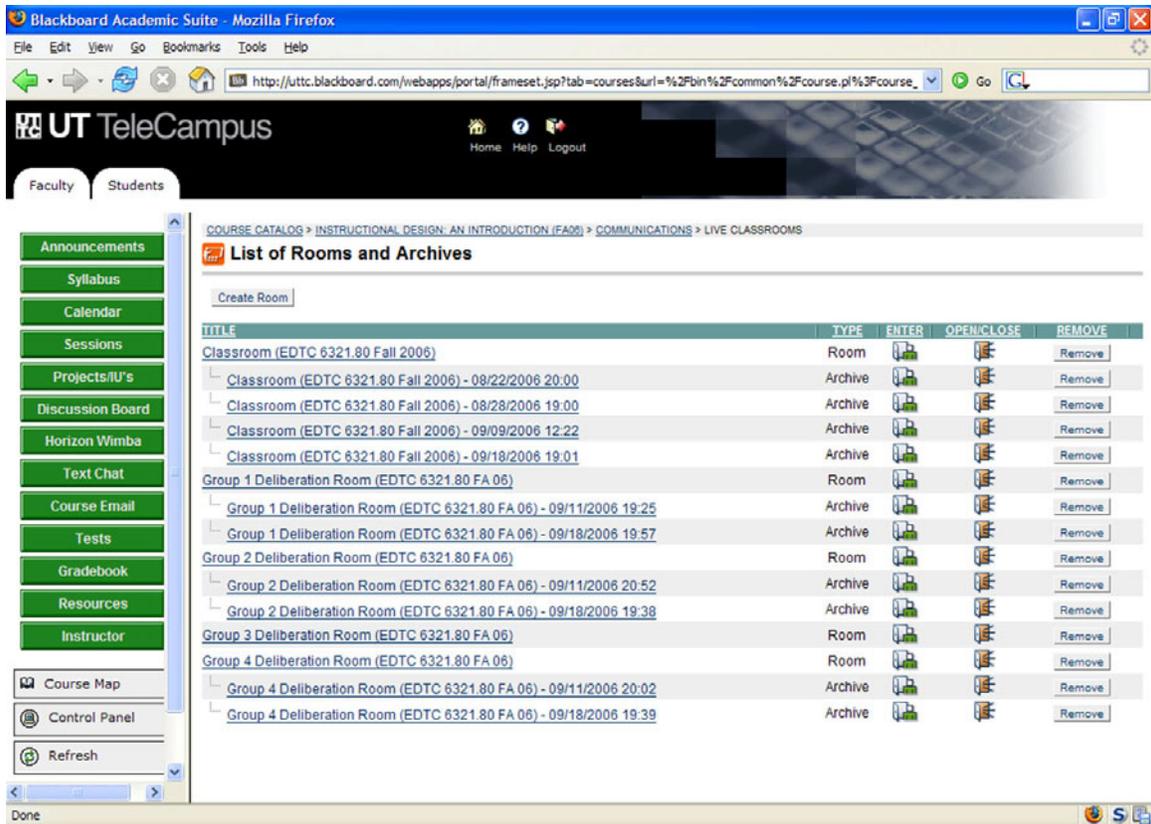
Figure 3. A screen shot that illustrates Horizon Wimba Live Classroom integrated into Blackboard.

In addition to Horizon Wimba Live Classroom, where both group deliberation rooms and the main classroom are created, students also use the Blackboard Collaboration feature (also known as text-based chat), Blackboard Discussion Board (i.e., the forum), Blackboard Course Email, Skype, and telephone for communications purposes.

Summary

This paper described how faculty members use the Star Legacy model, coupled with a suite of tools that includes a "cutting edge" CMS, to develop instruction for online students. To bridge the gulf between the theory and the practice, the present paper attempts to exemplify the working model for the participants/readers through the developmental process using specific examples from two, completely online courses in a Master's level degree program. This paper also shows how integrating the VaNTH design model into a course management system, as well as a powerful communications package can result in literally a new level of interactivity and learning in online courses.

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Ethics 7000 Asks:
Should "Exploring Our ISD Field" Come First, Last, or at all?

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Abstract

In 1978, the graduate instructional systems design master's program at the University of Central Florida began. The faculty required that the first course for students literally took them immediately into the field. The faculty felt that waiting until a graduate student had completed two years of a master's program to really explore the field was a breach in ethics. By the time classes had been completed it was too late to turn around and exclaim, "Oh, but this is not the field I wanted!"

Does truth in advertising extend to the reality of what the field is like, before one pays thousands of dollars in tuition, books, living expenses, and untold commuting miles, in the case of those involved in this scenario? Is there cause for litigation in that, what was said, failed to match reality? The authors have one opinion; the audience may have another. What do you think?

What follows is an historical overview of the course design; the competencies developed through the DACUM process that the UCF constituent based suggested be included within the master's curriculum; an example of the course syllabus used in 2002; a listing of the sites visited over time with descriptions of many of them; and finally, examples of basic instructional technology course descriptions as found in several different universities.

Underlying Theoretical Bases

Dewey, Dale, Gagné, Jonassen, and others have argued that first-hand experience trumps theory delivered, sans context. Dewey (1897) wrote, in his work, *My Pedagogic Creed*, Article IV – The Nature of Method:

> I believe that much of the time and attention now given to the preparation and presentation of lessons might be more wisely and profitably expended in training the child's power of imagery and in seeing to it that he was continually forming definite, vivid, and growing images of the various subjects with which he comes in contact in his experience (p. 77-80).

Given this belief, it was felt that much of the initial course in the UCF ISD master's program *Survey of Instructional Systems,* be devoted to formulating the student's imagery that would sustain them through subsequent classes, once they had experienced multiple facets of the field.
Edgar Dale would later expand the notion of experience, placing it into the context of a mediated continuum, ranging from the concrete to the abstract. He began his discussion by first calling attention to the base of the Cone:

> The base of the cone represents reality itself as we experience it at first-hand. It is the rich, full-bodied experience that is the bed-rock of all education. It is the direct purposeful experience that is seen, handled, tasted, felt, touched, smelled. It is the unabridged version of life itself-tangible experience, which we commonly refer to as "something you can get your fingers on" "something you can sink your teeth into," etc. (Dale, 1946, p. 38).

Following on Dale's credo of placing the direct experience at the base of his Cone, the course we designed was purposefully designed to provide those touches of reality Dale so aptly described.
Gagné, given his military training experience in the 1960's, took two decades to articulate what would become the mantra of instructional designers around the world – his *nine instructional events* recommended for successful teaching of a specific objective (1985). Considering that the major objective

of the Instructional Systems Survey class was to arrive at a career decision, the course design made concerted efforts to ensure that, throughout the course, the focus reflected those events:

Gain attention – In this class you will experience varieties of ISD careers by means of visiting a number of different organizations who create or provide instructional design products or services.

 Identify objective - pose question: "Is the field of ISD for me?" How will you know and what action will you take?

Recall prior learning – how do these job sites compare with your previous work experiences? As we progressively explore these sites can you apply what you have experienced to the accumulation of facts, rules, procedures, attitudes, values and connect these to previous site visitations?

Present stimulus – Through the site visits your hosts will provide multiple and contrasting forms of stimuli that will allow you to measure levels of consistency on a weekly basis.

Guide learning- point out "eternal verities" about the field as seen during site visits; ask questions of those at the sites that validate or repudiate professed realities observed. Monitor student acceptance of information, attitudes, skills and values to ensure the "Hawthorne Effect" in minimized.

Elicit performance - ask students to rank-order their site preferences and tell why, indicating what ISD model the site emulated. Begin to assemble group project segments in support of final project completion.

Provide feedback – affirm student opinions, discuss alternative views, suggest additional attributes for the field not observed, validate conclusions, encourage students to posit their arguments in support of or against conclusions reached about specific sites.

Assess performance- provide students results of their assessments and indicators that demonstrate the student is arriving at a career choice decision.

Enhance retention/transfer – through group projects that depict sites that model contemporary ISD practices, draw conclusions that will pertain to the next series of courses that were derived from the Survey course. Encourage students to make individual site visits to organizations of specific interest; reinforce that the information obtained and experiences gained in this course are designed as an overview and the the remaining classes will ass the specific skill sets needed to achieve basic performance levels. Encourage students to consider applying for internships at more than one type of site.

Apologies to the late Robert Gagné for taking perfectly good instructional events and morphing them into the above variants.

Surround students with reality and they will define the context as it applies to them. Exclude the context and they remain detached. With a strong cognitivist emphasis in the early years of the program (1978-1993), other methods of teaching emerged and the course took a decidedly-constructivist turn in its emphasis and subsequent outcomes. We still revered the theories and practices of the aforementioned authors, we saw wisdom in models proffered by Keller, Dick and Carey, as well as Heinich, Molenda, et al. but we were, at least in the aims of this course, trying to prepare the students for a professional life of activities based on collaborative efforts.

Jonassen and Rohrer-Murphy (1999) provided new insights as how we chose to amplify the objectives of the course. They suggested activity theory as an alternative basis for designing of constructivist learning environments (CLEs):

Activity theory provides an appropriate framework for analyzing needs, tasks, and outcomes far designing CLEs. Activity theory is a socio-cultural, socio-historical lens through which designers can analyze human activity systems. It focuses on the interaction of human activity and consciousness within its relevant environmental context. Since conscious learning emerges from activity (performance), not as a precursor to it, CLEs should attempt to replicate the activity structures, tools and sign systems, socio-cultural rules, and community expectations that performers must accommodate while acting on some object of learning (p.61).

Perhaps another influence of moving more to the constructivist side of the scale was the author's own continuing evolution to a teaching model that increasingly involved the emphasis on collaboration, interpersonal skill development, and abiding fascination with changing media formats, all of which would become tools of these master's students.

During this same period the UCF Instructional Systems master's program accepted a number of students from abroad, many of them from Asia. International students, especially those for whom this was their first trip to the United States, need the context even more, not only to extrapolate what is learned in America to home country (Cornell, R.A., Pan, S., and Tsai, M. (April 2002) but in addition, to justify why they pay twice or more the cost of courses taken than their American peers.

Given these premises, when should students begin to experience the field of their choice? We hold sooner is better; for many reasons. The first is the epitome of practicality – if you can see the product before you buy it, you have the opportunity to ask the seller questions, thus ensuring that what you are buying is what you get.

Put another way, imagine sitting through a year and a half of coursework and yet to put foot inside an organization that designs instruction. When that day arrives, your context will be the words of your professors, the writings you have read, and…yes, please go on…

Will a final-semester internship compensate for the deficit of not having first-hand experience or insight about the field ahead of time? We think not. *Our point is that the course we recommend should come first in a student's program, not last!* In doing so, we have sent a strong ethical message to our students. We said to our new master's students, here is our field, with all of its attributes, its excitement, and also, its realities. We stated up front, that the objective of the course is for the student to make an informed career decision by the end of the semester. If, at the end of the course, the student feels this is not the field for them, great! Think of all that tuition money saved by making a decision not to continue! In most instances, we find that students completing the course complete the master's program and many then apply for entry into the PhD.

The course, then entitled, *Survey of Instructional Systems*, begins by providing each student with a list of competencies they will eventually acquire, some in their classes, others through semester-long internships, and others upon being hired in their first instructional design position. See attachment 1 for the course syllabus and attachment 2 for the competencies list.

Questions to Answer When Visiting the Sites

Students are given issues to investigate and questions to answer as they visit 10-12 organizations. Depending on the availability of corporate sites determines how many visits during the semester. The more the better. Areas of inquiry involve answers to the following:

1. Here are the places we work (note the size of my cubicle or work station vs. that of my colleague).
2. Here is how I dress, on casual days, on days when clients come.
3. This is the salary I get, within company parameters.
4. Here is the amount of travel asked of me.
5. These are advancement possibilities, including pay and position.
6. This is how I am evaluated, and by whom.
7. These are our clients, for whom we design instruction.
8. This is what they expect from me, considering that my degree is in ___ with ___ years of experience.
9. These are the tools provided me to do my work, and of these ___ were used in class when I was a student.
10. Here are typical timelines for projects, and the system we use in forecasting task accomplishment.
11. Here is the number of times we met the timelines, and what rewards, if any, were received for doing so.
12. Here is the number of times we missed the timelines.
13. Here are some reasons why we missed the project deadline.
14. Here is an example of the penalties we paid because we missed the project deadline.
15. This is my benefits package.
16. This is the number of days off I get each year.
17. Here are the sources of help when I need them.
18. Here are the colleagues I work with and why they are important to me.
19. These are the different cultural entities with whom I work on a daily basis.
20. Here are the conceptual ISD models we employ.
21. Here are our financials, in general terms.
22. These are our clients, and the number of months or years they have been our clients.
23. Here are the kinds of projects we have worked on this year.
24. This is who owns the company and here is where they are located.
25. When I graduated from the program I had these major skills.
26. Here is what I really like about working here.
27. Here is what I wish could be different about working here.

28. On a scale of 1-10, with 10 being tops, my happiness in working here is a ____.
29. Here are some things I wished I had learned when I was in the program.
30. Here are our personnel policies related to equal employment, diversity, gender equity, sexual orientation, citizenship, security clearance requirements, pensions, overtime, tuition reimbursement, maternity leave, bereavement leave, hiring, release from position, and retirement.

Logistics Related to Course Management

In the late 70's until the present, the need for instructional designers fluctuated but basically remained consistent in an upward growth mode. Central Florida has become a hub for simulation, training, and more recently, instructional gaming. As the technologies have evolved, so too has the need for more diversity in skill sets. In the late 70's into the mid-80's, the emphasis was mostly on basic ISD skills. With the advent of eLearning, however, and later simulation and gaming initiatives, the ISD base has expanded to include a plethora of tangential skills. Within this context the expressed need for a master's degree program in instructional system design evolved. It was decided at the outset, that the first course in the program would be one that provided the fundamentals of the field and those who worked within it.

For this kind of program to be successful it had to depend upon the good will of the organizations who would hire its graduates. Our plan was to take the students to the workplace – the sites to be visited. The organizations were told that the basic class was made up of students whom, for the most part, had little or no previous ISD experience. Given that the initial group of organizations had participated in our first DACUM analysis, they had already told us what workplace skills they were seeking.

The DACUM process (Developing A Curriculum) (n.d) was employed in 1978 to "identify instructional needs, instructional program planning, curriculum development, training materials development, creating and revising job descriptions and standards, employee recruitment, ISO 9000/1400 performance, and career guidance" (http:www.ateec.org/curric/dacum/dacum_overview.htm).

The class traditionally met once each week, in the evenings. During fourteen weeks, four required attendance on campus, with the remaining ten classes being held at a difference site each week.

The first task was to find ten organizations that would be willing to keep their key staff at work for two-to-three hours after the workday ended. Initially this was a hard sell, at least for the first year or two. It then became apparent to the organizations that opening their doors to the class, many of whom might become potential employees, made good business sense. Once it dawned on the site owners/managers, that their quest to locate new hires was solved, at least at the entry level, finding willing organizations to host the class each year ceased to be a problem.

Initially there were few students in any of the organizations we chose to visit. As time passed, however, increasing numbers of the UCF ISD graduates were employed locally, thus affording a valuable contact within who often served as catalyst for the company opening their doors after hours.

An aside. Either through serendipity of just dumb luck, one of the first organizations to host the class was the Darden Restaurant in its new training center based in South Orlando. Upon our arrival at the training center, then designed to train employees in the new Red Lobster brand, the class was welcomed by training lead, Sam Jones, and ushered into a room where a sumptuous seafood buffet awaited the class!

Word of the Red Lobster generosity spread quickly through the other companies and organizations and almost immediately it became de rigueur for the sites to begin their presentations with an accompanying series of culinary offerings, ranging from sodas and cookies to full buffets. This was extremely helpful to our students considering most of them worked full time and attending the evening class precluded them stopping off somewhere to get a quick snack before class. (*Author's note*: It is speculated that some of the sties subsequently evaluated by the class suffered reduced evaluations by their not meeting the catering criteria of other organizations.)

EME 5054 Sans MapQuest

Once we were able to line up site visits (some were announced later in the semester pending corporate approvals) the next step was to provide the students with directions to the site. Given that most were commuting, the directions had to be written from multiple points on the map. Those sites in the Research Park adjoining UCF required minimal guidance; those that were in other parts of Orlando, were in adjoining counties, or located several hours distant (and there were some of these), required considerably sophisticated linguistic and cartographic skills by the instructor and the ability to follow directions by the

students. Students soon learned to ask their peers for help if they encountered problems locating the site. Car-pooling solved many location identification issues but not all. The advent of MapQuest eventually solved the geography problem, for most.

Extolling Virtuosity

On a number of occasions students arrived late to a site or appear dressed in less-than-acceptable clothing. In addressing the first issue, it became a rule that any student arriving more than two minutes late to a sire would find that site's door locked. One time a carload of six students arrived late, only to find they were locked out. This proved an especially painful experience as the site was sixty miles distant from the university. After that experience, being late to a site was very rare.

With the advent of cell phones, now ubiquitous, students in the mid-90's onward at least had the option of calling me at the site, should an event beyond their control arise.

The matter of "acceptable" dress arose with every class year and time was spent addressing grooming, clothing choice, and interpersonal communications. While one might think such issues would not be necessary with graduate students, they were for some. Eventually, peer modeling of behaviors and dress became the norm and these concerns gradually dissipated.

Pros and Cons of Managing the Course

The benefits of having the Instructional Systems Survey class at the beginning of the master's program include:

- If, at the end of the course, the student indicates that ISD is not the field for them, they have saved thousands of dollars that can then be used for entry into another program or used for other purposes.
- After having observed many of the students in the entry level course, managers at many of the sites follow up with specific inquiries as to who a given student was and how they might invite them to come for an interview. Many students have been hired on the basis of their demeanor and demonstrated intellect noted during attendance at one of the site visits.
- The student who does make a decision to enter the ISD field has a clear understanding of the innumerable variations found in companies and organizations that create ISD-based products and services. Consequently, after having reviewed the competencies aligned with the program, they do self-assessments quickly, choosing to opt for classes wherein they may lack strength in specific areas they deem important to the job they seek.
- Over time, a cadre of very strong supporters in companies and organizations emerges. Some of their enthusiastic support stems from the fact they now have a number of UCF graduates working for them. Other constituents see the strong relationships that emerge between their expressed career skills and the skills brought them from the program.
- By the completion of the ISD masters, the Survey course is the one most often cited as being their "best class." The instructor assigns this credit away from him but to the excellence found in these organizations and how the students perceived them.
- Because of the nature of the course, with its ever-changing venues, there is a refreshing newness to each class. It was necessary to vary the types of sites chosen to ensure that this freshness was maintained.
- Those areas that might be termed negatives include:
- To the teacher-centered professor, relinquishing all that valuable face-time to others was viewed as their being vulnerable. In a course such as this, the instructor is truly a facilitator; ergo, the professor who needs the constant control of his or her class will not be comfortable with such an arrangement.
- To set up the course logistics each year requires an excessive amount of work, much of it requiring that the instructor maintain continual good relationships with the companies and organizations within the university service areas and beyond.
- The student who has a high need for individual recognition will find a course such as this restrictive in that their grade is primarily based on their ability to work well in a teamed environment.

- The concept of self-motivation is an underlying principle for the program as are interpersonal skills. If student lack motivation or "people" skills, they will not be happy in this program.
- Sometimes the expectation of those at the various sites exceeds the capacity of the students, given that: a. this is their first course in the program, b. students from all bachelor's degree majors are accepted into the program.
- Students struggling financially may encounter initial difficulties in traveling to sites or they may not own much appropriate clothing. Eventually the students resolve these issues, sometimes with the help of peers or from the instructor.

Conclusions

There is no doubt that the course, Survey of Instructional Systems served its purpose. Of the almost-1,000 students who enrolled in the program, ten decided that ISD was not for them. Probably of the 1,000+ who chose to remain, twenty-five failed to complete the master's. Those odds speak for themselves. If the author had it to do again, he would find a young professor filled with fire in his or her belly and assign them this class. He or she would be a person the students are excited about being around, who was genuine, self-effacing, filled with humor and caring for all of the students. Author's Note: *The course as described is no longer taught.*

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What does "interpretation" have to do with instructional design, and why on earth would we need an "anti-interpretation" instructional design methodology?

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The short answer is simple. By the time a learner is exposed to "designed" instruction, the steps taken in the production of learning content have interpreted and re-interpreted data so many times as to render it ambiguous. The consequence is that more time is spent in various interpretations of content as to render it extremely difficult to recontextualize by the learner. The *intuition* is that excessive time spent in interpretive activities is interfering with the learning process, therefore an anti-interpretive instructional design methodology might improve learning performance.

To the academic reader such as yourself, for which this report is intended, has been trained in a culture that promotes and uses analytic methodologies for the presentation of arguments and statements about subject matter. Your automatic (or semi-automatic) response to reading the above paragraph is most likely to question or to try and map out the assumptions and for the more enlightened, beliefs and positions about learning theories, philosophy (perhaps) or even the scientific enterprise of empiricism. These are among the hallmarks of analytic techniques, and you would rightly expect that some statements about things like "interpretation" and "instructional design" would be illustrated in an analytical way. This is usually in the form of a series of arguments or some empirical evidence that justifies, and/or shows logically why we should be paying attention to this sort of thing[1].

The preceding paragraph is intentionally crafted to draw a parallel to "designed" instruction that has been analytically derived. Like the first paragraph of this report, most designed instruction tend to deliver summary information that has been pre-interpreted and condensed in such a way that leaves the learner without much grounding with which to provide adequate context. In other words inadequate justification of content by way of contextual or external referencing is naturally ambiguous. And here is the non-essential problem: even though we can consider the average analytically trained person reading this report to have a reasonable amount of cognitive skills to use a variety of theoretical groundings, without adequate context, she flounders in the ambiguity of multiple *potential* interpretations. I could present the first paragraph at a round table discussion and hours, days or even months could be spent in exploring possible explanations by stating theoretical frameworks and processing those four meager sentences and interpreting them as to have some kind of "meaning" within a chosen theoretical framework. This generally includes other non-essential arguments about the appropriateness of a favored interpretive model (which I will use interchangeably with the term "theory") as the analytically-trained are prone to do. This is descriptive of the enterprise of academia, and it is also the enterprise of instructional design. This critique examines in an analytical way, the consequences of the analytical approach to instructional design as an *interpretive process mechanism*, and presents the idea of a more natural *anti-interpretive* approach to designing instruction.

As I mentioned "non-essential arguments about theoretical models" I will attempt to clarify with a self-referential comparison to typical analytic writing. At this point in an academic report or article some sort of ideological statement is made, or at least a clue is given to the author's theoretical allegiance, often even stated in the title of the article. This is a strategy to disambiguate the statements that appear in the thesis or in the supporting evidence. For example, if I were to state that this is a "behaviorist", "social-constructivist", "cognitivist" (or whatever) allegiance, I am actually providing a directive on how to interpret the text by way of the assumptions of the descriptive theory. It is shorthand for preceding each proposition of the article, as justified by "factual evidence" or by its place in a philosophical-dialectical

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[1] The full stated assumptions and discussion of theoretical frameworks and justification for an anti-interpretation instructional design methodology will be in the author's forthcoming M.A. Thesis, tentatively entitled, Interpretation, Anti-Interpretation and ADDIE.

discussion with "if the assumptions of theory *X* are true, then these propositions are true." If an ideological statement or a proposed interpretive framework is absent, astute academic readers would automatically assume that the report is to be interpreted according to my previously known ideological positions.[2] The instinctual intent in this strategy is precisely to avoid the kind of non-essential judgments and critiques about positions that are political in nature, in other words, about having justifiable beliefs for being in one ideological camp or another. However we make a huge assumption that despite interpretive directives, the content will be interpreted according to the author's intent.

Since I am not well known and I have not stated an ideological position, the analytically trained reader might assume that this is a meta-theoretical piece as it questions theoretical assumptions of theories, or more specifically the assumptions of theoretical analysis (this is partially correct). To provide some additional grounding, anti-interpretation is not about radicalizing an atheoretical or anarchic (Feyerabend, 1988) or synthetic (Spencer, 1895) approach , but that purely analytical approaches to designing instruction is reductive in the sense that too much source data is ignored, and therefore instrumentally misapplied to the objects or units of analysis.

The analytical approach to "meaning-making" is really no different for any learner presented with "designed" content, in the sense we promote analytical and critical thinking skills from about the age of puberty as part of our mandatory systems of education, and somehow we assume that an analytical technique is the best way to decode instructional content. It is also obvious that those who manage to do so successfully usually go on to become professional analysts in either business or academia. The intuitive strategy is to disambiguate in a "scientific" way a mass of discretely (ontologically) classified data to make it meaningful. Meaningfulness is defined here as what follows after description, in other words, it is the result of processing data using an interpretive framework as an instrument of context. The consequence of this approach is that meaning is not relative to the source data or the "real world" phenomena, but rather to the interpretive framework or the theory. In other words, it is not experiential (observable) phenomena that are linked to the theoretical interpretation but the ontologically derived assumptions of data descriptions.[3]

There are other disambiguation strategies, but broadly speaking the analytical approaches in designing instruction are audience or learner analysis, context or environmental analysis, and/or goal and task analysis (Jonassen, Tessmer, & Hannum, 1999). These are all supposed to give the instructional designer an interpretive framework in which to evaluate "activity" or "content" in such a way that it may be presented in the most efficient way possible. This is no different than your typical academic report, whereby ideological statements, presentation of evidence and even logical arguments are all used in a way that assume the readers have the analytical skills to process the information and create "meaning" through selective omission. But this is no guarantee that the content is (extrinsically) valid, as a skeptical academic will believe or not believe the presentation of the content largely based on his own ideological beliefs. For example, I might say that this report is a call to a return to logical positivism and Skinnerian behaviorism, which despite the evidence I present, would be dismissed as outmoded by anyone who adheres to an ideological position that says that we are not justified in having those beliefs (which is the current fashion in learning theory).

This is the dilemma facing the instructional designer. In that through distillation of content and presenting it, he cannot possibly anticipate how it will be judged against the learner's own beliefs, whether those beliefs are experientially, culturally, socially or academically derived. The problematic is that we can analyze to death all of the above-mentioned operating parameters of the learning process, but as long as content is being presented, it will be a question of rhetoric or poetics as to whether or not the learner's beliefs will be sufficiently in agreement, or altered (the case may be). The astute reader at this point might be thinking that this is a "communication" or "message design" view of learning, and this is not what learning is all about. If this is true, then we must to let go of analytically-motivated and derived data as the primary mode of representation (and I will expand on this notion further on in the report). The underlying assumption of the analytical approach says we are justified in presenting the "essence" of subject matter that will be somehow easier to understand by learners. By taking the analytical approach, I venture that we

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[2] I have the luxury of being unknown, and I am using this to my advantage.
[3] This view is a summary of post-structuralism as represented by Gadamer, Foucault, Derrida and Lévi-Strauss.

are simply deluding ourselves with analyses that we believe should be sufficient justification for the content presentations we come up with.

The problem is that WE believe our conclusions and content choices, but the learner, alas, did not have access to the analytical process that formed our beliefs about the content and our choices of presentation. WE (the instructional designers) are justified in our beliefs, but somehow our justification is not enough for a learner to automatically believe what is being presented. To demonstrate this, ask yourself, now that you have read just a bit more than 1200 words, if you really have enough information to believe the four sentences of the first paragraph. It is more than likely, since I have intentionally left out the guideposts, that you don't know which ideological hat to wear (or which one I am wearing), or what I might believe or what your own beliefs about instructional design or learning can help in the interpretation of those statements.

If this is difficult for an academic audience, imagine what it must be like for non-professional analysts, in other words, for a typical learner, when faced with just about any "designed" instruction. Just because an instructional designer has verified and justified beliefs about the subject material is not any reason to expect that a learner will automatically accept, believe, understand, retain and use it in a way that would demonstrate that it is "learned". In other words, there are not enough contexts to understand what I mean, not enough context to agree or disagree, judge or remain open, believe or disbelieve or to process further in order to arrive at a position of judgment about my statements. However, by not being careful about context, the effect is more likely judgment than openness. The selection of context, regardless of the analytical approach that seeks verification, is a crap-shoot of possible meanings when it reaches the learner[4].

Up to now the strategy has been to provide context, and that our analytical methods intend to process data into that context as a disambiguation AND a justification strategy. We can use external references, theoretical frameworks, the productions of theoretical frameworks (logico-empirical or otherwise) or experience. These are all correspondence models of justification and they simply provide the background for having belief about certain propositions. This is just to say that any statement or presentation of content is conditional and dependent upon a good deal of external references, theoretical frameworks, the productions of theoretical frameworks (logico-empirical or otherwise) and experience (which may internal to the learner or external by what has been learned by other people), stated or otherwise unstated. The intuition is that we can be increasingly precise in our content and context descriptions that will somehow facilitate transfer either into or out of the learner. There is simply never enough context, but can we assume that a theoretical framework or a belief about something is indeed adequate context?

"The short answer is simple."
This statement represents, to a great degree, a promise that the reader will be able to apprehend, grasp, "grok", understand or get the gestalt, meaning or insight into what I am proposing, without too much difficulty (notice that I used seven different words that mean roughly the same thing). But it is fairly easy to attest that the simplicity or ease in which that might happen is largely dependent on the double-edged sword of our abilities as communicators within the academic context. This is to mean there is some kind of congruency between my ability as a poet/rhetorician/ scientist and your ability as a trained analyst to accept or reject a particular viewpoint or belief about something we might have a conversation about, in this case instructional design or any of the learning theories that inform it. In other words, the difficulty here is, once the rudimentary grammars of communication and language have been overcome, the validity of the statement "the short answer is simple" is relative to a very large web of beliefs (Quine, & Ullian, 1978), therefore subject to interpretive judgment. We might agree at this point that we can extend this to the "short answer is simple, but the long answer is not."

The promise of instructional design is very similar. The underlying belief is that by appropriate analytical techniques, we can somehow organize knowledge and skills in such a way that renders it simple to

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[4] Keep in mind this argument depends on the verifiability of experience that follows a certain internal logic and not one that depends on some kind of external correspondence. This is counter-intuitive for instructional designers as the intuition is to provide context, or the "right" context, given the results of analyzing the operational assumptions of learning a given content or activity. The disambiguation strategy here is to be consciously ambiguous, which is different that presenting ambiguity or more precisely, unintentionally creating ambiguity.

apprehend ("understand", or what have you). The long answer, which is the one that takes place when the content reaches the learner, is that it is not so simple. So what is the promise of instructional design, if not to compress what we know about knowledge and skill production into tightly essential packages that appear to be simple by nature of their brevity? Only that the consequence of unpacking knowledge or activities in the learning context, is that they expand so much and so quickly that we don't have the equipment (frameworks, theories, properly trained teachers, etc.) to know how to deal with the decompression effectively[5]. In other words, instructional design is largely about packaging and package delivery and not really about what happens once the packages are delivered to the warehouse, that black box we refer to as the learner's mind.[6]

"By the time a learner is exposed to "designed" instruction, the steps taken in the production of learning content have interpreted and re-interpreted data so many times as to render it ambiguous."
The process of instructional design is essentially to accomplish one of two things. The first is to take previously rationalized knowledge and/or behaviors, strip them of their original conditional-contextual links and recontextualize the resulting package to the learner. The second is to strip the learner of her context-conditioning and recontextualize her to the knowledge and/or behavior "package". Both approaches require extensive hermeneutical interpretation on the part of the learner. It should be possible to organize instruction to deal with the interpretive variables that are encountered in the learning process, rather than assume that a prescribed or suggested analytical interpretation will be used by the learner.

To step back from the mechanical picture of instructional design, the more abstract notion of interpretation, or the role of interpretation, can be roughly aligned to the discipline of hermeneutics. I will qualify and use this term not by its romantic origins and relationship with religion but rather as the stance one takes when encountering data or phenomena that is unknown, unclassifiable or otherwise inconsistent with either theory or experience (in other words, difficult to explain). (Rorty, 1979) This stance is similar to the radical hermeneutics of Derrida and Foucault as defined by (Gallagher, 1992) [7]. The hermeneutical state is the natural state of learners, and not the analytical one.

If we consider that the analytical processes of instructional design are also largely interpretive, the only possible outcome is that we end up replicating and compounding interpretations of interpretations[8]. It would be sufficient only to acknowledge that this indeed is an effect of the process of instructional design on the learning context and worthy of study. A deeper examination would identify specific points in the process where an analytical interpretation is used instrumentally, that is *transduced* into another subprocess of instructional design. For example, the results of a needs assessment is transduced into a learning design

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[5] An example is the Calculus. There are two only two central precepts, differentiation and integration, and the modeling equations are relatively straight-forward. However it takes roughly 12 to 13 years of mathematics instruction before it is introduced to senior high-school or junior college students.

[6] It might be appropriate here to question whether or not packaging and package delivery is a good representational metaphor, which is another often abused and potentially ambiguous disambiguation strategy. If we object to this metaphor, we must also question whether we should use an objectified model of knowledge (concepts, procedures, or whatever representation is appropriate for a given "natural" epistemology) and assume that these bundles of objects are somehow transferred and accumulated in the *mind*. I would like to take this further and say that the notion of *mind* as a repository of knowledge-representations is also a huge assumption, and that it may be an underlying assumption of the data-compression model of knowledge I am illustrating here. We might not have any justification at all to have these beliefs. This has serious consequences for the use of analytical techniques to arrive at the kind of compressed content data-descriptions we inadvertently establish as a goal of well-designed instruction.

[7] I am skipping over the relationship between hermeneutics and metaphysics however it is worth noting that the grounding of most learning theories in positivist psychology rejects metaphysics, hence hermeneutics. In my thesis I expand on the neo-pragmatist idea that empiricism in the natural and human sciences makes huge metaphysical assumptions.

[8] This is similar to, but sufficiently different from Gidden's concept of the "double hermeneutic" in interpretive social sciences. In *The Consequences of Modernity* Giddens show how sociological knowledge becomes part of the social fabric, hence influences and modifies the interpretive framework that created the knowledge in the first place. My distinction is not that the learning process is self-referential, as social agency is intentionally limited (usually) to the learning context. In other words, the people in a decontextualized learning environment do not have direct influence on the social sphere or community of practice(Wenger, 1998).

plan, then packaged as a result of developmental and implementation constraints. The resulting "learning" (if you could call it that) is also often constrained by assessments that call for positivist evidence (visible and measurable phenomena).

The effects of designing instruction are one of analyzing data for the purpose of transformation for the needs of the *process*, rather than the *learner*. As stated previously one consequence are the interpretation of the interpreted data, rather than the re-interpretation of source data in each of the ADDIE sub-processes. Another consequence is the obscuring of the extrinsic goals motivating the selection of content and activities. This will require revisiting some notions of analytical interpretation as they are formed by learning theories and extrinsic goals.

"The consequence of an analytical instructional design process is that more time is spent in various interpretations of content as to render it extremely difficult to recontextualize by the learner."
Qualifying this statement requires a deconstruction of theoretical models of education, learning and the process of instructional design, which is presented here as a three part strategy: exposing learning theories as interpretive frameworks, demonstrating how learning theories produce deficiency interpretation models and finally how extrinsic goals become obscured by analytical instructional design processes.

Analytical Interpretation and Learning Theories
The proliferation and scope of learning theories in general, and instructional methodologies in particular, is a healthy thing from a philosophical perspective. It is an indication that, as educators, we show a willingness to question underlying assumptions and beliefs about learning and teaching. From an analytical perspective, the domain of education has virtually exhausted the exploration of different units of analysis, both categorical and intrinsic, ranging from analyses of environments, learners, content or what have you.

What is particularly troubling, however, is that the proliferation of learning theories and instructional methodologies, despite all good intentions, have failed miserably at the task of improving the performance of the designed instruction. By performance, I don't necessarily mean quantitative improvements such as speed of learning or amount of content and/or skill, but also qualitative improvements such as "transfer", "retention", "executive capacity" and the resulting promises of value to our cultures, societies and environment ("quality of life" and "ethical standards"). This should also be extended to the performance of the instructional design process itself, of which learning theories appear to be counter-productive. For the sake of argument, the issue is perhaps analyticity itself, either as over-analysis, dependency on analytical frameworks or the mis-use of analytical techniques, which is what and how things are measured[9].

Regardless of the instrumental usefulness of analysis, it comes down to understanding where, when and how it is to be deployed. In other words, an effective philosophy of education must include, first and foremost, an awareness of the consequences of analysis, an exposure of the underlying assumptions behind analytical selection (which include metaphysical and ontological assumptions), and ultimately, epistemic guidance for the organization (interpretation) of instruction. The idea driving this line of thinking is Richard Rorty's "post-analytical" pragmatism[10] and the project is to apply this idea to the common analytical components of instructional design processes. While I borrow heavily from Rorty's approach and use the techniques of analytical philosophers to present my arguments, this is largely to facilitate understanding to an academic audience and not due to lack of awareness. The purpose is not to deny or radicalize an alternative strategy (such as a "synthetic" or "ana-synthetic" approach) as I am also in full agreement with W.V.O. Quine's pragmatism which argues for a dissolution of the distinction between the analytic and synthetic, or to be more precise, the division of epistemic statements into respective analytic and synthetic categories as a means of determining truthfulness (Quine, 1996).[11]

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[9] The simple analogy is that it is one thing to have a theory to predict the weather by means of measuring air temperature and pressure. It is another thing entirely to predict the weather by measuring the air temperature and pressure in your tires.
[10] As developed in Philosophy and the Mirror of Nature. A prescriptive post-analytical methodology is outlined later in this report.
[11] The project of neo-pragmatism is to both look at the consequences of traditional epistemic dualisms and to dissolve what are shown to be metaphysical assumptions. These include mind/body, fact/value (or truth/value), content/context,

The justification for this approach is largely the highly conditional nature of epistemology as well as human activity. As demonstrated by the first part of this article, any statement or proposition (basic or extended) is effectively conditional on its possible contextual links, whether or not supplied by the author. The truth-value of any statement or activity as *evidence* has been extensively discussed by (Rorty, 1979). What is useful here is the notion of a dependency on how our descriptions of things are dependent on theory[12]. The distinction I make is not that knowledge is bound to "context" per se, but that it is *conditionally* bound to context mediated by an interpretive framework. The consequence of this distinction is largely an issue of how to deal with *value judgments* upon the presentation of data.

The simple test is to show how analyticity works, such as in the evaluation of any statement for truth-value. *Statement X is true if it can be verified through the use of N reference forms*. However the verification argument falls down when the dependencies are obscured, and this is what happens when analytical approaches become the justification for a choice of presentation, or themselves used the creation of dependencies for other processes. The example would be using a social constructivist assumption about the creation of new knowledge and modeling a learning environment after it. Just because *new* knowledge is created in a dialogic-social community of practice is not a reason to assume that this is the best way to learn about *pre-existing* knowledge or practices. The real issue is how to prepare learners to be full-fledged participants in the conversations that *hermeneutically* deal with new data within the boundaries of a given community.

Deficiency Models as a consequence of "Goal" Analyses
Consider that most learning prescriptions are based on the results of interpreting extrinsic goals in a way that presents a deficiency that must be corrected. For example, it is a purely metaphysical assumption that learners are containers that acquire knowledge or practical skills. The common "gap" analysis establishes that a particular set of knowledge and/or skills are missing and the instruction is designed to correct the deficiency. Entire domains of research and productive enterprises have been built around it, notably "performance improvement", "designed instruction". Other consequences of the deficiency analysis are "learning disabilities" which in turn spawned their own domains of academic and economic activity.

To show how the deficiency model is a metaphysically derived value-statement and not fact, consider that "learning disabilities", is just an artificial "categorical" label, and how it dissolves when we dispense with the deficiency model of learning. A hyperactive or inattentive child is considered "learning disabled" as their inattentive or hyperactive nature somehow prevents them from acquiring knowledge or skills at the same rate of success when measured against their "normal" peers. This is a deficiency analysis, therefore we find deficient results. The intuitive practice (not based on any reasonably accurate science) is to correct the so-called "deficiency" that is modifying the child's behavior to bring her up to the performance level of her peers. This is clearly the consequence of a bad analytical assumption, as it is possible to turn this around by looking at other criteria. We could, as an alternative, choose to perceive the inattentive or hyperactive child as not having the right conditions for learning[13], or that it is really the environment or learning strategy that is inappropriate. For example, we fail to explain how, and under which conditions, learning "disabled" students often outperform their peers as they are accomplishing these feats under "unobservable" conditions, usually outside externally directed learning contexts.

If this is indeed true, then we then interpret the hyperactive or inattentive child as actually a high-performance learner who happens to be in a low-performance environment. The consequence in this case is that we have greater expectations on the performance of our children, rather than our learning

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analytic/synthetic, appearance/reality and so on. The stance is skeptical, in that we are not justified in accepting the consequences of instinctive dualisms as a basis for scientific theories or more precisely, empiricism.

[12] See also Bernard Lonergan's notion of the "virtually unconditioned", where he shows how agreed-upon propositions become virtually unconditioned by "virtue" of their socially constructed truth-value. Once we agree on a definition we drop the conditions that make a proposition dependent on context, however those supporting assumptions don't just disappear, they are only obscured.

[13] This also means questioning the validity of things like Gagné's first instructional event, which is "Gain Attention". Clearly this is a problem for nearly 10% or more of the student population that can't even get to the first event, never mind the other eight.

environments. We analyze the wrong criteria and call it "science". The analogy is a Ferrari stuck in an inner-city traffic jam: this is a car that will perform poorly in the city, but on the open road will leave the cars adapted to urban driving in its dust.[14] The point here is do we want to promote diversity of knowledge and skill sets, or homogenize the learners to better fit the system?

The obfuscation of extrinsic goals in the instructional design process

Extrinsic goals are defined here as an integral part of the needs analysis process, whereby the reasons or needs for a learning package are defined. These are referred to also as business goals or stakeholder goals, or the motivation behind the designed instruction. These are not to be confused with learning objectives or goals (which have more to do with internal measurement or as the plan to get through the learning content).

An analytical goal inquiry usually aligns a content or skill-based competency with a "business" need, whether it is poor performance or relative performance, strategic needs such as equity building, resource exploitation or competitive pressures, or compliance needs such as legal or mandated safety standards.

What is not obvious is how deeply layered and multi-faceted extrinsic goals compete to shape the motivation behind a learning package. For example, the federal government might have a goal of improving Canada's ranking in high-school science and math education, which is transferred and interpreted by the provincial governments responsible for curriculum, which is then transferred and interpreted to regional educational school boards, then on to the schools, then the teachers and finally the students. The next line is society goals, which might include the needs of various cultural groups or other structures such as the employment market, and finally the needs and expectations of parents. It is not likely in any stage that the root extrinsic goal is valid given the environmental (or contextual) constraints facing each stakeholder having an influence on actual learning outcomes, right down the line. It is also a huge stretch of the imagination that this goal is attainable not so much because of these constraints but rather that each step introduces *process* goals that supervene or take priority.

This is not to say that all of these goals are competing. For example, it is easy for stakeholders to accept literacy goals as virtually all stakeholders *value highly* the benefits that literacy brings. But even with adequate goal alignment, literacy levels in Canada have actually *declined* from 1975 to 1990 and only showing some improvement since then (Coulombe, Tremblay, & Marchand, 2006). This is an example of how *constraints*, or rather the competitive goals of the sub processes of the system conspire to obscure the laudable goal of *literacy*. These are usually complaints of "lack of money, time or human resources" which just a way of saying that provincial governments, school boards, schools, teachers and students all have other priorities, thus other goals, for the resources at hand.

A post-analytical goal inquiry seeks to answer why? questions with the following dimensions: Why is it we organize grade 9 algebra to begin and end at a given point? Why do we wait until grade 9 to introduce algebraic concepts? Why do we feel that *all* students must master algebraic operations? In other words, the same as *"Miss, WHY do we have to learn this stuff?"* as any high school teacher might be typically asked by her students when giving them all of this *abstract* content. Poor "miss" can give all kinds of *plausible* explanations about developmental psychology, requisite knowledge or skills, or that it is needed to get a job or to graduate from high school, but the reality is that the true answers are formed by the needs of the educational structure (Bruner, 1996) and then obscured by the immediate need of getting classroom students to the end of the course content so they can pass the exam. We don't dare admit that immediate,

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[14] This is not to say that we do not have a humane way of dealing with the issue of attention-deficit/hyperactivity disorder. Just as most Ferraris don't ever see a racetrack, we prevent their high-performance engines from stalling from the effect of extended idling (fouled spark plugs) by simply raising the idle speed. This is exactly what stimulant medication does with the ADHD child, it effectively raises the "idle speed" of their brains and prevents their neuronal "spark plugs" from fouling. What is not explicitly stated is that most children have an adaptive capacity for extended "idling" in the typical classroom but it does not justify the use of learning environments that are low-performance as consequential and too costly to change. As with learners, cars simply perform better when not slowed down by traffic congestion and other barriers to movement. However it just appears easier to change the student and not the system. The consequence is billions of dollars worth of pharmaceuticals are purchased by parents and billions of barrels of oil are wasted through unnecessary traffic congestion. If schools were made responsible for the cost of all the stimulant drugs prescribed, things would surely be different. The reality is that we do not hold schools accountable for poor performance.

practical needs take precedence over the meta-goal so we come up with excuses in the form of "plausible explanations" that have no grounding in anything we could even reasonable call "science". The consequence is that the content becomes ambiguous as there is little solid *pragmatic* context in which to relate it to, other than *it is needed to get to Calculus* or *Engineering* or *it is good for cognitive development*. The obfuscation of goals is also apparent in the type of instructional design seen in business training. However it would seem that it should be so much easier as there are fewer stakeholders and goals are fewer and easier to identify (profit, customer satisfaction, lower turnover, etc.). However business training is just as ineffective as process goals are still interfering and taking precedence. For example, a company might want to increase sales performance, however the best way to train salespeople might not be possible due to the high cost of development of training (a competing goal of keeping expenses down) or the technological infrastructure (a competing goal of the needs of the IT department to have a reliable, purpose-built system). Even if the constraints are overcome, there is no consensus on how to interpret "increased sales" into employee performance behavior, and competitive pressures or production inefficiencies might be casting a big shadow on an analysis that is just too narrow to consider it a factor in increased sales per employee.

The obfuscation of extrinsic goals has a direct relationship also to the selection and presentation of instructional content, which usually includes other analyses as the subject matter expert (SME), the learner, the environment in which the learning takes place and/or eventually used. Each of these factors will be interpreted with some kind of framework and learning content then selected and evaluated to meet the relevant criteria for a given learning strategy. *Each analytical result is the product of the goal of the interpretive framework, and therefore takes precedence over the extrinsic goals in the selection of content.* Let's not forget the poor learner who is now faced with trying to come to terms with the content or activity that has been selected for him. Most of it is irrelevant to his goals, we then spend time and resources trying to get his goals aligned with the business goals (incentives and consequences) which are by now completely subsumed by the practical concerns of delivering the instruction.

Finally it is worth mentioning that *evaluation* is also a constraint that competes for content/activity selection, in the sense that we strive for fair and objective assessments of learners. Objective assessments must be easy to measure, therefore observable and interpretable in a way that is reliable. Even though a particular activity or content might be the most appropriate for a given competency goal, it may not be selected just due to the interference of assessment goals.

The intuition is that excessive time spent in interpretive activities is interfering with the learning process, therefore an anti-interpretive instructional design methodology might improve learning performance.
The way out, as I have suggested, might be to adopt an anti-interpretive approach to designing instruction. The intent is to remove interference between the learner and the desired knowledge/competency regardless of the motivation to learn or the directives of getting other people to learn.

This could be as simple as making all of the extrinsic goals explicit, and guide learners in developing their own personalized interpretations of those goals. For example, it makes better sense to do this rather than provide hit-or-miss interpretations, the results being that more time is spent interpreting interpretations and dealing with the consequences of doing just that. The consequence is spending more time managing the process of interpretation of pre-interpreted content, rather than learning how to apply the knowledge. The hit-or-miss "predigested" instructional content approach misses the point that learning *about* is answering why questions with a much broader scope, or the type of scope that is commonly employed by the analytical approach of instructional design. To move beyond content acquisition, which now becomes appropriated beliefs, as guided by the answering of personally relevant why questions, is a strong intrinsic motivator for human activity (Carley, 2005) (Lonergan, 1970), and according to social constructivism, it is through activity that knowledge is created and where learning is most effective.

Rorty's Post-analytics as a model for the anti-interpretation approach
The approach I am advocating is pragmatic, or to be more specific, neo-pragmatic in that the key is uncovering the underlying assumption of social practice without regard for dualistic interpretations. In this way neo-pragmatism is at once holistic without denying the productive qualities of descriptive frameworks that might be considered dualistic in nature. The other characteristic of neo-pragmatism is that consequential results are sought and aligned with identified value propositions, rather than truth-

verification. Finally it is understood that the important thing about conceptual knowledge is not cultural relativism (where truth statements are verified) but that simply concepts are unstable. These points of view have been developed by Quine, Davidson, and Rorty and informed by the analytical methods of Wittengstein, Habermas and Gadamer. Post-analytics could be considered the methodologies of both Derrida (deconstruction) and Foucault (genealogy) which have admittedly different aims but are nonetheless useful. Richard Rorty's post-analytical pragmatism (Rorty, 1979) (Rorty, 1982) as it touches learning and epistemology, can be defined as follows:

1. When encountering anything that is outside our current knowledge structures (i.e. rationalist or empirically derived) (new data, new phenomena) we automatically assume a "hermeneutical" stance in order to deal with it.
2. All analyses are derivative and reductive, played out as a language game.
3. The Cartesian mind-body dualism is not sufficient for the development of a solid epistemology.
4. Apprehension (coming to know) is imperfect, therefore concepts are not stable.
5. Justification for beliefs is a matter of social (and/or cultural) practice.

As this pertains to an anti-interpretive approach, this means several things.

1. An understanding that content analysis serves little purpose but to create ambiguity, compounded by the competing goals of the entire instructional process, including extrinsic goals. The approach is not to dispense with content but to dissolve the distinction between knowledge and skill, or knowledge and its application. It makes little sense to guess "requisite knowledge" for a certain skill set and present content before it can be used. This is perhaps a mirror of how it works in social practice but not necessarily in a learning context. Instructional design needs to work with the hermetical stance of the learner and not against it.
2. The needs of the systems of education should not supervene on the learning need. We could call this "goal alignment" but it is really about aligning the goals of the system (and not the learners). An assessment of any ID process should be able to expose how interpretation of system needs undermines learning.
3. The implications of giving up the mind/body dualism are huge and not really useful for the design of instruction other than to understand that it does not produce a solid epistemology. This is meant to be shown by the instability and abstract nature of conceptual knowledge as somehow "discrete" objects that are stored as representations in a place called the "mind". Rorty's response is epistemological behaviorism, which is to say we should rather study the behavior of knowledge/activity and how it comes about rather than working out better and better representations of it, or by analyzing and attempting to modify individual behavior as a teaching strategy.
4. Since apprehension is not perfect, it makes little sense to use it as an implicit learning goal. This has the added bonus of dispensing with learning assessments that are designed to measure apprehension, and the resulting interpretive effect on content/activity selection.
5. Justification for belief replaces factual statements that are meant to be verified by direct correspondence to experience or to nature. By the same token this proposition does not obscure value propositions behind statements of "objective" fact, or what might have been derived empirically or through other forms of analysis. A post analytical needs assessment considers primarily what is valued as the meta-goal driving the need for instruction, and explores the consequences of those values when put through instructional processes.

Where to from here
This methodology is nascent and admittedly not fully worked out. There are many other consequences to this approach, including how affective approaches to learning might be incorporated with this methodology. For example, if we dispense with the positivistic-analytical approaches to learning we can reintroduce a huge component of human experience, which is *how we feel* and this does not preclude learning about them. In addition, the process of learning is inherently pleasurable and this begins with curiosity, or the desire to know and the intense pleasure at experiencing Eureka! moments. Our excuse has been it is difficult to observe and measure affective outcomes, but if does not mean we cannot use how we feel as a gateway to the use of interpretive frameworks to rationalize data. The goal is not an emotional outcome as a learning goal (that is silly and why we don't do it) but to use emotional response as an

instructional strategy. If the mind/body distinction is obliterated, then so should the emotional/rational. Since we are linking knowledge to belief in this strategy we also acknowledge that the strength of belief is something that is highly charged with emotion.

The other intuition is that real, qualitative and quantitative research can be done. I believe that tools could be developed that can help assess existing instruction for the amount of interpretive load placed on a learner. The development and refinement of a post-analytical "anti-interpretation" instructional design strategy would also benefit from research. It may seem odd that I appear to be advocating the dropping of analytical techniques but at the same time talking about creation of an analytical tool to measure the effects of analysis. However this is not really the case, as this is about the *interpretive* effect of analyticity and the solution is how to balance it, not to radicalize the alternative. As much as anti-interpretation might sound radical, it is really about giving equal time to the range of human experience that has been shoved aside in the name of positivism, the rejection of metaphysics in the psychological approaches to education and the analytical approaches to designing and presenting instruction.

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Which Types of Classroom Technology Do
Middle School Teachers Really Value?

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Abstract

The purpose of this study is to examine the extent on how middle school teachers value the technology in classroom and to what degree their students are using technology and the facilities, equipment provided by their schools. To answer many questions surrounding technology in schools, a study was conducted with randomly selected one thousand middle schools in eleven states and the data was conducted at the end of April 2004.

Introduction

Few would disagree that technology is increasingly important in the lives of all Americans. In education, especially, the use of technology has grown tremendously. For example, the number of computers in schools continues to rise each year with more than fourteen million computers in our elementary and secondary schools (U.S. National Center for Education Statistics, 2003-2004). The technology skills of students have also grown dramatically. A major national report on technology and readiness in schools, emphasized that all students must graduate from high school with the technology skills needed for life in the 21st century. All teachers must also be able to use technology as a major tool for achieving higher academic standards in their classrooms (CEO Forum, 1999). In response to the call for more and more technology in schools, most states have adopted technology standards for those preparing to be teachers. The National Council for Accreditation of Teacher Education (NCATE,) in its 2000 Unit Standards, advised that all programs for educating new teachers must produce candidates who are able to use educational technology to help all students learn. Programs must show how knowledge, skills, and dispositions related to educational and information technology are integrated throughout the curriculum, instruction, field experiences, clinical practices, assessment, and evaluation (NCATE, 2001 p. 13). Most experts would agree that all schools should help students be technologically skilled to face the challenges of the new century.

In spite of the tremendous growth of technology in American schools there is evidence that many teachers still do not use technology at all in their teaching (Education Week, 1999). Many questions also exist regarding the real values of technology in schools. For example, are schools providing enough tools, hardware and software for students to learn well? Do teachers really value technology tools in their teaching? In spite of these concerns, most modern educators believe that technology should play a major role in today's schools. Middle schools, in particular, can help their students develop the technology skills needed for success in later life and at the same time increase their achievement.

To answer the many questions surrounding technology use in middle schools, a survey was sent to 1000 middle schools in ten states (New Hampshire, Vermont, West Virginia, Kentucky, Oklahoma, Texas, South Dakota, Massachusetts, Montana, Nevada, and Iowa). The study explored the types of technology used by middle school teachers, how they valued the technology, and the facilities and equipment provided by their schools. One thousand questionnaires were sent to these teachers and three hundred sixty-nine were returned.

The questionnaire consisted of two parts. In part one the teachers marked how often they used particular types of technology (never, rarely, sometimes and often) and how valuable these types of technology were in their teaching (very valuable, valuable, no opinion, little value and no value). In part two the teachers indicated the availability of different types of technology in their schools and the training provided for them and their students by their schools. The results were analyzed using percentages of use and of value. The majority of those responding were female with one to ten years of experience. Moreover, most of the respondents were mathematics and science teachers followed by those teaching social studies and English. This article will report only those findings dealing with the values that teachers had toward various types of technology in their classrooms.

Results

Table A. Values of Technologies Used by Teachers

Types of Technology	Ratings	Percent of Teachers
Word Processing	Very Valuable	74.5%
Computers for preparing lessons	Very Valuable	69.9%
Internet	Very Valuable	60.4%
VCR	Valuable	55.6%
CD-ROM	Valuable	55.6%
Television	Valuable	46.1%
Digital Cameras	Valuable	40.9%
Computer graphics	Valuable	40.4%
E-Mail	Valuable	62.9%
Web pages	Valuable	35.5%
Films	Valuable	41.7%
Digital Camcorders	Valuable	39.0%
Microsoft PowerPoint	Very Valuable	48.0%
Tape Recorders	Valuable	34.4%
Laser Disk Players	Valuable	25.5%
Radios	Valuable	20.1%
Slide Projectors	Valuable	21.4%
Filmstrips	Valuable	16.0%

Table A shows that the types of technology most valued by teachers were: word processing (74.5% very valuable), computers for preparing lessons (69.9% very valuable), and the internet (60.4% very valuable). The next most valued types of technology with ratings of valuable were: VCR's (55.6%), CD ROM's (55.6%), television (46.1), digital cameras (40.9%), use of graphics for teaching (40.4%), e-mail for discussing teaching with other educators (62.9%), web pages (35.5%), films (41.7%), digital camcorders (39.0%), and Microsoft Power Point (48%). Other less valued technological aids which received valuable ratings were: tape recorders (34.4%), laser disc players (25.5%), radios (20.1%), slide projectors (21.4%), and filmstrips (16.0%).

Table B. Values of Technologies Required or Encouraged for Students

Types of Technology	Ratings	Percent of Teachers
Encourage the use of the Internet by students	Very Valuable	61.4%
Require the use of computers for learning or assignments	Very Valuable	57.1%
Require the use of the Internet by students	Very Valuable	50.8%
Encourage the use of digital cameras by students	Valuable	42.9%
Require the use of word processing by students for completing assignments	Valuable	45.7%
Encourage the use of computer graphics by students	Valuable	44.2%
Encourage the use of CD ROM's by students	Valuable	43.9%
Encourage the use of E-Mail by students	Valuable	35.7%
Encourage the use of spreadsheets by students	Valuable	42.1%
Encourage the use of databases by students	Valuable	31.5%
Encourage the use of electronic portfolios by students	Valuable	33.0%

Table B reveals how teachers felt about the use of technology by their students. The most valued types of technology required by teachers were: using computers for learning or assignments (57.1%) and using the Internet (50.8%% very valuable). In addition, those tools encouraged by teachers were: the use of the Internet (61.4% very valuable), digital cameras (42.9% valuable), word processing for completing assignments (45.7% very valuable), computer graphics (44.2% valuable), CD-ROM's (43.9% valuable), e-mail use (35.7% valuable), spreadsheets (42.1% valuable), database (31.5% valuable), and electronic portfolios (33.0% valuable).

Conclusions

The results of this study clearly showed the value of certain technology tools used in middle schools. It was clear that only three forms of technology (computers, the Internet and word processing) were seen as very valuable by most (over 60%) of the teachers. Other technological aids (web pages, digital cameras, VCRs and films) were rated as valuable by less than 40% of the teachers and e-mail was rated valuable by 63%. Other types of technology (Microsoft Power Point presentations, tape recorder, laser disk players, radios, slide projectors and film strips) was rated as valuable by even a lower numbers of teachers (16% to 48%). This apparent lack of strong support for technological aids in middle schools is somewhat surprising in light of the many proven benefits of these aids for teachers and students.

Additional findings affirm that middle school teachers tend to encourage, not require, the use of technology by their students. As was the case with the teachers, only computers and the Internet were rated as very valuable by 51% to 61% of the teachers. Other technological aids (word processing, computer graphics, CD-ROMs, e-mail, spreadsheets, databases and electronic portfolio) were seen as valuable by fewer teachers (32 to 46%). Once again, these results showed limited support for student use of technology.

Findings from this study also showed that middle school teachers did value specific technological aids in their teaching, but these aids were not overwhelmingly supported by most of the teachers. It is further apparent that many middle school teachers did encourage their students to use technology for their learning. The number of teachers who did encourage their students to use technology ranged greatly, from 32% to 46%, depending upon the particular type of technology. It was not surprising that computers and the Internet were the most popular types of technology for both teachers and students, since many teachers consider the term "technology" to really mean computers and their use in the classroom. It will undoubtedly take time for other types of technology to increase in popularity among teachers. As greater numbers of middle schools provide more technological aids and opportunities for in-service training, the attitudes of middle school teachers will hopefully become more positive toward all types of technology in their classes.

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Distributed Learning: Not Just for Students. A New Model for Mentoring Faculty

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Abstract

Mentoring is an important aspect of faculty life. Most universities have a single campus, so mentoring is easily facilitated. What happens when the faculty is spread across a large state? This session reports on a faculty mentoring program that attempts to close the distance gap by organizing Faculty Learning Communities and using distance learning technology (iLinc). This session is beneficial to those who are mentoring or thinking about mentoring faculty.

Mentoring

Theoretical support can be found for establishing mentoring programs for university faculty. Effective mentoring promotes professional and collegial faculty who provide consistent and rigorous academic programs for students within the university. In addition, mentoring programs at colleges and universities can be a model to ensure successful transition of new faculty into their academic environment. These programs are usually based on the traditional sort where a seasoned faculty facilitates the development of persons identify as protégés. A study of recent literature reveals there is limited information on co-mentoring or faculty-to-faculty mentoring. Co-mentoring models that are operational in higher education demonstrate professionally equal relationships and expand upon those that are exclusive (Mullen & Lang, 2005). The authors of this study, have launched a learning community with the specific goal of mentoring faculty who have expressed a desire to take an active role in their professional growth.

A faculty mentoring program is useful in providing structure for new faculty as they begin their careers at the university level. Mentoring is viewed as a strategy for enhancing the development and refinement of one's ability to transition into a new academic culture and for the university to ensure that students benefit through highly effective faculty (Wunsch, 1994). The mentoring process helps to build a collegial and cooperative relationship, which fosters a more productive institutional environment Boyle & Boice, 1998).

Universities benefit through increased productivity of their faculty to ensure the success of their students (Nicholls, 2002). Various colleges and universities have established mentoring programs for new faculty members: University of California, San Diego, Southern Illinois University, and University of Hawaii, to name a few (Wunsch, 1994). Some of these programs have clearly defined roles and responsibilities with long and short-term goals. Successful mentoring programs vary in type. They can be formal or informal, organized at the department, school or institutional level.

Curiously, there is a parallel in the principles of mentoring with learning community programs. The fundamental purpose of learning communities is to increase coherence in and between subject matters, to reverse intellectual fragmentation, which many disciplines tend to promote, and to encourage interaction between faculty and students, among students themselves, and among faculty team members (Regional Learning Communities Consortium, 2004). Faculty learning communities are different from but in many ways like most action learning sets in that they both are "a continuous process of learning and reflection, supported by colleagues, with an intention of getting things done" (McGill & Beaty, 2001, p. 11).

Faculty Learning Communities (FLCs) are cross-disciplinary learning communities. There are two categories of FLCs: cohort-based and topic-based. Cohort-based FLCs "address the teaching, learning, and developmental needs of an important grop of faculty or staff that has been particularly affected by the isolation, fragmentation, stress, neglect, or chilly climate in the academy" (Cox, 2004, p.8). .A curriculum for this type of learner cohort would focus on teaching and learning topics that interest them. Topic-based FLCs "have a curriculum designed to address a special campus teaching and learning need, issue, or opportunity (Cox, 2004, p.8).

Participants in the survey, conducted in the fall of 2003, were full-time faculty members at a private university in California was. From that survey, the need for mentoring was ranked at the top of issues to be

addressed. After a review of current research, a follow up presentation on mentoring was given at the Faculty Spring Symposium in April, 2004. Input was received from 20 participants in the session as to what their "Vision of Mentoring" would be at the University.

Ideas included (stated as written by participants): training for the mentor, natural selection for both mentor and mentee, recognition by the university as a Faculty Service component, mentoring should be done within departments, should have regularly scheduled times for meeting both formally and informally, need to set up a university model, administrative support necessary and guidelines set forward in a Mentor Handbook, set up a minimum of times to meet, and identify people in departments who are experts to serve as mentors.

At the Faculty Spring Symposium in May 2005, a survey was administered to faculty to further define the needs for mentoring of professors at various stages in their careers. The response from 107 faculty or 55 % of the total faculty indicated their initial areas of interest were writing opportunities, specifically the publishing process, and preview and feedback on materials for publishing. The second area was the desire to increase technology-related skills, particularly technology in the university classroom and online teaching techniques.

Our university has established a Center for the Adult Learner (CAL). The goal of this center is to foster best practices in the instruction of adults. One of the first efforts sponsored by CAL is Faculty Learning Communities (FLCs). These FLCs promote scholarship among members and sharing successful strategies for enhancing teaching and leaning in all courses. Based on the data gathered, a new faculty learning community was launched in Fall 2005 with the specific goal of mentoring faculty in using technology in the university classroom. Because the faculty is spread across 27 sites a distributed learning strategy was determined to be the most efficient way to conduct group meetings. Group members use iLinc software to meet each month. With this conferencing software, meeting attendees can see and hear each other.

In its first year the FLC had 5 members. The interests of the groups were divided into two areas: using different software and changes to the andragogy because of the integration of technology. Members were able to share techniques for using different software. There were also meaningful conversations about increasing and enhancing interaction in online classes.

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What is a Podcast? / What is Podcasting?

A Google search > define: Podcast

Results in:

Podcasting, a portmanteau of Apple's "iPod" and "broadcasting", is a method of publishing files to the Internet, allowing users to subscribe to a feed and receive new files automatically by subscription, usually at no cost. It first became popular in late 2004, used largely for audio files.

Wikipedia defines podcating as:

Podcasting is the distribution of audio or video files, such as radio programs or music videos, over the Internet using either RSS or Atom syndication for listening on mobile devices and personal computers. A **podcast** is a web feed of audio or video files placed on the Internet for anyone to download or subscribe. Podcasters' websites also may offer direct download of their files, but the subscription feed of automatically delivered new content is what distinguishes a podcast from a simple download or real-time streaming (see below). Usually, the podcast features one type of "show" with new episodes either sporadically or at planned intervals such as daily, weekly, etc. Besides that there are podcast networks that feature multiple shows on the same feed. Podcasting's essence is about creating content (audio and/or video) for an audience that wants to listen when they want, where they want, and how they want.

Podcasting In General
Creating a podcast requires very careful planning. The better or tighter your planning phase is, the smoother the actual production of the podcast will go. Technology needed to develop a podcast are: 1) A desktop or laptop; 2) A microphone or digital media recorder such as an iRiver or a MiniDisc Recorder; 3) Audio Editing Software, such as Audacity or GarageBand; and 4) An application to help you create the "enclosures" of the podcast, such as Podifier. There are many other alternatives to the technology mentioned above, but for the sake of this paper, and our sanity, I've selected a few names from a very long list. Regardless of which platform you prefer, the compontents to create and generate a podcast are the same. Later on in the "Resources" section of this paper, you'll find a larger selection of technology available.

Podcasts cover a very broad spectrum of topics. Since there are no Federal Regulations to oblige by, the Podcaster (the emcee whose voice you hear on the podcast), does not need to file for a license, unlike traditional radio, which must adhere to guidelines set forth by the government.
As a direct result for not having a license, anyone can generate a podcast and therefore there are no restrictions to what topics are discussed nor how "clean" the language may be.

And unlike traditional radio, once your podcast is available on the web, it is then part of a "global" market as opposed to a "regional" one. This means that you listening audience can, literally, span the entire world and not just a small local geographic area.

Podcasts are, by and far, FREE – but there is a movement to make some podcasts accessible only for members who shell out fees. An example of this is slowly making its way through the music industry.

Definition of an "enclosure" can be found here:
http://en.wikipedia.org/wiki/RSS_enclosure

Industry and Podcasts
Many industries have launched podcasts to keep people informed of any new developments, news or updates to existing issues. And although many of these podcasts are free to download and listen to, there is some degree of work and planning involved in creating a podcast that people will "tune-in" for on a regular basis.

The music industry has helped podcasting immensely! Independent producers and unsigned artists are using podcast technology to reach the masses. By the letter of the law, P2P (peer-to-peer) services are legal and podcasts are free. It's no wonder groups such as the Artic Monkeys or Gnarls Barkley have reached superstardom in the mainstream music world, simply based on the number of times their music has been downloaded.

Usually podcasts involve music. But chances are the music you find will not be from any artist you may recognize. The music comes from unsigned artists who are looking to break into the industry.

There is a "buzz" to make podcasts with artist we all recognize. But to be able to listen to such artists would require us to A) become a member/subscriber to an online services or B) pay-as-we-go. Understandable since the music is of course copywritten and both the artists and their labels would need to be paid.

Other industries are also pushing and promoting podcasts. Sports are a major promoter for podcasts. Take a listen to ESPN Radio from their website. There you'll have a choice to either "play" the audio, "download" it to your computer or go to i-Tunes to send it to your iPod. The news can now be downloaded as a podcast. Listen to CNN and get the latest information or download a "video podcast" also know as a "vodcast" and watch the news or a CNN program such as Glenn Beck. Auto maker BMW offers podcasts off its website. IBM is another company offering podcasts to their customers.
These industries are utilizing the same technology that was mentioned earlier and are targeting customers and the general public-at-large. Now education is following this trend to target students, fellow instructors, parents and the communities they serve. Below are the various URLs referred to above:

ESPN Radio - http://espnradio.espn.go.com/espnradio/podcast/index
CNN - http://www.cnn.com/services/podcasting/
BMW - http://podcast.bmw.com/en
IBM - http://www.ibm.com/investor/viewpoint/podcast/05-08-05-1.phtml

Education and Podcasts
Imagine if you could download a podcast to help you learn how to properly pronounce words in a different language or learn English as a second language. Or perhaps find a podcast where an interview with a WWII veteran offers you a personal point-of-view of the events that occurred on December 7, 1941. You might find a podcast involving a disscussion on diversity issues and the media. These are examples of "podcasts from the classroom."

It's true that there are no limits to the topics podcasts cover and in education that is also the case. As an instructor, one can opt to have his/her lectures available for downloading to a digital media player, such as an iPod, Creative Zen or the new Microsoft Zune to be listened to for reviewing purposes. Science experiments and field trips can generate discussions that could make great podcasts, which can then generate further discussions outside of the classroom after downloading and listening to them.

Podcasting has been around for a few years and yet is still considered "new". Education doesn't end at institutions but has expanded to include Corporate Training. In areas such as Graphic Design and Multimedia, you can download either a podcast for listening or a vodcast to see how various techniques are achieved.

By providing the fuel to generate creative, intellectual and worthwhile podcasts for various fields of study, you can then use podcasts in developing countries where technology and education are now beginning to take form shaping the country's infrastructure.

Using podcasts in the classroom can give you a first person point-of-view of what is happening in "hot spots" around the world. Listen in on how things in Darfur are progressing from those who are there trying to make a difference. Or, listen to podcasts from both sides of the Israeli and Palestinian conflict in the Middle-East. These sorts of podcast are created by people who live in a world where violence and conflict have become a way of life. The news that we listen to may have a biased and/or scewed perspective of the situation and it's usually a good idea to get another perspective. Podcasts allow you the opportunity to hear various sides of an issue which allows you to formulate your own opinion of a situation. Below are some URLs that illustrate the examples listed above:

Medicins Sans Frontieres - http://www.msf.org/
iPod - http://www.apple.com/itunes/
Creative Zen - http://www.creative.com/
Microsoft ZUNE (article from Podcasting News) -
http://www.podcastingnews.com/2006/09/14/microsoft-zune-first-look/

Conclusion

Although podcasting is a relatively new media, newer forms are already making their way to a digital media player near you. These newer forms are known as "enhanced podcasts." They are designed to deliver photos and other images in synchronization with the audio of the podcast much like a slide show. As you can imagine, the file size will be much larger than a standard podcast and therefore may take longer to download. Below are URLs where you can find information on enhanced podcasts:

MakeZine - http://www.makezine.com/extras/43.html
Digital Producer - http://www.digitalproducer.com/articles/viewarticle.jsp?id=37839

Students benefit from podcasts in many ways. Not only can they download music legally to share with friends, but can learn about the latest business trends, or learn how to market their skills in an ever-changing economy, or listen in on a first person point-of-view from someone who has been on the front lines battling the insurgents in Iraq.

Podcasting is an experience that is fresh, current, entertaining, informative and in many cases, insightful. Where a moment in time is captured for the world to hear and share and become a part of human history.

Below are various lists of resources. These lists include information on how-to create podcasts for both PC and Mac; the sort of technology needed to develop a podcast, along with some free downloads, and where to upload it once it's done. There is information on books that can be purchased from your local bookstore, as well as online resources and directories which can provide you with many useful examples of podcasts.

From the user side:
　　　-Where to find podcasts on various topics?
　　　　　www.acidplanet.com/
　　　　　http://www.virginradio.co.uk/thestation/podcasts/index.html
　　　　　http://www.npr.org/rss/podcast/podcast_detail.php?siteId=4819382

Samples for podcasts
　　　-Music, Business & Finance, Technology, News, Educational, etc
　　　　　(Demonstration of examples of various podcasts.)
University of Wisconsin: http://engage.doit.wisc.edu/podcasting/teachAndLearn/
Librivox: http://www.librivox.org/
Podcast and Portable Media Expo: http://www.portablemediaexpo.com/audio.htm
NPR: http://www.npr.org/rss/podcast/podcast_directory.php
Media Artist Secrets: http://www.fmstudio.com/blog/index.html
Podcast from the West Bank in the Gaza Strip: http://www.rabble.ca/rpn/btw/

From the creators side:
-Tools of the trade
-Microphones / Flash Drive / Digital Recorders
iRiver (www.iriveramerica.com), iTalk (for iPods www.apple.com)

-Free Software vs. Consumer Software vs. Professional Software
-Audacity (http://audacity.sourceforge.net/download/)
-Adobe Audition (http://www.adobe.com/products/audition/main.html)
-Sony ACID
(http://www.sonymediasoftware.com/products/acidfamily.asp)
-GarageBand (http://www.apple.com/ilife/garageband/)
-Soundtrack (http://www.apple.com/finalcutexpress/soundtrack.html)

-Generating Enclosures
-MP3 Tag Tools (http://sourceforge.net/projects/massid3lib)
-Podifier (http://www.podifier.com/)

-Where to host your podcast?
- Our Media (http://www.ourmedia.org/)
- Gcast (http://www.gcast.com/?nr=1&&s=60900592)
- CastPost (http://www.castpost.com/)
- SwitchPod (http://www.switchpod.com/)
- iTunes (http://www.apple.com/itunes/)
- SlipCast (http://slapcast.com/)
- eSnips (http://www.esnips.com/signin/index.jsp)
- ShockPod (http://www.shockpod.com/)

-Can you upload to your existing website?
Yes, you can! The one drawback to this is that unless you have a method of monitoring the number of times it's been downloaded, you'll never know how well your podcast is doing. Monitoring how many times your website has been visited does not mean your podcast has been downloaded either.

-What is an Aggregator / News Reader?
- As defined by Google:
http://www.google.com/search?hl=en&q=define%3A+News+Aggregators

- As defined by Wikipedia:
http://en.wikipedia.org/wiki/News_aggregator

- List of Aggregators (from Wikipedia)
http://en.wikipedia.org/wiki/List_of_news_aggregators

Copyright Issues
-Creative Commons – http://creativecommons.org/

For additional resources on:
- Creative Commons
- Intellectual Property
- Fair Use Act
- Digital Millennium Copyright Act

See this webpage for additional websites:
http://faculty.plattsburgh.edu/edwin.vega/copyright_information.htm

Applications where podcasts can be beneficial:
-Books on Tape/CD
-Review lessons
-Conduct Interviews
-Archiving & Documentation
-Learn a new language
-TOD – Teaching-On-Demand

Who is currently using podcasts?

Companies/Corporations
-CNN - http://www.cnn.com/services/podcasting/
-Podcast and Portable Media Expo -
http://www.portablemediaexpo.com/audio.htm
-Disney - http://disney.go.com/music/podcasts/today/index.html
-NPR - http://www.npr.org/rss/podcast/podcast_directory.php
-ABC News - http://abcnews.go.com/Technology/Podcasting/

Education
- Education Podcast Network - http://epnweb.org/
- San Francisco Museum of Modern Art -
http://www.sfmoma.org/education/edu_podcasts.html
- Apple - http://www.apple.com/education/podcasting/
- Ball State University –
http://www.bsu.edu/library/article/0,1894,163773-11770-35591,00.html
- The Newsletter of the National Institute for Technology and Liberal Education
http://newsletter.nitle.org/v4_n3_summer2005/news.php
(Scroll down to the middle of the page: Article by Bryan Alexander)

Training
-Media Artist Secrets –
http://www.fmstudio.com/blog/index.html

What's next?
-VODcasting – Video-On-Demand
- Vlogging – Video Blogging

-Moblogging – Mobile Blogging
    -VCasts – Video Casts

List of resources:

Adam Curry - http://www.curry.com/
(One of the godfathers of podcasting.)

For Mac:

http://www.engadget.com/2004/10/05/engadget-podcast-001-10-05-2004-how-to-podcasting-get/ - Engadget
http://www.stager.org/podcasting.html - Gary S. Stager
http://macs.about.com/b/a/183613.htm - About.com

For PC:

Educational Podcasts:
http://www.bsu.edu/library/article/0,1894,163773-11770-35591,00.html - The Principles and Methods of Digital Listening: Educational Podcasting
http://www.podcastingnews.com/articles/Make_Podcast_Blogger.html - Making a Podcast with Blogger and FeedBurner
http://blog.wolverhamptonclc.co.uk/2005/08/09/podcasting-a-new-force-in-education/ - Podcasting: A new force in education
http://epnweb.org/ - Education Podcast Network
http://www.apple.com/education/ipod/ - iPod in The Classroom
http://www.macdevcenter.com/pub/a/mac/2005/01/25/podcast.html - How to record a Podcast (on a Mac)
http://edupodder.com/ - EduPodder

Hosting:
http://blipmedia.org/su/rp/?s=goog (r.Podcaster)
http://www.podcastingnews.com/archives/2005/08/new_podcast_vid.html (Podcasting News)
http://www.podbus.com/ (Podbus)
http://creativecommons.org/tools/ccpublisher (CC Publisher)
http://digitalmedia.oreilly.com/2005/09/07/hosting-podcasts.html (O'Reilly)
http://radio.indymedia.org/ (Radio Indy Media)
http://www.podcastdirectory.com/add/ (Podcast Directory)
http://www.feedburner.com/fb/a/popup-quickstart-podcast (Publish Your Podcast)
http://www.podcast.net/addpodcast (Podcast)
http://www.podcastalley.com/podcast_genres.php?pod_genre_id=3 (Podcast Alley)

Podcast Software:
http://www.podifier.com/ (Podifier)
http://ipodder.sourceforge.net/index.php (iPodder)
http://ipodderx.com/ (iPodderX)
http://jpodder.com/ (JPodder)
http://www.apple.com/itunes/hp/download/ (iTunes)
http://www.apple.com/itunes/ (iTunes)
http://podfeeder.com/ (PodFeeder)
http://www.dorada.co.uk/ (RSS Radio)
http://www.dopplerradio.net/ (Doppler Radio)
http://thirstycrow.net/happyfish/default.aspx (Happy Fish)
http://www.download3000.com/download_10509.html (Podspider)

Podcast Info:
http://www.bbc.co.uk/radio/downloadtrial/ (BBC Radio)
http://en.wikipedia.org/wiki/Podcasting (Wikipedia)
http://www.podcastingnews.com/ (Podcasting News)
http://www.podcast411.com/ (Podcast 411)
http://www.answers.com/topic/podcasting (Answers.com)

Tools:
http://www.podcasting-tools.com/ (Resource for Podcasting)
http://reviews.cnet.com/4520-6450_7-6212319-1.html (MP3 Insider)
http://www.feedforall.com/tools-for-podcasting.htm (Feed For All)
http://www.e-learningcentre.co.uk/eclipse/vendors/podcasting.htm (e-Learning Centre)
http://www.rss-specifications.com/podcasting-explained.htm (Tools for Webmasters)
http://www.garageband.com/podcast (GarageBand.com)
http://www.workz.com/content/view_content.html?section_id=464&content_id=6834
(WorkZ)
http://www.potionfactory.com/news.html (Potion Factory) [Mac Only]
http://mixcastlive.com/category/podcasting-tools/ (MixCast Live) [Free Download]
http://www.apple.com/support/garageband/podcasts/ (from Apple for everyone)
http://www.podcastingnews.com/archives/2005/02/feeddemon_takes.html (Podcasting
News)
http://www.acidplanet.com/podcasts/default.asp?p=Create&T=1 (ACIDplanet.com)

Forums:
http://creativecalf.creativecow.net/cgi-bin/new_view_posts.cgi?forumid=205 (Creative
Cow)

Additional Website Resources:

http://engage.doit.wisc.edu/podcasting/teachAndLearn/
        5 steps to designing podcasts that teach

http://podcast.nox.org/
        examples of real podcasting uses in education, how to guides, demonstrations

http://www.podcastforteachers.org/
        hosted by Fordham University

http://www.librivox.org/
        listen to or volunteer to create audio books with public domain resources

http://www.e-learningcentre.co.uk/eclipse/Resources/podcasting.htm
        library of resources for discovering podcasting

http://www.robynrosenberg.com/pod.htm
        list of podcasting in libraries and higher education

http://www.uis.edu/podcasting/projects/index.html
        how podcasting is being used at University of Illinois at Springfield

http://podcasting.arizona.edu/
        podcasting in use at Arizona University

http://images.apple.com/education/solutions/podcasting/pdf/PodcastCreationGuide.pdf
        free guide from apple on creating podcasts- 31 pages

http://teachwtech.blogspot.com/2006/02/episode-7-preview-k-12-podcasting-and.html
        a podcast, a blog, and resources for k12 podcasting

http://www.xplanazine.com/resources.html#anchor6
        podcasting resource links from xplanazine

http://podcasts.yahoo.com/series?c=e&s=8c30a8feaf2ee510df5dee2c0ef51814&es=31&rs=1
        a podcast about education and podcasting

http://playlistmag.com/features/2006/02/library/index.php
        article: libraries turning to iPods and iTunes

http://keillor.richmond.edu/blojsom/blog/ats/2005/09/07/Educational-Uses-of-Podcasting.html
        teaching students English/Japanese through podcasting

Software

Proof of identity required – i.e. Faculty, Staff or Student (ID Cards or Transcripts)

Academic Super Store - http://www.academicsuperstore.com/
Studica - http://www.studica.com/products/index.cfm
Journey Ed - http://www.journeyed.com/home.asp
Advanced Academic Solutions - http://www.advancedacademic.com/
Campus Tech - http://www.campustech.com/
Software Express - http://www.swexpress.com/
Creation Engine - http://www.creationengine.com/

Free Loops for ACID (PC) and/or GarageBand (Mac): (No ID required.)

Free ACID Loops - http://www.freeacidloops.net/

ACID Fanatic (download the previews – they're FREE) -
http://www.acidfanatic.com/index.php?section=loops

ACIDplanet (Home of the 8-Pack every Tuesday) -
http://www.acidplanet.com/tools/8packs/?t=8973

Looperman - http://www.looperman.com/loops_samples_menu.php

Loops (Right-Click to save WAV files.) - http://www.loops.net/

PlatinumLoops - http://www.platinumloops.com/free_loops.shtml

Indica Audio (Membership Required – it's FREE) -
http://www.indicaaudio.com/actions/home.do

The Daily WAV (Soundbytes from TV & Movies) -
http://dailywav.com/index.php

Free Loops - http://www.freeloops.com/

Future Wave Shaper - http://www.futurewaveshaper.com/

Loop Masters (Can download Demo MP3s) - http://www.loopmasters.com/

PocketFuel - http://www.pocketfuel.com/gallery.php

FindSounds (Type in the instrument you're looking for.) -
http://www.findsounds.com/ISAPI/search.dll

Nature Sound Effects (Thunderstorms, etc.) –
http://nature-downloads.naturesounds.ca/

Sound Effects - http://www.koumis.com/soundfx.htm

SonnyBoo (These are ZIP files of INDIE music) -
http://www.sonnyboo.com/music/music.htm

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Procedural Principles of Design
The Role of Analysis and Evaluation in Educational Design Processes

Irene Visscher-Voerman

Summary

Educational designers conduct a variety of design activities in practice. Building on several reconstructive studies of design practice, 8 procedural design principles, related to analysis and formative evaluation activities were formulated and discussed and elaborated in a one-day workshop with 24 educational designers from various contexts. Purpose was to check the extent to which these designers thought these principles were valid for their own situation, and to increase the robustness of the principles, by further specifying and contextualizing them. The results of the workshop show that the amount of innovation of the product to be designed impacts the way in which analysis and evaluation activities are conducted. Results also show that analysis and evaluation strategies differ in education versus training contexts, or in generic versus specific situations.

Introduction

The work of designers in the field of instructional design and educational technology is aimed at improving learning and performance in a variety of settings (Reiser & Dempsey, 2006). In their design processes, these educational designers are assumed to work systematically while analyzing learning and performance problems, and designing, developing, implementing and evaluating instructional and non-instructional processes and resources. In literature, these types of activities have been visualized in so-called ADDIE-models with a more or less cyclic nature. The last two decades, there has been increased awareness that designers may work differently from what is proposed by traditional ADDIE-design models. This has resulted in a number of reconstructive studies, in which design practice has been studied, resulting in practical design knowledge. Not only were designers found to plan less rigorous and systematic strategies to meet constraints such as limited time, budget, and personnel, they were also forced to adapt their approach along the way, because of unplanned circumstances (c.f. Pieters & Bergman, 1995; Walker, 1990; Wedman & Tessmer, 1993; Winer & Vázquez-Abad, 1995; Visscher-Voerman & Gustafson, 2004). This results in tenable shortcuts and in selective and careful (non)use of design activities contained in the models. Clear differences between practice and literature come to the fore with respect to analysis and formative evaluation activities and their alleged function. One of the areas where the gap between practice and literature is most evident is that of formative evaluation, either or not in relation to analysis.

Most reconstruction studies result in a summary and discussion of the results in contrast with literature, and eventually provide a reflection on the worth of the strategies or activities applied for the studied contexts and for other contexts. As such, it yields articulated state-of-the-art knowledge about design practice. If one wants to help developing design methodology, it is also important to bring the findings to a next level. Firstly, by identifying the activities that are judged relevant and useful in addition to existing methods, and that could have potential for other designers in similar or other contexts as well, formulating them as procedural design principles. Secondly, by exploring to what extent the principles *are* valid for other contexts, situations and designers. And thirdly, by further increasing the robustness of the principles by contextualizing them, i.e. by specifying more precisely in what situations these strategies are valid.

These steps were followed in a study on which this paper reports. Eight procedural design principles, concentrated on educational analysis and evaluation activities, were formulated based on findings in literature and reconstructive studies. In a one-day workshop with 24 designers from various design contexts, these principles were then validated and further contextualized. The general question to be answered is 'What are practical and robust procedural design principles, related to educational analysis and evaluation?' The study was a follow-up study of the DATE-research (Visscher-Voerman, 1999; Visscher-Voerman & Gustafson, 2004) in which 24 design practices were reconstructed. This paper introduces the design principles, describes the design of the workshop and presents and discusses the results. The paper will also reflect briefly on the worth and function of such a workshop as a particular research activity in a process of formulating and increasing design knowledge.

Towards The Formulation of Procedural Design Principles

The first step in the study was to formulate procedural design principles. In order to be able to formulate valuable improvements to existing design methods, the focus was on those aspects that showed a tension or gap between the assumptions and starting points of traditional ADDIE-models as studied in literature, and current practices. Also, those strategies were selected that seemed to be promising and useful ways of dealing with typical design dilemmas. One of the areas where the gap between practice and literature was most evident is that of formative evaluation, either or not in relation to analysis. In this area, 8 procedural design principles were formulated and discussed in the workshop. The subsequent sections will name the 8 principles as used in the workshop. For each principle, a brief rationale will be given for its content and why this principle was chosen. At the end of this section, Table 1 presents an overview of all principles.

Design As A Solution-Driven Process And The Role of Analysis

In traditional ADDIE models, the analysis phase, as the first phase in the process, is meant to explore the problem and its context, usually resulting in a problem definition. It includes the identification of the user or learner group, analysis of the tasks and skills to be mastered or content to be learned, demarcating the user environment (e.g. Kessels, 1993; Romiszowksi, 1981; Smith & Ragan, 2004). The analysis should provide the designer with enough information and insights in the situation that (s)he is able to further plan the process.

One conclusion, derived from several reconstructive studies (cf. Rowland & Wilson, 1994; Schön, 1983, Visscher-Voerman & Gustafson, 2004, Walker, 1990) is that the nature of design processes is solution-driven, rather than problem-driven. Rather than conducting a full analysis, designers conduct only a restricted analysis, which is also more focused on developing solution specifications than on the problem. To stimulate solution specification, designers conduct several analysis activities that seem to be useful and cost-effective: the making of early prototypes; reviewing existing materials; showing products from former projects. Despite the chance of premature closure of the solution, such activities help to speed up the process. Of course, it seems logical that designers should reflect critically on those solution options. A careful consideration of how those solutions will fit the current situation, and a consideration of potential pitfalls and problems to be expected, will help to create a more realistic view of the design process to be planned. These considerations resulted in the formulation of three design principles (principles 1, 2, 3).

For many designers, the consideration of alternative solutions is likely to be an essential part of the design process. Even if designers have clear ideas for the (potential) solution at the start of the process, the DATE-study (Visscher-Voerman & Gustafson, 2004) showed that a majority of designers considered alternative solutions as an essential part of the design process. Principle 4 has been formulated so as to check participants' opinion on this point.

Because of the large amount of uncertainty, which is a characteristic of the majority of design situations, the following tactic seems to be very useful. It seems reasonable that designers split the design process into phases with formal decision moments and concrete products, and should only plan the upcoming phase in detail (principle 5).

The Role Of Formative Evaluation

The evaluation of a design under construction is a distinct phase in the ADDIE models. Through evaluation activities, the quality of the product under development is being assessed. In accordance with the findings, the product may either be improved or implemented as it is. A typical evaluation activity is the pilot test or try-out of the product late in its development (e.g. Andrews & Goodson, 1991). However, several authors and researchers have stressed the importance of formative evaluation and advice to conduct evaluative activities early in the process, integrated with design activities (e.g. Tessmer, 1994, Nieveen, 1997). The survey research by Winer and Vázquez-Abad (1995) showed that instructional designers increasingly acknowledge the worth of formative evaluation (pilot testing), and increasingly evaluate several prototypes of a product before they deliver the final product. Others, however, found that evaluation activities do not receive the amount of time and attention as suggested in traditional design models (Van den Akker et al., 1990; Pieters & Bergman, 1995, Wedman & Tessmer, 1993, Zemke, 1985; see also Keursten, 1994; Leshin, Polluck & Reigeluth, 1992). The results from the DATE-study (Visscher-Voerman & Gustafson, 2004) do not fully support this conclusion. Here, all designers deliberately conducted one or more evaluation activities, often interwoven with design activities. This shows that designers do not only perceive the value of formative evaluation, but also try to integrate these activities in their processes. Yet, it was also noted that

only in a few cases designers conducted their evaluations systematically, according to previously formulated plans and criteria. Most evaluations were conducted informally, relying on personal judgment of designers and stakeholders involved. Designers also indicated relying on small numbers of evaluation respondents in order to keep their evaluations efficient. Although this seems plausible, given the constraints of many design projects, designers could run the risk of gathering one-sided or biased information. If designers would try to increase triangulation (Miles & Huberman, 1994) over persons or methods, this could increase their effectiveness. This led to the formulation of principle 6.

Another obvious finding was that evaluations were not only used to check the quality of the product under development, but also to sharpen the design specifications. Some designers started designing as early as possible. The use of concrete prototypes was seen as an essential means for identifying the specifications of the product in interaction with client, experts, and, especially, members of the user population. Depending on user satisfaction and available time and finances, the process of design, evaluation, and revision is repeated several times. This is regarded the best way to gather user insights, needs, and wishes regarding the validity, practicality, and effectiveness (Nieveen, 1997) of the products. Evaluations can thus play an important role in clarifying product specifications (principle 7).

Several designers regarded it useful to conduct their evaluations themselves, as an efficient way to integrate evaluations in their processes. Despite the risk of designer bias, this seems a plausible tactic, especially for early evaluations, where the focus may be more on improving the design, rather than on determining its final and overall value. This led to the formulation of the principle 8.

Table 1: Procedural design principles as input for the workshop

1.	Designers should make a prototype in an early stage of the design process.
2.	A useful means to help clients, partners, and other stakeholders to choose a solution and to formulate product specifications is by showing products from former projects.
3.	An essential part of the analysis phase is a consideration of possible pitfalls and problems during the design and implementation phases.
4.	Even if designers have a clear idea for the (potential) solution at the start of the process, consideration of possible alternative solutions is essential.
5.	Designers should split the design process into phases with formal decision moments and concrete products, and should only plan the upcoming phase in detail.
6.	For efficient and effective formative evaluations, several (about three) sources and several (about three) data gathering instruments should be used.
7.	In order to clarify product specifications, designers should spend their time on carefully planned formative evaluations of early versions of a prototype, rather than on an elaborate preliminary analysis.
8.	Designers should conduct formative evaluations themselves.

Design Of The Workshop

The function of the workshop was to validate the design principles derived from the reconstructive studies and to increase their robustness. The principles were presented to 24 designers from various design contexts, in order to check the extent to which these designers valued these principles valid for their own situation, and to further specify them to different design contexts. In order to make all participants' actions visible and traceable, all materials to be used in the workshop were provided with unique codes (one for each designer). Also, the whole day was videotaped, so that comments made could be replayed. The workshop activities were pilot tested, to test the procedure as well as the clarity of the principles formulated, with eleven researchers from the department of Curriculum at the University of Twente, most of them having experience within one of the six design contexts. Only minor changes were made. These subsequent sections describe and account for the participants selected and the workshop method chosen.

Participants

As participants in the workshop, the choice was made to invite both designers who participated earlier in the DATE-study and 'new' ones. The choice to ask designers who had been interviewed partly relied on the belief they had a right to know and might be interested in the overall findings of the DATE-research (cf. Miles & Huberman, 1994; Stake, 1976). The reason to ask new designers as well, was to check the validity of the principles with new designers and design situations. Since another goal of the workshop was to contextualize the principles, it

was important to select designers from different contexts. To assure sufficient variety, six different contexts were distinguished (see table 2). Ultimately, twenty-four designers participated in the workshop. There were 12 male and 12 female designers. Their design experience ranged from 2 to 21 years. 13 Designers had a formal background in design education, 8 of them at the Faculty of Educational Science and Technology at the University of Twente. 11 Designers had either a background in the subject matter area or in other studies, mostly within the educational domain, such as general educational studies.

Table 2: Designers participating in the workshop (n=24), spread over 6 contexts.

Context		Interviewed	New	Total
TB	Textbook design	2	2	4
CD	Curriculum development	1	2	3
MM	Design of educational multimedia	2	2	4
IT	Design of internal training and HRD programs	2	1	3
ET	Design of training and HRD programs in external bureaus	1	6	7
DE	Design of distance education	3	0	3
	Total	11	13	24

Workshop Activity

For the workshop, the design principles were put on flip-over sheets, which were spread over the walls in the room. During the workshop, the design principles were discussed and elaborated in small-groups, using metaplan techniques (Schnelle, 1978). The activity consisted of four steps. The first two steps were aimed at validating the principles, the third at further contextualizing the principles in small groups, the fourth at validating the contextualized principles.

Firstly, review of principles and voting on hand-out (30 minutes). The workshop moderator reviewed each principle briefly, clarifying the meaning of words and explaining the tone. Participants were asked to judge the tenability of each principle in their own specific context. For each principle, they were asked to put their votes on a hand-out, by indicating on a 4-points scale to what extend they agree. They could also circle the question mark if they would not know yet. With the first few principles, designers started to discuss meaning of words. In any of these cases, the workshop moderator suggested the designers to save those remarks and considerations for the discussion in small groups. This first step was a preparation for the next step, and was planned to guarantee that designers scored individually, and were not influenced by scores from their colleagues.

Secondly, voting with stickers. In this 10-minutes step, designers were asked to make their votes visible for others, by putting a sticker on each flip-over sheet, corresponding to their votes on the hand-out. Everyone having voted, the workshop moderator took a few minutes to go over each principle to search for striking patterns (such as much agreement or disagreement on a principle). Since designers from different design contexts received different colored stickers, it was also easily traceable whether there were clear differences between or within different design contexts.

Thirdly, elaboration of principles and defining heuristics in small groups (2 hours). Designers were divided into eight groups of three persons. The groups were formed so as to get a variation over contexts within groups as much as possible. Each group was provided with four design principles to work on. Thus, each principle was being discussed by two groups. Groups were instructed a) to generate arguments in favor of the principle and to state situations or contexts in which they believed the principle is valid; b) to generate arguments against the principle and to state situations or contexts in which they believed the principle is not valid; c) to reformulate the principles into new and valid ones, making use of the generated arguments. After Van den Akker (1999), these new principles should be formulated using the following format: If you want to make ….(product specification)…. for context ….(context specification)…. then you should do .…(action).… because ….(rationale).… Having finished the group work, designers put these new heuristics on paper and placed these next to the old principles on the flap-over sheets in the room. Then, each designer could walk through the room and read what other groups had come up with.

Fourthly, plenary review and discussion of new principles. During this 45-minute review, the workshop moderator asked each group to share their most important point of discussion or most critical aspect.

<center>**Results**</center>

This section describes the results of the workshop activity. First, the overall scores on the principles will be presented, together with an overview of the general pattern in scores. Then, the scores for each principle will be listed and discussed, according to the following structure: indication of overall score, table with scores differentiated

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to the six design contexts, supplemented with the explanation given by the workshop moderator, arguments in favor of and against the principle as generated in the small group discussion, and the new, contextualized design heuristics as the result of the discussion.

General Patterns

Table 3 provides an overview of the overall scores on the principles. There are several general patterns:
- Overall, designers agreed highly on the different principles, and most principles were scored positively ('+' or '++');
- 75% or more of the designers scored positively on principles 1, 2, 3, 4, 5;
- Highest agreement between designers was reached on principle 3;
- Designers scored most heterogeneously on principles 6, 7, and 8, of which principle 7 was scored most negatively ('-' or '- -');
- Designers scored relatively few question marks;
- Within all contexts, the DE-designers scored most heterogeneously.

Table 3: Range of votes for each principle

Principle	++	+	-	- -	?	Principle	++	+	-	- -	?
1	12	10	0	1	1	5	12	6	4	2	0
2	13	10	1	0	0	6	5	6	11	1	1
3	20	4	0	0	0	7	1	6	9	6	2
4	13	8	2	1	0	8	4	8	8	3	1

Principle 1: Designers Should Make A Prototype In An Early Stage Of The Design Process

Table 4 shows the scores for the principle as well as the explanation provided by the workshop moderator. Overall, designers highly agreed on this principle, arguing that early examples help to visualize and discuss the desirable outcome of the project. Only one TB-designer disagreed fully, arguing that prototypes are cost-expensive, and should thus be avoided. In this respect, it is important to use the term 'prototype' in the sense as formulated in the explanation. Evaluations of 'prototypes' being a 90% version of the final product may indeed be cost-expensive, especially when major changes need to be made.

Table 4: Scores on principle 1

	++	+	-	- -	?	Explanation
TB	3	0	0	1	0	The concept of 'prototype' refers to any kind of
CD	2	1	0	0	0	materialization or visualization of an idea for a solution,
MM	2	2	0	0	0	or part of the solution (e.g. first description of a product,
IT	2	1	0	0	0	outline of a chapter, a framework, etc.). It should be
ET	2	5	0	0	0	stressed that designers should make such a prototype
DE	1	1	0	0	1	early in the process.
	12	10	0	1	1	

Arguments in favor	*Arguments against*
+ Early prototype can serve as vehicle to reduce uncertainties and clarify design specifications.	- Not always cost-effective
+ In case of innovative situations (such as multimedia design or innovative learning processes), when clients are not familiar and inexperienced.	- Not in case of clear design specifications, available examples or duplicate of a former product, or in case of 'standard' processes.
+ Prototype evaluation stimulates discussion between client and users, and might increase commitment	

New design heuristics
- In case of an innovative or a complex product, designers should make an early prototype (=concretizations of (part of) a possible solution), because: it clarifies the (consequences of the) design specifications; it can be tested quickly; and it increases commitment.
- When creating a product for a situation with innovative elements, designers should develop a prototype in an early stage, because expectations could be tuned and uncertainties be reduced.

Principle 2: A Useful Means To Help Clients, Partners, And Other Stakeholders To Choose A Solution And To Formulate Product Specifications Is By Showing Products From Former Projects

There was a strong agreement on this principle. Only one ET-designer scored partly negative (Table 5), giving a warning that designers should stay open, and not let the example solution fully define the problem to be solved. This warning is integrated in the first new design heuristic. It also opens the reasoning for principle 4. Overall, participants agreed that, comparable to principle 2, this activity can really clear up matters and help specify the outcomes of the project.

The new heuristics happen to be formulated for the context of curriculum design only. The formulation shows that designers intend to show solution examples from adjacent domains (which may be easier to empathize with) and that rely on comparable design principles.

Table 5: Scores on principle 2

	++	+	-	- -	?	Explanation
TB	2	2	0	0	0	By showing one or more products, or by explaining
CD	2	1	0	0	0	what you have done in former projects, you help the
MM	2	2	0	0	0	client shape his ideas and needs.
IT	0	3	0	0	0	
ET	5	1	1	0	0	
DE	2	1	0	0	0	
	13	10	1	0	0	

Arguments in favor	Arguments against
+ Cheap and inspiring activity	- Risk of premature closure, of having the example
+ Clears up matters and questions (leading from abstract to concrete specifications)	solution define the problem to be solved.
+ Do not only show solutions but also design approach and its potential results	- Can create negative opinions about solution chosen

New design heuristics
- When designing for clients who are unfamiliar with the type of solution, designers should show them a wide range of possible solutions, because that will be inspiring and illuminating. But, it should not lead to copying a solution unthinkingly or to insufficient problem analysis.
- If you want to design course materials for the subject French to be taught in schools, you should show course materials for the subject English that are based on the same principles, because that provides the client with a concrete picture of the course materials and the results gathered with it thus far.
- In case of curriculum design for a general context, designers should show a concrete example of a teaching method in a comparable domain, because that gives the client a concrete idea of the teaching method used and results obtained.
- In case of curriculum design for a general context, designers should be careful with showing products from former projects, because the example could come to lead its own life and push the actual problem into the background.

Principle 3: An Essential Part Of The Analysis Phase Is A Consideration Of Possible Pitfalls And Problems During The Design And Implementation Phases

There was a very strong agreement on this principle (Table 6). Only four designers, from different sectors, only agreed partly. The other designers all agreed completely with the principle. The remarks made seemed to focus just on the importance of analysis, per se as resulting in a baseline against which decisions can be made regarding the product to be designed. An analysis focusing on needs may in itself prevent later problems from occurring.

Both new design heuristics show that the amount in which designers have physical access to stakeholders and target group determines whether the analysis is focused on 'now' (analysis of current needs) or is oriented on the future (consider possible problems in future phases). Formulated in this way, the difference between corporate programs and educational programs is also a difference between specific and generic situations.

Principle 4: Even If Designers Have A Clear Idea For The (Potential) Solution At The Start Of The Process, Consideration Of Possible Alternative Solutions Is Essential

Twenty-one designers (88%) scored positively on this principle (see Table 7). Designers from the sectors IT, ET, and DE were most consistent in their scores. In the TB, CD, and MM sector, a small minority scored negatively on the principle. CD-designers showed the largest spread in scores. Comparison of the arguments shows

that the arguments in favor seem to stress the importance of the principle in general, whereas the arguments against show specific situations in which the principle should not be applied. Such as when designers need or want to design a specific type of product (because it is being subsidized or because they want to make exemplary materials). Or put

Table 6: Scores on principle 3

	++	+	-	- -	?	Explanation
TB	3	1	0	0	0	This principle refers to a consideration of certain possible consequences of a specific design. This could lead to anticipation of this problem during the process, or to the choice not to go that direction.
CD	3	0	0	0	0	
MM	4	0	0	0	0	
IT	2	1	0	0	0	
ET	6	1	0	0	0	
DE	2	1	0	0	0	
	20	4	0	0	0	

Arguments in favor	Arguments against
+ In analysis phase, designers determine what clients want, which is the basis for the formulation of learning goals, and accordingly, the design. + Important to check whether client's initial solution ideas fit real needs. Will prevent problems in implementation phase.	- Not in case of innovative situations, in which certain vision or ideology is being developed. They should not be constrained before they even started.

New design heuristics
- When designing a corporate development program, designers should conduct an analysis amongst all stakeholders involved (client, future users, or designers), because this increases the chance that the program will be geared to everyone's needs.
- When designing 'normal' (non-ideological) educational products, designers should consider possible design and implementation pitfalls and problems during the analysis phase, because it helps to be prepared and adjustments can be made if possible.

Table 7: Scores on principle 4

	++	+	-	- -	?	Explanation
TB	1	2	1	0	0	Design processes need to be split up into phases that stakeholders can recognize. Each phase needs to end formally, so that the process can be stopped or adjusted. Only the next phase should be planned, because that is the one that is most easy to foresee.
CD	1	1	0	1	0	
MM	1	2	1	0	0	
IT	2	1	0	0	0	
ET	6	1	0	0	0	
DE	2	1	0	0	0	
	13	8	2	1	0	

Arguments in favor	Arguments against
Helps client to make soundly based choices; and satisfied clients will return + Alternative solutions could work better. + If effectiveness is more important than efficiency. + Transfer, implementation aspects and implementation can be studied. + Another option is to investigate applicability of solutions that worked in other situations	- Not, when initial choices have already been made. - Not in case of constraining conditions, such as market factors or technical hindrances. - Not if specific solution type is subsidized. - Not, when designers need to take specific educational or learning psychology as starting point. - Not if designers wish to create a recognizable product to compete in the market.

New design heuristics
- When the solution has not been prescribed imperatively, designers should carefully consider possible alternative solutions and choose one based on relevant arguments, because they should always strive for the best solution and should not entrust that that is the one that came first to their minds.
- When designing learning systems for companies, designers should pay a lot of attention to the analysis, because it highlights the relation between problem definition, solution direction, and constraints, which facilitates decision-making.
- When designing a method for schools, designers should choose a certain profile or concept, because that makes them recognizable and identifiable. This provides clarity (but is a producer's risk).

differently, when developing a specific type of product or conceiving a certain theory is a goal, rather than a means. In such cases, consideration of alternative solutions may only be distractive.

Principle 5: Designers Should Split The Design Process Into Phases With Formal Decision Moments And Concrete Products, And Should Only Plan The Upcoming Phase In Detail

75% Of the designers scored positively on this principle (see Table 8). Two out of three IT-designers partly disagreed with the principle. Designers from the TB, CD, and DE-sector were most positive. Designers from the others sectors were most divided. While the workshop moderator read the principle, several remarks were made by designers. MM10 indicated that her company works with fixed-time, fixed-money proposals towards clients. This means that an advanced planning is made for the client, which should also be kept, but that designers may constantly change and adapt their individual and internal plans during the project. Designer ET17 argued as the most important that the planning makes sense to stakeholders and that they recognize themselves in the planning.

The newly formulated heuristics seem to refer to the function and use of planning in general, rather than to the specific assertion of the principle (split the overall process into phases and plan only the first phase in detail). Both heuristics seem to focus on different functions of planning. The first heuristic refers to the function of a planning document as a communication tool, and as such supports a detailed planning (in all phases). The second acknowledges the complexity of many design processes, thus indicating that a planning can never fully structure the process.

Table 8: Scores on principle 5

	++	+	-	- -	?	Explanation
TB	4	0	0	0	0	Design processes need to be split up into phases that
CD	2	1	0	0	0	stakeholders can recognize. Each phase needs to end
MM	2	0	1	1	0	formally, so that the process can be stopped or adjusted.
IT	1	0	2	0	0	Only the next phase should be planned, because that is
ET	1	4	1	1	0	the one that is most easy to foresee.
DE	2	1	0	0	0	
	12	6	4	2	0	

Arguments in favor	Arguments against
+ planning useful for structuring and monitoring process	- Can be a hindrance when acceptation of the design is more important than timely delivery.
+ only next phase can be 'known'	
+ Establishes clarity towards client	
+ Note, phases can still be conducted partly concurrently	

New design heuristics
- When designing educational products for specific clients, the principle should be put to work: designers should present concrete work plans to clients because these plans support communication and establish clarity.
- When designing innovative products for large companies, the work plan should be kept global, because the change process cannot be estimated in advance, and a detailed work plan could raise resistance.

Principle 6: For Efficient And Effective Formative Evaluations, Several (About Three) Sources And Several (About Three) Data Gathering Instruments Should Be Used

Designers were divided in their scores on this principle (see Table 9). Although only one designer totally disagreed, half of the group partly disagreed with the principle. The other half was fairly or fully positive. This division is also evident in the way the groups elaborated the arguments for the principle. Also within sectors, except the IT-sector, scores were heterogeneous. From the arguments given in favor and against the principle, it can be concluded that the factor time plays a decisive role in conducting or omitting on or more formative evaluation activities. The fact that the application of several evaluation methods may increase the reliability of the conclusions is perceived as less relevant.

The first new heuristic repeats the overall worth of evaluation. In the second heuristic designers did not so much add a specific design context but provide a constraint that exists in every design situation, namely time.

Table 9: Scores on principle 6

	++	+	-	- -	?	Explanation
TB	2	1	1	0	0	Formative evaluations are often skipped because people think they are time-consuming, expensive, and need a lot of respondents. The idea behind this principle is that evaluations could be conducted on a small scale, although 'triangulation' is needed to draw justifiable conclusions.
CD	1	0	2	0	0	
MM	0	2	1	1	0	
IT	0	0	3	0	0	
ET	2	1	4	0	0	
DE	0	2	0	0	1	
	5	6	11	1	1	

Arguments in favor	Arguments against

+ Evaluation can be valuable and valid, and is important for all contexts.
+ Formative evaluation:
  - can help prevent problems during process;
  - can partly contribute to creating commitment;
  - can increase product quality.
+ Triangulation over respondents and data (sources) leads to empirically reliable conclusions
	- Formative evaluation may be excluded from process if it hinders the time range of the project.
	- Relying on many resources may blur the results (different opinions) and may take too much time.
	- Usually one (client) or two (client and content expert) sources are enough.

New design heuristics
- In case of educational design for one-off clients, designers should conduct formative evaluations during the design and implementation phase, because formative evaluation improves the quality of the product, may prevent problems further in the design process, and helps to create commitment.
- If they want to design efficient and effective formative evaluations of a product, designers should not use too many sources, because it hinders the time range of the process, and because designers run the risk that not all gathered relevant information can be processed.

Principle 7: In Order to Clarify Product Specifications, Designers Should Spend Their Time on Carefully Planned Formative Evaluations of Early Versions of a Prototype, Rather Than on an Elaborate Preliminary Analysis

Designers disagreed highly on this principle, either within or between contexts. Overall, this principle was supposed to be different between corporate training and education sectors, which again seem to relate to generic and site-specific situations. Negative scores were dominant (see Table 10).

Table 10: Scores on principle 7

	++	+	-	- -	?	Explanation
TB	1	0	1	1	1	The concept of formative evaluation activities means in this case: show intermediate versions to stakeholders with a specific goal and question. The term preliminary analysis refers to several analysis activities prior to the design phase.
CD	0	1	2	0	0	
MM	0	2	2	0	0	
IT	0	1	1	1	0	
ET	0	2	3	2	0	
DE	0	0	0	2	1	
	1	6	9	6	2	

Arguments in favor	Arguments against
+ In the education sector, extensive analysis (content-related) is often not possible. Thus, formative evaluation is absolutely necessary. + Teachers prefer seeing a first product and react to it, above having a thorough analysis and wait for the product.	- Training needs and preferences can only be detected in analysis phase. Formative evaluation could help improve the product.

New design heuristics
- In case of design for the context of schools (generic design!), designers should attribute major time to formative evaluation, because they cannot rely on other sources than market research for changing the product.

Principle 8: Designers Should Conduct Formative Evaluations Themselves

Similar to the previous principle on formative evaluation, designers disagreed on this principle. Scores within sectors were also heterogeneous (see Table 11). Although some of the arguments refer to a specific type of context (such as politically sensitive situations) the arguments mostly seem to refer to basic ideas about evaluation (the drive to be objective versus the convenience of being subjective) or to specific evaluation qualities of the individual designer or team.

The first design heuristic tries to balance between objectivity and subjectivity. The second heuristic adds a context to the original principle.

Table 11: Scores on principle 8

	++	+	-	- -	?	*Explanation*
TB	2	0	1	1	0	Formative evaluation is showing a prototype or intermediate product to clients, experts, users, and other stakeholders, to get their judgments on the product and to generate suggestions for revision. If designers conduct formative evaluation themselves, it will save time (efficiency). Also, designers will get to know where problems occur, so that they can prevent/overcome these problems in next versions adequately (effectiveness).
CD	1	1	0	1	0	
MM	0	2	2	0	0	
IT	0	2	1	0	0	
ET	1	2	3	1	0	
DE	0	1	1	0	1	
	4	8	8	3	1	

Arguments in favor	*Arguments against*
+ Designers can evaluate more purposively than someone who does not know the design process.	- Designers could be biased, thus hindering objectivity
+ Designers can be more subtle because they know what to probe;	- Not in case of politically-sensitive situations or when fundamental choices need to be made with respect to the content.
+ Is efficient, designers can do it quickly themselves and can immediately apply the results;	- Not when the evaluation gets too specific for designers' evaluation expertise.
+ Diminishes ballast.	

New design heuristics
- If designs are made in a team, the team should evaluate themselves, since they know what to probe. The evaluator is preferably not the designer, as this will benefit the objectivity.
- If formative evaluations need to be conducted on projects that are politically insensitive, or content-insensitive, then designers should conduct these themselves, because they are quick, have no ballast, can directly apply results, and have a chance to probe.

Conclusions

The study started with the overall question 'What are practical and robust procedural design principles, related to educational analysis and evaluation?'. To answer this question, 8 design principles, primarily related to analysis and evaluation, were formulated based on a number of reconstructive studies. As such, these design principles had a basis in practice. In order to check how robust these practical principles are, a workshop was planned with 24 designers from different design contexts, in which these principles were discussed and contextualized.

Overall, designers showed a remarkable agreement on the majority of the principles. Although this may be due to the rather general nature of the principles, it also indicates that the principles have potential for different contexts. In the new heuristics that were formulated by designers, some of the old formulations were sharpened. Some of them were specified more towards different contexts and thus increased insights into the specific situations in which the principles are valid. The discussion of the principles shows that to some extent, the specific design situation influences the way in which analysis and evaluation activities are conducted. But the discussion also shows that the choice to conduct or omit specific activities, and the perceived relevance of the activities rely on more basic and personal perceptions. For example, some designers argue that designers should never conduct formative evaluations themselves because they cannot be objective, while others view this subjectivity as very positive for conducting evaluation themselves, since they are much subtle because they exactly know what they want to evaluate

and they are more sensitive to the findings. Overall, the factor *time* shows to be a very important and decisive factor in the choice of conducting or omitting evaluation activities. Although this finding fully supports findings from other reconstructive studies, it partly contradicts the finding for principles 1 and 2, where designers indicated to support the principle of showing and discussing early prototypes or examples from other projects, which are in fact kinds of (informal and low-profile) evaluations. One possible explanation is that designers may have different perceptions of the term evaluation, this being rather formal and more towards the end of the process.

With respect to the context, the amount of innovation of a situation or a product seems to highly influence the flow of the design process. Designers proposed an iterative approach in these cases, as a means to tackle and reduce uncertainty. The creation of prototypes early in the design process was regarded as useful because it helps to clarify the design specifications and their consequences. In this way, expectations can be tuned and uncertainties reduced. Because results are visible early in the process, they can be tested quickly. For these reasons, the use of early prototypes was also supposed to create commitment. Because of the amount of uncertainty that exists in innovative situations or for innovative products, designers need not to be too pretentious with their plans. In these contexts, it seems to be more efficient to keep the planning global and to let the process flow evolve.

Several newly formulated heuristics distinguish between the education and the training or corporate education sector as a specific design context influencing the process. The supposed difference between these sectors came out especially in relation to principles 4 and 7. It would be interesting to further explore whether this difference stems from differences in for example target groups (kids versus adults) or function of the design (aimed at increasing general knowledge versus specific skills or work related knowledge) or whether they really refer to a difference in site-specific situations in which they can and do know the target group (which is more often the case in organizations) and generic situations in which they can not possibly know the whole target group. Designers attached different weight to analysis activities for both education or training contexts. Overall, the role of analysis as activity to steer the project was regarded more important in the context of corporate training than in education, because in the former, a clear link can be established between a problem and the solution. In education, analysis was only regarded useful in case of redesign of an existing product. In case of 'new' design, formative evaluation was supposed to have more impact. Also, the consideration of different solutions was regarded to be more important in the corporate context, to help clients deliberately select a solution and get them committed to ideas. Only in cases where a certain program is prescribed, considering alternative solutions was not regarded necessary. For educational publishers, it is important that their products can be recognized. Therefore, they tend to develop a specific rationale of their materials and do not consider alternatives.

For the validation of design principles, either stemming from specific design research as identified by Van den Akker, Gravemeijer, McKenney and Nieveen (2006) or from reconstructive design research, such as the DATE-study, such a workshop can be a valuable activity in later stages of the research process. By bringing several designers together, the researcher has quick and efficient access to a huge amount of experience and contexts, as long as careful selection of respondents has been taken care of. The workshop seems to be primarily relevant for the validation of procedural design principles compared to substantive principles. Whereas substantive design principles could certainly be validated by evaluating a product that has been designed according to the principles, the validation of procedural principles by applying them on a design process seems to be less evident, given the time that is needed to finish the process. In those situations, it can be a good alternative to discuss the principles with designers whose daily work is to design.

While the discussion of design principles in a workshop may help the researcher to develop design theory, it may also directly impact design practice, since it provides designers with an opportunity to discuss and network with congeners, also across disciplines, which they may miss at their busy jobs. It helps them sharpen their own ideas about what design is or should be and thus, directly impacts their work. As such, the learning experiences of such a workshop feed both practitioners and researchers.

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The Design of Falcon: From an Assessment Management System to an Integrated System that Supports Performance, Assessment, Knowledge Sharing, and Learning

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Background of the Project

Teacher preparation programs throughout the United States are being challenged to implement systemic approaches to evaluate the readiness of their students to enter the teaching profession. Grade point average and completion of required courses are no longer acceptable evidence of degree program quality. Institutions have developed systematic assessment plans that detail data sources (i.e. both direct and indirect measures of student learning), data analysis procedures, and processes for utilizing these data for program improvement. Since these efforts can be time consuming and complex, many have turned to technology as means to support and enhance the process.

This was the case in Louisiana, where, during Spring 2001, leaders from 21 teacher preparation programs throughout Louisiana began discussing the need for a technology-based system to address these needs and the implications of the National Council for the Accreditation of Teaching Education (NCATE) standards (NCATE, 2001). Between July 2001 and June 30, 2002, faculty and students in the Division of Education at Xavier University of Louisiana and the College of Education at the University of Louisiana at Lafayette gathered requirements and implemented PASS-PORT.

PASS-PORT, a web-based system, enables institutions to define key transition points, called portals in PASS-PORT. Each portal consists of a set of requirements students must meet (e.g. minimum grade point average, minimum rubric ratings on required artifacts) providing a mechanism for determining whether a student is ready to move into the next phase of the degree program. Students can create or upload artifacts that document knowledge, skill, and dispositions. These artifacts can be placed in electronic portfolios and aligned to professional standards and a reflection provided by students. Portfolios can be routed electronically to assessment teams for evaluation of students at the portals (i.e. key program transition points). PASS-PORT has experienced success in that 20 teacher preparation programs that utilized the system for recent accreditation visits passed without stipulations.

The Problem

Though PASS-PORT has helped institutions meet accreditation requirements, the following problems have emerged.

Failure to follow best practice program improvement process. Though many institutions desire to have data for decision making or to meet accreditation pressures, they fall short implementing systematic assessment plans that detail data sources (i.e. both direct and indirect measures of student learning), data analysis procedures, and a process for utilizing these data for program improvement. .For example, some institutions struggle to clearly define degree program outcomes and select or develop data sources to assess them. Many institutions collect data, but fail to "loop back" and use those data for making decisions about improving the degree programs.

Perceptions of extra responsibilities and tasks imposed by PASS-PORT. PASS-PORT emphasizes a top down approach by focusing on unit assessment needs that are driven by external standards set by accreditation agencies. The emphasis is misplaced on satisfying the accreditation agency rather then focusing on how each individual in the organization can improve program outcomes. Many faculty have a negative attitude toward the process because it adds to their busy work schedule with assessment tasks they see as having no purpose other than meeting external accreditation pressures.

Theoretical Framework

Literature related to electronic performance support systems (EPSS) and knowledge management systems (KMS) provides a theoretical framework to address these problems. An EPSS generally refers to a system that provides just-in-time support for performance and learning with a repository of information, resources, and tools

(Gery, 1991; Hannafin, Hill, & McCarthy, 2000; Harmon & Jones, 1999). PASS-PORT can be perceived as an EPSS in that PASS-PORT is an electronic tool that facilitates administrators and faculty in assessment data gathering tasks and aggregation tasks. KMS is "a class of information systems applied to managing organizational knowledge" (Alavi & Leidner, 2001, p. 114). KMS may facilitate one or all of the following processes: knowledge creation, storage/retrieval, transfer, and application. PASS-PORT can be categorized as a KMS, because it enables capturing, aggregating, and retrieving of assessment data.

Ma and Harmon (2006) argue that EPSS and KMS should be integrated with learning technologies because they have a shared theoretical base; integrating the three technologies may leverage the strengths of each. KMS, EPSS, and learning technologies are all solutions to performance problems. KMS deal with managing knowledge at the organization level to achieve strategic advantage (Alavi & Leidner, 2001; Schwen, Kalman, Hara, & Kisling, 1998), whereas traditional EPSS are more interested in improving individual performance (Laffey, 1995). Learning technologies, on the other hand, usually focus on supporting performance by enabling learning and knowledge acquisition at the individual level. A recent trend toward a holistic view of learning, knowledge, and performance provides a theoretical base for connecting the three areas. Situated cognition (Brown, Collins, & Duguid, 1989) suggests that learning, knowledge generation, and performance occur as parts of the same process. Theories such as distributed cognition (Greenberg & Dickelman, 2000; Salomon, 1993) and activity theory (Engeström, Miettinen, & Punamäki-Gitai, 1999) indicate that learning, knowledge, and performance can be enhanced by improving the individual and the community, or the tools and artifacts used by both. In addition, learning and knowledge at the individual, group, and tool levels enhance each other.

Ma and Harmon (2006) suggest an integrated working/learning environment (IWLE) as a conceptual means to integrate KMS, EPSS, and learning technologies. Users interact with the IWLE user interface while performing, learning and managing their knowledge. At the user interface level, there are three types of tools available: performance support tools, an intelligent learning portal, as well as community building and knowledge sharing tools. Performance support tools provide the information, resources and devices needed for someone to perform tasks. Examples of performance support tools include rule-based or case-based advisory/expert systems, workflow automation systems, decision-support tools, data mining tools, productivity software such as text processors, and applications specific to a job. Users turn to the intelligent learning portal if their performance problems cannot be resolved with the use of performance support tools. The intelligent learning portal prescribes customized learning experiences for users based on their backgrounds and the current problems they encounter. Community building and knowledge sharing tools can be used together with performance support tools and the intelligent learning portal to facilitate learning and performance during social interactions. These tools support community building, knowledge acquisition, transfer, storage and application. Examples of such tools include groupware, bulletin boards, discussion forums, and information searching tools that provide access to various knowledge repositories and directories. To facilitate the integration of these tools, a knowledge capture function is embedded in all the tools with which users interact. A top-down process captures data from the interface and sends it down to the bottom objects and data layers. A bottom-up process gathers reusable information from the data and object layer, repurpose it for specific presentation formats and sending it to the users in the formats such as online training, job aids, simulations, and etc.

In summary, the following guidelines can be derived from the literature reviewed above: 1) provide tools and resources to support best practice work process; 2) capture all data entered by the user in the process; 3) repurpose the data to support user learning and performance as well as to facilitate knowledge sharing.

Problem Analysis and Solution Development

The theoretical framework described above provides a lens for us to analyze the problems we have encountered in implementing PASS-PORT and to help us generate solutions. The first problem is the failure of some organizations to follow best practice program improvement process. One of the attributes of EPSS is that the work process, business strategies, and best practices should be built into the system to ensure their implementation. PASS-PORT lacks direct support for the entire program improvement process. Data collection at transition points as well as data aggregation and retrieval are supported. However, PASS-PORT does not support the other steps in the program improvement process, including assessment plan definition, data interpretation, noting actions taken, and results dissemination. The lack of this support has resulted in institutions beginning data collection without making thoughtful decisions on the overall assessment plan (i.e. identifying key outcomes to measure and determining data sources to be used as evidence). In addition, data interpretation may or may not happen on a regular basis and action may not be taken to address issues identified in the assessment data. Directly supporting the whole program improvement process may enforce the implementation of best practice. Therefore, we decided to add functionality in PASS-PORT to facilitate the entire process.

The second problem is faculty perceptions of extra responsibilities and tasks imposed by PASS-PORT. Faculty often view the implementation of assessment systems as a burden imposed to only meet external accreditation pressures. This problem is similar to what some KMS developers have encountered. For example, In a KMS project, the users almost unanimously stated that they would not use this KMS in their daily operation, because it was not integrated into their work environment (Johnson, Birnbaum, Bareissand, & Hinrichs, 2000). Using the KMS would take them out of their work context and add to their workload. To address problems like this, they added an EPSS interface to the KMS. In other words, they built data capturing and data retrieval into employees' daily work process which is supported by an EPSS. Along the same line of thinking, in our case, embedding the assessment data gathering process into faculty members' daily work may decrease the workload and lead to positive perceptions of the tool.

How do we achieve this goal? PASS-PORT was originally designed for evaluating students at transition points. Students upload artifacts that document knowledge, skills, and dispositions, place these artifacts in portfolios that are submitted in order to gain permission to move through a transition point. Faculty evaluate the portfolios to judge whether the student is ready to move into the next phase of the degree program. This process occurs outside of the context of any course, so faculty members perceive it as "extra work" imposed by the assessment system. To address this problem, we consulted other assessment process and decided to choose one that uses course-based assessment to drive program and college level assessment (Walvoord, 2004). Course-based assessment is an established process familiar to students and faculty, so it is ideal to leverage it in supporting both program and college assessment. A misstep in the original design of PASS-PORT was a failure to realize the power that course-based assessment can bring to program and unit assessment. Faculty members are already engaged in a process of continual course improvement where they: define course goals and objectives, measure the degree to which these are met, and then utilize this information to make improvements to the course. The process can be leveraged not only to inform the faculty member of course effectiveness, but also to provide vital data for program and unit assessment. Many higher education institutes have adopted course management systems (CMS) to deliver courses and facilitate course-based assessment. To use course-based assessment to drive program and unit assessment, we need to develop core CMS functionality and integrate the CMS with PASS-PORT.

The concept of an IWLE has inspired us to evaluate existing CMS to identify the gap. Traditional CMS support course design, delivery, management, and assessment tasks. However, it fails to provide pedagogical support for completing these tasks. Ideally, an EPSS should support all aspects of the major tasks in a work process. A preliminary study indicates that an EPSS is positively perceived by faculty as a tool to provide just-in-time support needed to design and deliver courses (Ma, 2005). Therefore, we decided to add functionality to support the implementation of appropriate pedagogy. Details of the functionality are presented in the next section.

Moreover, traditional CMS does not support the course improvement process. An IWLE type of system may provide opportunity to support this process. Knowledge capturing and aggregation tools may collect course assessment data, teacher notes and reflection, as well as data indicating how the course is meeting program outcomes. These data is presented to faculty through an EPSS interface to encourage faculty to reflect on the effectiveness of the course. Additionally, the system captures best practice activities, sample rubrics, and issue solutions. These data can be stored and provided to faculty to help them improve courses. Learning technologies can also play an important role. If the on-demand support is inadequate to meet faculty needs, learning technologies such as a faculty development portal give them opportunities to go through tutorials, workshops to receive informal and formal training. Best practices in teaching can be captured and repurposed for use in the faculty development portal.

Ideally, an IWLE should support all the work processes of users. Previous research shows that faculty members need a "one-stop shop" of resources to help them with teaching (Ma, 2005). Following the same logic, one would expect that they would benefit if a "one-stop shop" is provided to support all their work processes, including teaching, assessment, advising, community work, scholarship, and etc. Along this line of thinking, we added functionality to support advising and merit and promotion processes because they are easier to support with a system. Future effort may be needed to provide support to other processes.

Falcon: An Integrated System to Support Performance, Assessment, Knowledge Sharing, and Learning

The ultimate goals of establishing an assessment process is not only to meet accountability expectations from accreditation agencies, but more importantly to develop a mechanism to enable ongoing assessment and improvement at the course, program, and college levels. We argue that to have users buy into the program improvement process, assessment procedures should be an integral part of the daily work process, and the data gathered should be used to facilitate learning and improvement. Based on this assumption, we have created Falcon

as an integrated system to support performance, assessment, knowledge sharing, and learning at course, program, and college levels. This section describes the functionality of Falcon.

Program Improvement

Falcon provides sophisticated tools and mechanisms for supporting organizations in program improvement. Key components include: degree program transition point definition, assessment plan configuration, course-based assessment drives program assessment, explicit linkage of outcomes at all levels of an organization, and support for external performance data.

Degree program transition points. Falcon supports the definition of degree program transition points (i.e. portal), articulation of requirements (including artifacts to be evaluated), creation of evaluation instruments (i.e. rubrics) to evaluate artifacts and performances at each transition point, and setting the level of performance required to move through a transition point. Candidates submit artifacts to meet portal requirements; faculty view artifacts and the evaluation rubric side-by-side to perform evaluation. The transition point component serves (1) as a gate were the readiness of the candidate to move into the next phase of the program is judged and (2) as a data source for drawing conclusions on the quality of degree programs.

Assessment plans. Falcon supports the entire program improvement process, including defining assessment plans, collecting data, aggregating data, interpreting data, taking action, and disseminating results to stakeholders. Assessment plans are built upon degree program outcomes. For each program outcome, any number of data sources can be selected as potential sources of evidence that the outcome is being met. Data sources include: user demographics, surveys, artifact evaluations, test scores (e.g. Praxis), and external data. A rationale is provided indicating how the data source will be used to judge whether the outcome is met. Once the data sources are selected, Falcon automatically aggregates the data sources. Falcon also supports regular interpretation and executive review. On a regular basis, the data sources can be reviewed, conclusions drawn, weakness articulated, and summary posted to the assessment plan. Additionally, after the executive review committee reviews the data and interpretation summary, any actions taken can be posted to the assessment plan. Falcon allows all faculty to review assessment plans including all program outcomes, associated data sources and rationale, aggregated data, interpretation summaries, weakness identified, and actions taken. These features ensure that the model process is followed and organizations actually "loop-back" to improve programs based on data.

Course-based assessment drives program and college assessment. Course assignments rated by the instructor alone may not be adequate to support program and college assessment. Walvoord (2004) suggests that adding other raters may render course assignment a legitimate tool for program and college assessment. In Falcon, tools are provided to automatically send a percentage of course assignments to outside raters to meet program assessment requirements. This functionality helps save limited resources. In addition, faculty members do not feel they have to do "extra" tasks to complete program and college level assessment. Such positive perceptions will help ensure program improvement procedures are carried out.

Explicit linkage of outcomes at all levels of an organization. Falcon supports accreditation efforts at all levels of an organization (i.e. University, College, Program). Though faculty are familiar with course-based assessment processes, they are often unfamiliar with the connection between course outcomes and program / college outcomes. To address this issue, Falcon explicitly represents the linkage between course outcomes, program outcomes, as well as unit outcomes and provides tools for faculty to view the impact of their teaching on program and unit outcomes. For example, consider the situation where two different undergraduate courses have primary responsibility for a program outcome. A tool that allows a faculty member to aggregate data by program outcome allows him/her to see the degree to which students are meeting program expectations. Next, she might "drill down" into the program outcome and see a breakdown of the data by the courses that are linked to it. She then might view the performance of students that have come through her course. Falcon is designed to explicitly represent the linkage between course, program, and college outcomes.

Support for external performance data. Falcon accommodates external sources of data including tutorials, rich learning environments (e.g. problem-based learning environments), and immersive video games. Increasingly faculty are recognizing the importance of electronic learning environments as a means to provide opportunities for students to demonstrate authentic performance albeit virtual settings. Once configured, external learning environments can transparently persist performance data to Falcon. These data can then be included in course, program, or college assessment processes.

Course Design, Delivery, and Improvement

Falcon provides common CMS tools to support course delivery, communication, and collaboration. For example, tools are available for faculty to disseminate course content, including documents, text, and graphics, and rich interactive content. There are also tools that facilitate dialog and collaboration, including: alerts, threaded discussion forums, evaluation of postings using rubrics, email, chat, peer evaluation and feedback, and file sharing.

Moreover, Falcon has the following unique characteristics that support course design, delivery, and improvement: course templates to ensure consistent implementation of courses, just-in-time support for course design, delivery, and improvement, portal to both technical and pedagogical resources and tools, and sharing of best practices and teaching experiences.

Course templates to ensure consistent implementation of courses in the program. Course characteristics are inherited from department definition. A department can define a course template, including course details such as: course outcomes (aligned with program outcomes), required projects and associated scoring instruments. Course-based rubrics can be aligned with course outcomes, program outcomes, unit outcomes, and professional standards. Additionally, course-based rubrics can inherit attributes from unit approved instruments, departmental approved rubrics, and course approved rubrics. When a course is created by a faculty member, it automatically includes required elements.

Just-in-time support for course design, delivery, and improvement. Research shows that importance of on-demand support. Faculty members expressed the need to acquire relevant knowledge that addresses their specific concerns about teaching (Laga & Elen, 2001) and that can be applied immediately (Carbonaro, Snart, & Goodale, 2002). They are especially interested in learning from concrete examples provided by experienced peers (Carbonaro et al., 2002; Laga & Elen, 2001). Falcon has the potential to meet this need. It provides on-demand examples of activities, assessments, and best practice solutions to problems. For example, when a faculty member is designing a discussion forum activity in Falcon, the system provides example discussion activities, templates for activity instruction, and the associated rubrics faculty may reuse to create their own. If a faculty member runs into an issue, for example, students are not posting meaningful messages on the discussion forum, s/he may search the issues library to find out how other instructors have addressed similar problems. During and after teaching, Falcon helps the professors monitor their teaching with a set of tools, including course summary data, notes, issues log, connection to program data, connections to other courses. If course improvement is needed, Falcon provides best practice examples to help faculty redesign the course.

Portal to both technical and pedagogical resources and tools. In a previous study investigating faculty needs (Ma, 2005), faculty members asked for a "one-stop shop" of resources to help them with teaching. They wanted a gateway to the following types of knowledge organized around their teaching: technical knowledge, content knowledge, pedagogical and content pedagogical knowledge, as well as experiential knowledge. A professor in this study commented the importance of having a portal to both pedagogical and technical. She stated that WebCT support staff usually provide technical help on how to do something in CMS, but do not help with pedagogy. And the center for teaching effectiveness will tell you, pedagogically, how to do activities but not provide information about the technical aspect. Falcon provides a portal to both types of tools and resources. For example, when an instructor creates a discussion board activity in the Assignment Tool, Falcon not only walks the instructor through the steps to actually create the forum, but also provide pedagogical support through examples, advices, and templates.

Sharing of best practices and teaching experiences in the community. Lee Shulman, a leader and long-term advocate of teaching improvement, called to "make teaching community property" (Shulman & Hutchings, 2004). His recent model of teaching improvement includes the community as a key component that facilitates teacher learning (Shulman & Shulman, 2004). Systems have been developed to capture and share teaching examples (Kolodner, 1991; Krueger, Boboc, & Cornish, 2003; Wang, Means, & Wedman, 2003). However, content collection is a very time-consuming task in developing these systems. In a study that examines faculty perceptions of an online teaching case library, faculty expressed the desire to share their work, but they commented that they may not have time to do so (Ma, 2005). Falcon may help address the problem. The Assignment tool not only scaffolds faculty on how to develop an activity, it also captures the activities and the scoring instruments developed by them. The Issues Library allows faculty to search for solutions and to store their own issues and solutions for future reference. With these tools, faculty may contribute their own to the community without extra effort. They only need to click on a checkbox to make the activities and issues they created available to the community.

Advising

Advising students during their academic career is a key factor in improving retention rates. In many institutions, this responsibility falls to the faculty member. Falcon was designed with the following functionality to make the advising process more efficient and effective: monitoring of degree progress, advising appointments, advising records, and advising frequently-asked-questions.

Monitoring of degree progress. Each degree program defined in Falcon consists of a collection of required courses and transition points. As a student receives final course grades, it is displayed next to the required course. As transition point requirements are completed, an indication of whether the student has met the minimal requirements for that requirement is displayed. This enables the student and faculty advisor to remain current on the students progress toward completing degree requirements.

Advising appointments. Advisors are able to define advising appointment slots in which students can select. This simplifies the process in communicating to students available appointments and supporting students in selecting one that fits their schedule.

Advising record. As students select an advising appointment, they are provided an opportunity to select courses they wish to take in the upcoming semester. The student is able to view the required degree curriculum and grades for those courses they have already completed. Once submitted by the student, the faculty member is able to view, edit, and approve the advising record.

Faculty Development

In Scholarship Reconsidered: Priorities of the Professoriate (1990), Ernest Boyer makes a compelling case for America's colleges and universities to expand our view of scholarship and how it is assessed. Falcon features can help support the demonstration and assessment of scholarship. Boyer's expanded view of scholarship (i.e. scholarship of discovery, integration, application, and teaching) provides a useful framework for examining Falcon's features.

Portfolio approach for merit, tenure, promotion. Falcon supports the creation of reflective portfolios. Portfolios are ideal for documenting faculty development. Faculty can create or upload artifacts that document professional growth. These artifacts can be placed in electronic portfolios and aligned to professional standards and a reflection provided. Portfolios can be routed electronically to assessment teams for evaluation.

Artifact templates for consistent documentation. Artifact templates can be developed to ensure consistent data collection. For example, a template can be developed to document grant funding received. Template fields might include funding agency, scope of the grant program (e.g. local, state, and national), total dollar amount, number of students funded by grant. The artifact template insures that data collected is consistent. As faculty receive grants, they simply document the information in Falcon. This artifact is then available for use in faculty evaluation and institutional reporting. The artifact templates also provide a way to make organizational priorities explicit. For example, if an institution wants to encourage faculty to engage students in service learning, an artifact template can be created that provides for a mechanism to collect key data on service learning projects. These data can then be considered in annual faculty review and is available for aggregation at the departmental, college, or university level.

Teaching artifacts. To facilitate documentation of teaching, Falcon creates a summary artifact for course taught. The summary report includes data such as: course outcomes (linked to program outcomes), student demographics, student performance on course assignments, complete assignment requirements and scoring instruments, and comparison of student performance across sections and semesters.

Service artifacts. Falcon is designed to foster a community of practitioners. Contributions to the community are valuable service. Falcon supports documentation of contributions to this community through shared activities and assessments. Additionally, advising activity is document by Falcon providing another means for demonstrating service to the organization.

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The Design of an Analogical Encoding Tool for Problem-based Virtual Learning Environments

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Introduction

Providing opportunities for students to gain experience in applying what they have learned in everyday authentic situations is a challenge facing instructional designers and teachers. Schools typically emphasize the transfer of abstract concepts where knowledge is viewed as a discrete object residing outside of the individual and learning occurs out of context (Brown, Collins, & Duguid, 1989).

Problem-based learning (PBL) has been widely advocated as an instructional approach that provides opportunities for engagement in authentic contexts while completing authentic tasks (i.e. problem solving). A rich body of research conducted with adult learners suggests that PBL is particularly effective in helping learners to develop deep understanding of principles within a domain (Gijbels, Dochy, Bossche, & Segers, 2005). However, the literature on PBL points to problems that may make its use with young learners difficult. Many students have difficulty with the student directed learning required in PBL (Hoffman, Ritchie, 1997). The challenges of implementing PBL in a classroom require scaffolding (Koschmann, Kelson, Feltovich, & Barrows, 1996).

Virtual learning environments that utilize a problem-based approach provide opportunities for creating authentic contexts, engaging students in authentic tasks, and providing scaffolding to support learning. One type of scaffolding that is often employed is the use of cases.

This paper explores the potential of having learners explicitly compare two cases, a process called analogical encoding, while working in a problem-based virtual learning environment. Research on analogical encoding suggests that teaching students to compare cases side-by-side improves knowledge acquisition and transfer. Analogical encoding aids students in attending to the deep underlying structures (i.e. principles) of cases thereby reducing potential distraction of surface features. This paper intends to translate research findings on analogical encoding to a scaffolding strategy in a problem-based virtual learning environment.

Analogical Reasoning

Analogical reasoning is widely accepted to be important in learning and understanding. Novel problems can be solved by reference to previously understood situations (Kurtz, Mao, and Gentner 2001).

In its simplest form, analogical learning results from noticing similarity between a well-understood "base" domain and a less well understood "target" (or "test") domain. Solving a problem in the target domain can be facilitated by mapping corresponding aspects of the target domain to the base domain, and adapting a solution from the base domain.

A number of learning environments utilize cases to scaffold learning. For example, Roger Schank utilized "war stories" from domain experts in providing just-in-time support to students engaged in goal-based scenarios (Schank, Fano, Jona, & Bell, 1993). *Alien Rescue* provides video-based vignettes to support middle school students in designing probes to be sent to worlds in our solar system (Liu, Williams, & Pedersen, 2002). Cognitive flexibility hypertexts utilize "mini-cases" that facilitate the learner in "cross-crossing" the conceptual landscape (Spiro & Jehng, 1990). In Learning by Design classrooms (Kolodner, Owensby, & Guzdial, 2003), design cases are provided for middle school students to develop scientific concepts and generate solutions to design problems.

However, the actual process of retrieving and applying relevant past knowledge (the "transfer" problem) is not trivial. It has been variously shown that even when appropriate bases are stored in memory, retrieval often fails (Perfetto, Branford, & Frands, 193; Ross, 1989; Weisberg, DiCamillo, & Phillips, 1978, all cited in Kurtz et al. 2001). In addition, while structural similarity is the main predictor of suitability for problem solving, surface similarity has been shown to be a better predictor of retrieval. Furthermore, retrieval is only part of the problem: once the base is retrieved, the relevant solution must be adapted to the target problem (Novick and Holyoak, 1991, and Novick, 1995).

Though the idea of providing cases to support learning is appealing, individuals are often unable to retrieve and apply cases to current problems (Gentner, Loewenstein, Thompson, 2004). Gentner et. al. argue that one factor influencing this poor performance is that the cases are likely encoded in situation specific format. The solution proposed and researched by Gentner's research team is having students compare cases side-by-side resulting in improvements in retention and transfer.

<center>Analogical Encoding</center>

Analogical encoding (also known as mutual alignment) is a mechanism for making common structure more salient by comparing examples (Gentner and Markman, 1997). It is based on the theoretical framework of Gentner's (1983) structure mapping theory, which posits that analogy involves the identification of correspondences between the structures corresponding to two domains and the transfer of information from the more-understood, or base domain, to the less-understood, or target domain. In analogical encoding, the two domains are equally novel to the learner, thus each acts as both base and target with respect to the other.

Analogical encoding promotes learning in two ways. First, because the learner transfers information between the two situations, the representation of each of the situations becomes enriched with information more evident in the other situation. Second, the identification of correspondences between structured representations of each the two situations allows the learner to strip away details that are not relevant to the common structure, leaving behind an abstract representation of the structures that can then be applied to novel analogous situations, regardless of whether or not the novel situations share surface similarities with the originally learned situations.

There is some existing evidence that comparison can facilitate learning. Gick Holyoak (1983) found that instructing participants to describe the similarities between two analogs led to formation of abstract schemas and facilitated transfer to a further problem. Catrambone and Holyoak (1989) showed that inducing participants to compare multiple examples improved performance on long-term transfer across contexts. Cummins (1992) found that when learners were given questions that required comparison of analogous problems, they developed deeper understanding of the solution principles than did learners who received an equal number of noncomparison questions. Schwartz and Bransford (1998) conducted classroom studies to show that inducing learners to generate distinctions between contrasting cases led to the development of more differentiated knowledge structures. Loewenstein, Thompson, and Gentner (1999) found that graduate management students who compared two analogical cases were nearly three times more likely to incorporate the common strategy into a subsequent negotiation task than were students given the same cases separately. These and related findings suggest that analogical encoding can invite abstraction and promote transfer (see also Gentner & Namy, 1999).

In summary, research on analogical encoding (i.e. learning by comparing two cases) suggests that teaching students to compare cases side-by-side improves knowledge acquisition and transfer. Analogical encoding aids students in attending to the deep underlying structures (i.e. principles) of cases thereby reducing potential distraction of surface features.

<center>Overview of Learning Environment</center>

Our team is currently developing a four-week 7th grade life science curriculum prototype that will consist of approximately 10 class periods of hands-on classroom-based activities and approximately 10 hours of video game activities. The game, to be built using the *Torque Game Engine* (http://garagegames.com), features intriguing storyline, immersive 3-D representation of context and quests (problems), simulations, tools and resources that support quest completion, choice of roles and tasks, levels of play, record keeping, as well as real time interaction and feedback. Quests in the virtual environment are supplemented by classroom-based activities, which address students' knowledge gaps revealed during game play and extend problem solving from the virtual and fictitious world to similar problems in the local community.

Styled after highly successful commercial products like *World of Warcraft* and *Everquest*, the role-playing game has science fiction/fantasy setting. Pursuing larger strategic objectives, the player character will be challenged with a variety of "quests;" that is, player-characters must pose questions and seek answers, investigate mysteries, formulate hypotheses, gather evidence and information, use appropriate tools and techniques, and ultimately take action to solve problems presented within quests. These quests form the main plotlines of the interactive narrative and will provide the immediate motivations for player-character activities in the game. Each quest is designed to achieve specific learning goals.

The game takes place amid an ancient conflict between two sentient species and their struggle for dominance on a planet in another solar system. It is a warm, wet world of stormy oceans, dotted with countless

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islands and a single small continental landmass. While not technologically sophisticated, the planet's two rival sentient species have reached a turning point in their evolutionary history where it is likely that one—the *Mruk-ma*—will likely drive the other—the *Sheft-ma*—into extinction.

The Mruk-ma are an aggressive, sea-faring species, while the Sheft-ma are city-builders who make their home in "The Coastlands," along the marshy seashores and river valleys of Mertis' lone continent. For the vulnerable Sheft-ma, the strategic key to their self-defense is a deteriorating system of fortifications built in the coastal wetlands surrounding their cities. But these wetlands are mysteriously disappearing at an alarming rate, and the threat of invasion by Mruk-ma fleets is growing.

A decisive change comes when the survey ship of an advanced alien race crash-lands in the oceans of Mertis. Arriving in escape pods from their doomed spaceship, the strangers, called *Cilati*, are scattered around the planet. Now hopelessly stranded on Mertis, some of the alien crew manages to make their way to The Coastlands, where they are warmly welcomed by the Sheft-ma. The Cilati survey team brings with them precious scientific knowledge, technology, and methods that could dramatically shift the balance of power in the conflict between the two rival species. The survival of the Sheft-ma will depend on whether they can effectively utilize the science and tools of the Cilati to rebuild their crumbling forts and defend their disappearing coastlines.

The Celiats are a highly advanced race of space-faring explorers. Extremely long-lived, they traverse the galaxy in pursuit of knowledge about other planets and other life forms. Celiat ships have visited countless worlds, quietly observing the species that inhabit them. Generally, they never interfere in the cultures they study, and they seldom even make their presence known.

However, it quickly becomes apparent that the Mruk-ma have adopted a radically new strategy in their struggle with the Sheft-ma: ecological warfare. By attacking the delicate environment on which their peaceful rivals depend, the Mruk-ma hope to wreck the Sheft-ma civilization and eliminate their species.

The future of their civilization now depends on whether the Sheft-ma will be able to master the mysterious science of their alien allies, the Cilati. It is only amidst desperate circumstances like these that heroes emerge…….Heroes who know that understanding the world around them is the first step in controlling it.…Heroes who recognize that well-armed fleets and fortresses alone will not be enough.…Heroes who foresee that the secrets of science will be the key to Conquest of the Coastlands.

Quest Learning Goals

In order to test the analogical encoding concept, we have designed a quest which engages the player in guided scientific inquiry. The player learns that Sheftma fishermen are reporting drastically smaller fish catches in recent months. Additionally, the player learns that a "monster" has been sighted by some fishermen, causing some to believe the two events are related. The player character is asked to research the problem.

This quest provides an opportunity for the learner to explore an ecosystem that has been disturbed by an invasive species. Through the investigation, the learner will discover that an invasive species (i.e. the monster sighted by fishermen) is indirectly affecting the fish populations. In this scenario, the undisturbed food web consists of the following: the fish consumes a shrimp-like creature and the shrimp-like creature consumes zooplankton.

Many fishermen believe that the monster is eating the fish. But in actuality, the monster is an herbivore that consumes seaweed used by the shrimp-like creature for laying its eggs. It is the destruction of the shrimp-like creature's nursery that is resulting in a decline of shrimp, the sole food source for the fish.

The player does not work alone on this problem, but is mentored by two non-player characters: a Cilati and a learned Sheftma elder. The Cilati provides support and guidance to the player in conducting the research. The quest has the following learning goals:

- *Scientific Inquiry:* With guidance, learners are able to articulate the question or problem at hand, design an investigation, gather data, draw conclusions, and communicate the results and research process (National Science Content Standard A).

- *Ecosystems and Populations (National Science Content Standard C)*
  Enduring Understandings
  o A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.
  o The equilibrium of an ecosystem may change.
  o The number of organisms an ecosystem can support depends on the resources available and abiotic factors.

- o Identify the impact of an organism on an ecosystem
- o Identify food webs
- o Observe and describe how organisms including producers, consumers, and decomposers live together in an environment and use existing resources
- o Classify living things by common characteristics

Through interactions with the Cilati mentor, the player character is guided through defining the research question (i.e. Why are the fish catches smaller than usual?) and conducting initial data collection on fish catches. During this process the player learns of "monster" sightings in the same region. The player eventually visits the fishing area to collect data. During this site visit, the player makes a sighting of the "monster" that was reported earlier.

After the player character has seen the beast and a certain amount of time has elapsed, the Cilati mentor will contact the player character describing that he has located a few relevant cases from another planet they studied that might be useful in solving this problem. Recall that the Cilati have traveled the galaxy in pursuit of knowledge about other planets and other life forms. The player's *Library Tool* (i.e. analogical encoding tool) automatically opens to display two relevant cases. The Cilati assigns the player the task of reading and comparing the two cases.

<div align="center">Design of the Cases and the Analogical Encoding Tool</div>

The cases presented by the analogical encoding tool are real Earth cases where an ecosystem has been disturbed by an invasive species. The underlying principle that we wish the player to draw out is that an invasive species can disrupt the balance of an ecosystem. The change in the ecosystem caused by the invasive species may impact a native species of interest directly or indirectly. Consider the two following cases:

> *Case 1: Introducing New Species Disrupts the Food Web*
> Written by Sizon Matwr
> Cilate Stardate 11.43.15
> Observation of Earth date February 15, 1989
>
> In the earth year, 1965, homosapiens on the North American continent in the state of Montana, introduced the opossum shrimp as a food source for salmon. The shrimp had been identified as a food sources for salmon, but researchers did not realize that the invasive shrimp ate the cladoceran and copepod that supported young salmon. Within a short period of time, the shrimp reduced the food population for the young salmon which in turn impacted the number of adult salmon and salmon predators such as Bald Eagles and Grizzly Bears. Through this experience, homosapiens learned that introducing a species can disrupt the entire food web and lead to a larger problem than they originally faced.
>
> *Case 2: Nutria*
> The nutria, scientific name *Myocastor coypus* of the Animal kingdom, Phylum Chordata, and Class Mammalia is found in fresh and salt water ponds and swamps. It is a large semi-aquatic rodent that is native to South America. They were introduced into the state of Louisiana in North America in 1930 and farmed for their fur. Some nutria escaped and established breeding populations in areas ranging from Texas to Virginia. Many native birds, crustacean, and fish species lay their eggs in the wetlands. Nutria are herbivores and devour native wetland vegetation. The nutria's disruption of the wetlands directly affects the life cycle of many wetland organisms.
>
> As nutria destroy the native aquatic vegetation, they remove plants and their roots which hold the soil in place. The turbidity of the water increases because the soil is washed away in the tidal flow and rain. Increased turbidity raises the temperature of the water and decreases the amount of dissolved oxygen.

Disturbing the balance of the native plants provides an advantage for non-native plant species to become established.

Native animals and fish that are dependent on the foliage, nectar, pollen, and roots of native plants are impacted.

Attempts to control the nutria include hunting for fur and food. Successful wetland restoration projects include fencing areas to exclude nutria.

Based on the approach used in the research on analogical encoding, our tool displays the two cases side-by-side. Additionally, the tool displays a grid with the key aspects of *case 1* entered into the grid. The player is then asked to fill in the aspects of *case 2* that are similar and then write a conclusion or summary statement.

Case 1 (Provided)	Case 2 (Completed by the Player)
Reduction in the amount of Salmon	Reduction in amount of Red Snapper
opossum shrimp	Nutria
Carnivore – eats native cladoceran and copepod	Herbivore – eats native plants
	Removes and disrupts areas where fish and shrimp lay eggs and young live the first part of their lives
Removes food required by young salmon	Reduces fish and shrimp populations
Fewer cladoceran and copepod so Salmon population is reduced	Fewer shrimp for Red Snapper so their number is reduced
Conclusion: Disruption of the habitat required for development of organisms in a food web impacts the rest of the web	

The tool, once fully implemented in the virtual learning environment, will enable the player to drag and drop key phrases from *case 2* into the grid. This will enable us to provide more accurate feedback to the player.

Future Research and Development

During Spring 2007, we will conduct a pilot research study to explore the impact of the analogical encoding tool on student learning. We will compare experimental (access to the analogical encoding tool) and control conditions (do not have access to the analogical encoding tool). It is our expectation that once the tool is refined we will expand its application so that the tool shows relevant cases for numerous contexts in the game. Additionally, we are interested in exploring different types of support that can be provided in the tool. For example, we may examine various strategies such as asking students to describe similarities and differences, providing questions that scaffold comparison of the cases, and providing intensive analogy training (Kurtz, Miao, and Gentner, 2001).

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Transformative Learning Experiences: How Do We Get Students Deeply Engaged for Lasting Change?

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In today's world of generic instructional methods and standards, we have observed a need for deeper kinds of learning engagement – the kind that leaves a lasting impression on the learner and has a demonstrable impact on practices. In this paper we offer our initial model for achieving transformative learning through deep engagement. The model draws on theories of cognition, aesthetics, and ritual and symbolic support for identity change.

For the past two years our research lab has explored ways to broaden the theoretical foundations of instructional design (ID), particularly to strengthen the relevance of ID thinking to problems encountered in practice. Our recent work has explored how practicing instructional designers follow aesthetic concepts in designing learning experiences (Parrish, 2005, Parrish, 2006) and how ID practices fit within larger organizational values of respecting diverse learners and encouraging inclusive practices (Wilson, 2005a, Wilson, 2005b).

One problem we have observed is the proliferation of generic, highly-templated learning resources. As traditional training materials are converted to e-learning in particular, high volumes of content are produced but often at a sacrifice to quality (Merrill & Wilson, 2007). In higher education and K12 environments, curriculum is referenced to standards, but learning activities often do not push beyond a superficial level. In these technically correct but shallow learning environments, learners will express a need for deeper kinds of engagement – the kind that leaves a lasting impression and has a demonstrable impact on their practices. In this paper we offer an initial analysis for understanding these concerns, and point the way for continued inquiry along these lines.

Transformative Learning – What is it and Why Should We Care?

Instruction comes in different forms – tutorials, simulations, courses, workshops. Some instruction is designed to be short, simple, and directly tied to performing a required work task; other times instruction may be quite removed from the immediate context of a practical task. One important kind of instruction is the kind that leaves a deep and lasting impression on the learner. Instruction can transform the learner in different ways, e.g., how the learner sees herself – as a professional, a learner, or problem solver of some kind. Or how the learner sees the subject matter, perhaps leading to an entirely new way of seeing problems and situations. Typically this happens in larger units of instruction, e.g., full program curriculum, semester-length courses, or week-long workshops. Striking impressions can be made in shorter forms, but would be less expected for narrow, more technical kinds of training.

The term *transformative learning* is used by Mezirow and associates (e.g., Mezirow, 1991; also Cranston & King, 2003; Dirkx, 2000) as an approach to adult education that emphasizes its emancipatory potential and enhances awareness of social responsibility. Our use of the term is somewhat different. In contrast to more routine kinds of learning outcomes, transformative learning would seem to involve the following indicators:

- *Significant growth in the learner's identity as a competent problem solver or practitioner.* The learner becomes a constructive participant as opposed to a consumer or recipient of content.
- *Significant restructuring of learners' schemas about the subject matter.* The learner develops a new stance toward the subject matter.
- *Positive shift in interest, commitment, values, or attitudes toward the subject matter.* The learner develops new intentions or plans for action based on their new understanding (Hidi & Renninger, 2006).
- *Strong feelings toward an instructor or learning peers, who may serve as guides, models, mentors, or inspiration in the learning process.* The learner develops new, reciprocally rewarding relationships with teachers/leaders, learners, or a community of practice.

In other words, transformative learning is understood in terms of its cognitive, attitudinal, identity-forming, or motivational impacts, as reported by learners themselves. While all learning may be seen to transform the learner in some way, our use of the term denotes a deeper or more impacting kind of change as suggested by the indicators above. While all learning has some value, we would argue that transformative learning plays a unique role in

shaping learners' identity and aspirations, which in turn lead to commitments and action plans. In other words, transformative learning experiences can be pivotal or defining moments in learners' lives.

Transformative Learning Experience

We think of *transformative learning experience* as the learner's construction of learning events that were particularly meaningful and transforming in their lives. A transformative learning experience (TLE) is defined as having the following qualities:

- *Lasting impression*. The learner holds in memory details about the learning experience
- *Part of the person's self-narrative*. The learner references the learning experience within a narrative about themselves or their relation to a subject matter of importance to them.
- *Behavioral impact*. The learner can point to specific changes in their lives as a result of the learning experience.

These qualities all point to the constructed nature of the experience. This is consistent with the notion of *experience* in general. Experience, we believe, is best seen from the learner's point of view. Table 1 relates experience to instructional strategies and learning activities, two other constructs used to explain learning within the ID literature.

Table 1.
Four ways to thinking about activities that lead to learning.

Way of Thinking About Activity	Description	Intentional Perspective
Learning experience	The learning activity and its significance as perceived by the learner, containing - Narrative – what happened when - Lesson or outcome – The point, outcome, or lesson learned from of the narrative	Learner (Designers or teachers may also think of designing an experience)
Learning activity	Description of activities that students engage in for learning	Teacher or learner
Enacted instructional strategy	The adaptations and improvisations needed to make the strategy work in real time	Teacher
Planned instructional strategy	A specific type of learning activity from an instructional theory or curriculum guide	Teacher or curriculum designer

We categories above are not organized into a hierarchy, that is, learner experience is not intended to be privileged above strategies or activities. Indeed, learning activities can arguably be most closed connected causally to learning outcomes (Ryder, 2006). Strategies are helpful when understanding teacher or designer intentions; activities have the clearest link to learning; experiences, we believe, are valuable in what they tell us about learner perceptions and schemas, and the lessons they take away from instruction.

Consistent with this constructed view of learner experience, we can see immediately that individual learners contribute substantially to the process. It's not so much about what is "done" to the learner as how the learner participates in the experience. Teachers and designers can talk about crafting or designing the learner experience, but the level of control over that learner experience is quite indirect and mediated by several factors not under teacher control. With respect to transformative learning, some learners may be ready for deeper change while others are not. Some may attach to an instructor as a role model or inspiration, while others don't. So part of the discussion needs to examine the relationship between learner and instructor, or between learner and content – not just the features of instruction alone.

The construct of transformative learning experience is very close to Gordon Rowland's notion of *powerful learning experience*, defined as "an experience that stands out in memory because of its high quality, impact on one's thoughts and actions over time, and transfer to a wide variety of contexts and circumstances (Rowland, Lederhouse, & Saterfield, 2004; see also Rowland & DiVasto, 2001; Rowland, Hetherington, & Raasch, 2002).

Encountering Rowland's work late in the conceptual development of the construct, we will attempt to better integrate Rowland's work with our own in a future paper.

To summarize, we see transformative learning experience or TLE in these terms:

- It is related to strategies or methods of instruction, but is not determined by those methods.
- It has to do with instructor and peer relationships, but is not determined by those relationships.
- It may be a targeted learning goal of instruction, but cannot be imposed on all learners, no matter how rich the instruction. Learner readiness comes into play.
- It leads to cognitive growth, but also attitudinal, identity, and action/agency change.
- It is fundamentally determined by learner perceptions.
- It may be re-evaluated or appreciated differently over time. That is, a transformative learning experience may not immediately be apprehended, but over time come to be seen as transformative. Thus a transformative learning experience becomes part of a person's self-narrative, which may change over time.

To help learners achieve deeper transformations, great care must be taken to carefully shape and craft the learning encounter – the materials, the sequencing, the interactions, the symbols, the content. This stance toward ID practice stands in contrast to strategy-centric beliefs – relying on the choice of the right instructional strategy to make the learning difference. In the best conditions, designers take the time to craft and hone the environment and resources to achieved desired ends – in this case, deeper engagement with a hope of learner transformation. In the discussion below we present three layers or lenses for viewing instruction – cognitive, aesthetic, and mythic perspectives. We argue that to achieve deeper levels of learner engagement and transformative change, designers should attend to all three layers of design as they visit and re-visit their learning resources, always with an aim to heighten the learning experience.

Cognitive Perspective – TLE as Effective Learning Program

Most practicing designers trained in current graduate programs approach designs from a constructivist or pragmatic theoretical stance. Our first, "native" approach is to ask, how can I design a learning activity that addresses the required standards and objectives, but gives learners a chance to actively make things and construct meaning? A good constructivist approach to instruction would be:

- Complex, problem-based
- Authentic, realistic
- Scaffolded, guided
- Active, participatory
- Reflective, intentional

We do not elaborate on this cognitive level of analysis because it currently predominates ID thinking, both in literature and in practice (cf. Duffy & Jonassen, 1992; Dunlap & Grabinger, 1996). A variety of instructional strategies are consistent with current cognitive learning theory, including problem-based, project-based, and guided-inquiry learning.

Cognitive load theory represents another approach to cognitive learning theory (Kirschner, Sweller, & Clark, 2006; Mayer, 2004; Paas, Renkl, & Sweller, 2003; Van Merriënboer, Kirschner, & Kester, 2003). We see cognitive load considerations more specifically addressing the ongoing thinking and processing while students are engaged in learning activities – a micro level of analysis. Thus once a constructivist activity has been developed, designers should examine the information-processing requirements of the lessons – in particular the completeness and availability of information for task completion. This micro-level analysis focuses on moment-to-moment cognition and complements the more holistic search for a constructivist activity that would drive the module or unit. Materials can then be fine-tuned to respect cognitive load constraints and provide adequate guidance and direction to students within the overall constructivist environment.

Constructivist learning activities and cognitive load analyses – these are just two methods for informing instructional designs from a cognitive perspective. The cognitive layer of design should be open to all the thinking currently in place informed by cognitive psychology. Indeed each layer of design – cognitive, aesthetic, and mythic – has a unique contribution in the overall effort. The main value of the cognitive perspective lies in its integration into present practices, making it a natural starting point for most of us, and in its close connection to psychology and learning research, which is steadily advancing understanding of cognition and learning. We would point out, however, that current cognitive models are better at *representing* a problem space than at pinpointing *where problem solutions come from* (Schön, 1990). Once a solution possibility comes to mind, known testing mechanisms can kick

in – designers can rationally evaluate the design space and determine an appropriate strategy. Where those creative solutions come from is less well understood. Because transformative learning experiences require unusually creative designs, we are well advised to rely less on narrow cognitive formulations of the design space. Aesthetic and mythic perspectives on the learner experience, both of which stretch designers toward more creative thinking, are presented below.

Aesthetic Perspective – TLE as Intensive Encounter

This perspective asks designers to think of instruction as an aesthetic encounter – much like watching a movie or listening to a symphony. Countering tendencies toward exceptionality among romantic and rationalistic thinkers, Dewey (1934) articulated a pragmatic view of aesthetics that brought it into people's everyday life, as intensified immediate experience (see also Berleant, 1991). A number of aesthetic motifs come into play when we examine the kind of intensive instruction that would lead to transformative learning experience:

- *Narrative or storytelling*. Some of the most powerful works of art depend on narrative as a central organizing device. Similarly instruction can be thought of as a story where the learner, instructor, and classmates become participants or actors.
- *Dramatic tension*. Stories depend on people's schemas and expectations. Moreover they build levels of dramatic tension by unfolding events that disrupt a harmony or peaceful situation. Stories both depend on and diverge from established expectations, leading to a sense of anticipation and desired fulfillment. Instructional disruptions – in the form of novel events, complex problems, and challenges – can be useful to learning if they are carefully managed and the learner is brought through the disruption in a positive way. Conflict and resolution are core narrative devices that also play a role in powerful learning experiences. Managing the dramatic tension requires careful attention to the pacing and rhythm of unfolding events and challenges – too much novelty can alienate the participant, too little change can lead to boredom and inattention. Careful and effective pacing not only helps with arousal levels, but buy-in and commitment as well.
- *Resolution and closure*. All narrative forms of art include some kind of resolution of tension that leads to a satisfying closure at the end of the experience. While not always a "happy ending," closure brings things together in a way that we can see how the story elements fit together into a meaningful whole. The more control the author/artist has over the elements of the narrative, the stronger the satisfaction and appreciation at point of closure. Instructional programs also need clear forms of closure, signaling to learners a variety of things – end of program, consolidation of understanding, time for reflection and apprehension of meaning from the experience, preparation for next steps such as taking the next course or entry into the world as a newly skilled person. More attention to the closure experience can help learners draw more meaning from the instruction, which would in turn make them more likely to use their new knowledge more appropriately when it's needed.
- *Empathy, role identification, and perspective taking*. Learners build relationships with other course participants, including the instructor. They must come to see problems through the eyes of others. They sometimes take on new roles and identities, sometimes temporary but sometimes required by the subject matter. At times learners are called to engage in a suspension of disbelief, or participate *as if* certain conditions were true. All of these projective elements are similar to how people respond to works of art. They help learners participants are complete, whole-person levels that include emotions and self-constructions. For transformative learning to occur, this kind of engagement seems critical.
- *Production details*. Designers usually think of aesthetics in terms of production values, attractiveness, and aesthetic appeal. Typography, color, media design and images – these also contribute to a learner's apprehension of the immediate stimulus or activity and can help it rise to a more intense level of experience. We may also include here some of the attention-grabbing design ideas of Kathy Sierra (2006), which includes visual design but also involves style and content elements designed to engage and interest the learner.

An aesthetic perspective on instruction could become a primary basis for organizing a course or curriculum. More commonly, though, designers will take existing or planned learning activities, and re-examine them through an aesthetic lens as a means to craft the activities into a more elegant and satisfying learning experience. When deciding on the pacing for a course, for example, a designer may carefully sequence activities and assignments in a way that creates cycles of tension and resolution – with students carefully led through challenges and peaks of

engagement, followed by consolidation and recouping energy reserves, culminating in a final challenge and resolution at the end.

Parrish (in press) has developed a method for plotting learner engagement in a course, based on existing methods for depicting dramatic tension in novels and stories. Figure 1 shows the projected pacing and flow of a typical course.
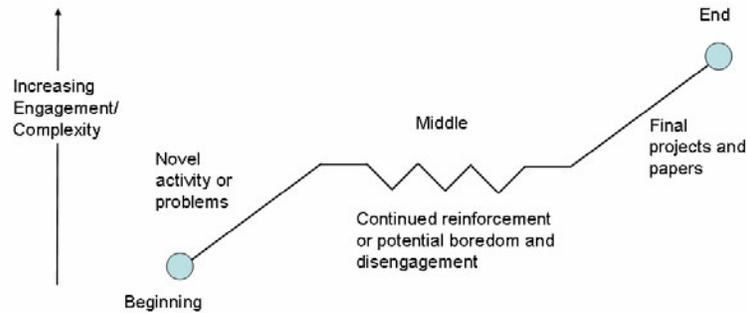

Figure 1: Engagement curve of a typical course (from Parrish, in press).

The vertical axis is a combination of learner engagement and overall complexity, thus accounting for the overall upward slope of the line. Learners become engaged in response to the central challenges of the course. They maintain, with some ups and downs, a level of engagement as they persevere through the middle sections, which have the potential to lose engagement if not well designed. Engagement typically peaks toward the course's conclusion, with a resolution of some kind achieved at the end.

The plot below (Figure 2) projects engagement and complexity for an instructional-design course that compares two instructional models and has students develop and critique each other's design projects. Following this plotting, a level of tension is introduced as learners confront differences in two instructional models, leading to reflection and growth about the process in general.
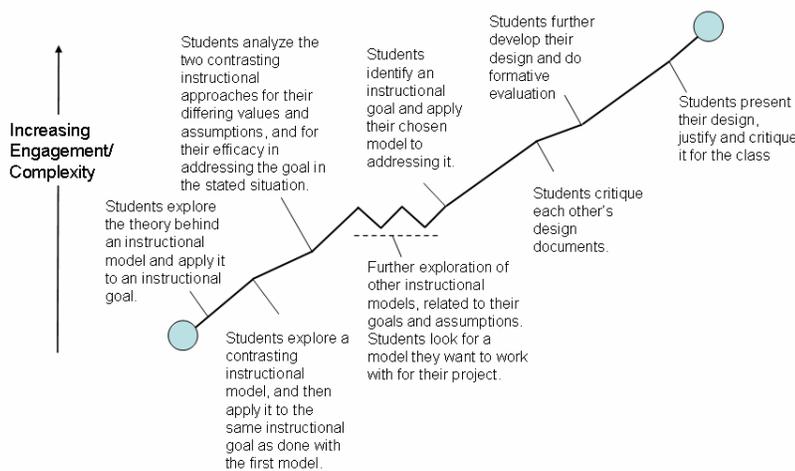

Figure 2: An engagement curve used for planning a course in instructional models for instructional designers (from Parrish, in press).

Parrish (2006) includes other methods of diagramming the learning experience. While these tools will likely be useful in some situations, the figures above are intended to illustrate ways to interpret instruction from an aesthetic perspective, which could lead to added insights about the learner's incoming experience.

Mythic Perspective – TLE as a Hero's Journey

The mythic perspective is similar to the aesthetic in its reliance on narrative as a central organizing device. Instruction becomes mythic when the learner identifies as a participant engaged in a life-relevant journey or path that will lead to conquered challenges and new identity. Insights into mythic processes are drawn from anthropology and comparative religion (e.g., Bateson, 1975; Campbell, 1968; Ileade, 1954; Jung, 1968; Trice & Beyer, 1984; Tripp, 1994; see also Groen & Jacob, 2006).

- *Immersive journey*. Joseph Campbell's (1968) synthesizing work on archetypal figures in world religions increased awareness of the hero's journey. The hero must leave home and go out into the world to find his fortune, overcoming challenges and returning home with gifts. In the course of doing so the hero undergoes deep and transformative change, including often a new name. Parts of the journey may involve immersion, flow, or intoxication, as well as more rational/intentions forms of participation.
- *Rituals and symbols*. Life events of community members are endowed with meaning through various rites, symbols, and language forms. These symbols serve to convey continuity and order as people progress through various changes and transformations in their lives (e.g., new names, investitures, personas; rites of passage, inclusion, and achievement). In some induction programs such as the military or teacher training, we see signs of attention to these mythical aspects of the change process. Certainly these symbols are evident more broadly in society at large, in both indigenous and Western cultures (Reagan, 2000, pp. 25-55); Trice & Beyer, 1984). Instructional programs aspiring to transform learner identities should look for symbols and language that could signify major life changes, giving participants a sense of meaningfulness and belonging.
- *Teacher as master guide*. Joseph Campbell (1968) speaks of an archetypal guide that is "protective and dangerous, motherly and fatherly at the same time" (p. 73). Mentors or masters can be tremendously important not just to learning but to personal growth and maturation. In Western history, the role of master teacher has been appreciated since the days of Socrates, and has even involved a sexual element (Steiner, 2003). India has the tradition of gurus as guides. Over time and through occasional twists or ritual processes, learners and apprentices take on the identity and qualities of the master and establish themselves as masters in their own right. Transformative instruction will rely on a skilled master teacher—not just a conveyer of content but a "protective and dangerous" guide—and may sometimes provide a mechanism to challenge and supplant the master (Herman & Mitchell, 2004).
- *Trust, risk, and transgression*. Hero journeys required an element of life-risk as the protagonists leaves the comfort of the known and enters more threatening, unstable worlds. There is sometimes an element of transgression, where breaking established norms and rules is required to obtain hidden knowledge. Likewise instructional programs should send learners permission to transgress and go beyond what they were taught, in order to advance knowledge and engage in life-long learning.
- *Reconciliation and rapprochement*. Often in the process of pursuing knowledge, relationships are threatened and challenged, forcing re-definition or re-negotiation between people. This impact on relationships is illustrated in films such as *Pygmalion* or *Educating Rita*. Just as transgression and re-invention may be needed processes, so are processes of renewal and reconciliation. Within instruction this may extend to teacher-student relations, or to relationships in the world. Students need ways to maintain and continue levels of trust and buy-in, even when things go wrong or need repair.

Mythic considerations, like aesthetic ones, would often involve a secondary review. The designer may take a planned activity or set of activities, and then look for ways to deepen the experience through rites, symbols, and special language – all with the intention to increasing the depth of engagement, buy-in, and role identification by the learner.

A Walk-Through of the Three Layers

We present below an illustrative walk-through of how these ideas could be used to design and deliver a graduate course in managing instructional projects. The details of the course are factual, since it was taught successfully by

Scott Switzer last year. We use the course as illustration because, on reflection, it embodies many of the aesthetic and mythic qualities we are looking for – even though Scott was only partly aware of these issues at the time.

Walk-Through - Cognitive Layer

Along with the final portfolio, the management course is intended as a capstone event for the master's program in instructional technology. In past offerings of the course, learners have focused on learning the fundamentals of project management, often through an applied project of some kind. Program leaders saw a problem trying to complete a real-life project the final semester, but were reluctant to give up the authentic experience. They asked Scott to conceive of a way to give learners an authentic management experience while bounded within the constraints of their final semester in the program.

Scott approached the course using four key principles culled directly from constructivist learning theory (Switzer, 2006):

- The use of an ill-structured problem or challenge
- Embedding this problem in an authentic context (to the extent possible given the parameters of an academic semester)
- The use of focused reflective activities in the learning context
- The establishment of a mentoring relationship between the course facilitator and the learners

Following these principles, a central metaphor for the course was devised – having students respond in teams to a fictitious RFP for instructional-design services. We present below Scott's design for the course, which were based primarily on cognitive instructional strategies.

From the first day, learners were presented with the challenge of responding to a realistic RFP, one that a learner described as "characteristically vague" and typical of her professional experience as a practicing instructional designer. The entire course was set up as a competition where the learners, working in teams, would respond to this RFP for a fictitious client. At the initial meeting, learners were told that they would be working for a client and that indeed, a winning bid would be selected at the end of the course. Learners were also informed that they would be responsible for driving the course schedule, arranging meetings with clients to ask clarifying questions, scheduling interim milestones to secure approval on their plan prior to moving to the next stage of the design, and arranging for their own support for preparing for these meetings. Class meetings were presented as an option for three different events:

- Formal client meetings where questions would be clarified, plans would be presented and feedback received
- Class sessions to cover a variety of content that learners would need to succeed (project management skills, budgeting, staffing, program evaluation, and return on investment issues)
- Class sessions that provided an opportunity for thinking and reflecting about other issues that were less skill-based (client management issues, being resourceful, managing internal team concerns, etc.) but no less important to the success of the program

The intent of these sessions was to get learners engaged in a realistic process for managing their own work. Learners were aware that the winning bid would be rewarded on a certain date, but in their teams, they were required to manage their own work to be able to present their final work to the client by the required date.

To ensure that learners did not get bogged down with prerequisite or peripheral knowledge, critical content was provided in a way that supported the learning objectives. Conducting a cognitive load analysis demonstrates a respect for the cognitive complexities of a learning experience of this nature and yielded some valuable insight on how to manage those complexities. An example was providing content resources for learning Microsoft Project. One of the identified hard skills to be learned was to develop a comprehensive project management plan to present to clients. It was not assumed that learners had previous experience with a project management tool such as Project, but it was also clear that there was not considerable time in our scheduled sessions for in-depth lessons on the tool. As a result, Adobe Captivate was used to create Flash-based mini-lessons that covered Project essentials. Learners could then access the lessons as needed outside of class.

Another response to cognitive load was to place corporate documents from the fictitious company in a common place for learners or teams to explore as they saw fit. Each document provided to the portal had some valuable information that was important to understanding the ultimate client solution, but it was not considered required reading. Adding to the authenticity of the situation, learners were made aware that additional information was available to them, but they were ultimately given the responsibility to determine whether or not it was a good use of their time. Some of the teams consumed all of the information they possibly could, and in most cases, there

was an increased level of insight to their response to the client training problem. Teams that initially did not bother to read all of the documentation were compelled to re-think their decisions when some of this information emerged as part of the client meeting sessions. For at least one team, there was an important lesson learned about *not doing your homework* prior to meeting with the client for the first time. And while this was an *unintended outcome* of the process, it was clear that the experience was taken to heart: for the remainder of the course, the team never failed to be prepared for meetings.

Walk-Through - Aesthetic Layer

An aesthetic perspective requires careful attention to all the design elements and their configuration to achieve an intense, memorable experience. For this review we use a framework established by Parrish (2006), containing the following four elements:
- Engagement
- Anticipation
- Pacing
- Resolution or Closure

Parrish (2006) defines *engagement* as "a relationship to groups or events in which one willingly makes a contribution that is active and constitutive. Engagement involves an investment of effort and emotion, willingness to risk, and concern about outcomes" (p. 1).   In Scott's management course, learners were asked to participate in ways that are uncommon in traditional classroom learning experience. By setting up the environment as a team competition, learners had a much greater stake in the outcome – early on, one of the participants wondered aloud that if there were four teams in the experience, the winning team would be awarded an A grade, the runner-up a B, and so on. While Scott purposefully never gave credence to that assumption, the resulting level of intensity was uncommon, as evidenced by the considerable investment of time and emotion for many groups. By the end of the second week, the facilitator could sense an increased sense of urgency on the part of most teams, along with an increased level of encouragement of teammates who felt lost or overwhelmed by the challenge they faced. At the end of the course, with one notable exception, all of the learners were actively engaged in the course, providing regular feedback in front of the entire class along the lines of "I've never worked this hard on any course!"

Anticipation "involves a concern for reaching a conclusion or resolving a question, issue, or mystery. Anticipation involves a look ahead with interest in outcomes" (Parrish, 2006, p. 1). Initially, the intent was to provide learners with a suitably vague RFP, allow them to engage in the process of deconstructing the document, and to support them to consider all of the possibilities as they went about the business to crafting an appropriate response to the stated training problem. The competitive bid response to the RFP created a fairly strong sense of anticipation and important consequence.

The *pacing* of the course is described as "our perception of time and the rate in which events take place in time as related to our level of comfort and ability to grasp their implications to a degree appropriate to our level of interest" (Parrish, 2006, p. 1). As previously stated, the course was initially framed as loosely as possible, placing the onus of scheduling and preparation for the task at hand directly in the hands of the learners. While it took a while for this to *sink in* for most learners, after the third week of the course, they had taken full responsibility for those actions. As expected, each of the four teams brought differing levels of expertise to the situation, and as a result, each team was in a different state of readiness as the course moved along.

Scott anticipated and observed a familiar pattern to constructivist educators of initial resistance, eventual buy-in, and intensive work culminating in a publicly shared report. A pivotal point came around the third week of term, after learners saw the scope and complexity of the work they were called to do, and had to decide to either buy in or drop out. Some teams directly confronted Scott about the challenge. With assurances of support from Scott, these teams resolved to continue, after which they cumulatively built a level of intensity in preparation for the final presentation.

Resolution is described by Parrish (2006) as "a feeling of unity or closure achieved when we perceive that events have reached resolution or an appropriate conclusion" (p. 1). From the outset, learners knew that they would be working in teams to try to produce a winning bid for the RFP. As events unfolded, learners were informed that the client would host an award banquet at the end of the proposal period to award one team with the winning bid. At some point in the process, the teams began discussing and looking forward to this event, making it the eventual focal point in the process. Each team presented a final solution to the client one week prior to the banquet, but most of the learners considered the final banquet as the culminating event, considering the feedback from the "client" and the

facilitator as closure to the process. As one learner described it, "I don't think I have ever been so concerned with a project after it's actually been submitted."

Walk-Through - Mythic Layer

Framing the management course as an experiential, immersive journey built around a competitive environment has a clear connection to Campbell's (1968) notion of a *hero's journey*. By learners seeing themselves as protagonists engaged in a personal quest to emerge victorious over other participants, learners were directly involved in a process of defining their journey and engaging in an adventure that included negotiation and reconciliation.

The RFP approach to the course put the students in peril – and that level of risk and challenge is what most clearly sets it off as a hero's journey. Many courses are specifically designed to minimize peril – to make learners feel completely safe, with incremental bites of content leading gently upward toward a satisfying attainment at the end. Not so this course – its philosophy was, "No guts, no glory!" In this case the learners rose to the challenge, and by doing so earned a reward commensurate with their efforts.

Scott's role in the course can be construed in terms of a master guide. At the beginning of the course, the facilitator clarified his role as wearing two hats – as a representative of the fictional client, and as a supporter of team processes. Learners were aware that the entire project was fictitious in nature, of course. At some point, they would need to suspend disbelief about Scott and come to see him realistically as a client rep. To get information about client intentions, learners had to direct all questions and concerns to Scott, serving as client rep. However, in an effort to personally support each team, Scott also presented himself as an additional team member in each group. While the team could not count on him to produce products for the RFP, Scott made himself available, both inside and outside of class, to address issues, provide support, and act as mentor whenever the teams asked for that support. While initially, some teams sought to use Scott in the hope of getting *inside information* that would give them an advantage in winning the bid, by the end of the third week, each team was respectful of Scott's dual-hat and asked for an appropriate level of support. Typically Scott acted as provocateur by presenting lines of inquiry that encouraged learners to think through their concerns rather than provide easy answers to the questions.

In spite of a fairly low-key approach to mythic design (because Scott was not tuned into this concept at the time), learners picked up on some themes themselves. While not required as part of the course syllabus or even suggested in initial discussions, once learners were assembled in teams, members created their own fictitious companies, complete with professional corporate identity packages with letterhead, logos, and organizational charts. A discernible process of transformation took place as participants transitioned from their identities as graduate students to specific defined roles within their own companies. These new identities were built largely on practical experience, both in and out of the Master's program, and allowed learners to exhibit their strengths as they engaged in the journey. One learner in particular had been compelled to take this particular course out of sequence and did not have the ID background of other participants in the class. However, in her professional life, she was a skilled health care professional and because the RFP was presented from a health care provider, found a place for contributions to the effort while learning about managing instructional products. This further illustrates the need for adaptations and improvisational response, even with carefully designed programs.

Eventually an actual third-party "client" was introduced to the teams to add to the authenticity of the experience. The client was a highly experienced instructional designer with over 20 years of experience in roles on both sides of this situation – as a client reviewing and accepting proposals for complex training projects, and as a vendor preparing design plans to respond to a number of RFPs. Through his review, feedback, and focused questioning of the teams' design decisions, the designer playing the role of the client established a considerable level of credibility among the teams, also acting as a mentor when the situation surfaced. The client was present at the final banquet and actually did award the bid – but took the strengths of each proposal to propose that each team be awarded some *section* of the contract in an unprecedented event for this fictitious company. Each team was acknowledged in public for a particular unique strength and insight that they brought to the solution. The decision to award a portion of the bid to each of the teams was based on the quality of the thinking and the quality of product that each team produced. It would have been difficult in any class circumstance to single one team out when all of the teams worked very hard to produce an exceptional product, but in this case, the client's background and expertise allowed him to respond with this solution in a way that maintained the credibility and integrity of the class experience. While a couple of learners joked about the nature of the *competition*, in the end, learners left the banquet discussing the level of closure that they had sought and a level of satisfaction with the experience they would indicate that they did not feel cheated by the final outcome.

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Concluding Thoughts

The walk-through of the management class is just one example of how the three-layer design for transformative learning might be implemented. Other approaches may be more technology infusing, such as the creation of aesthetically powerful, mythically deep learning environments that draw on game-design elements (Dickey, 2005, 2006; see also Davies, 2003). We see the work of Kathy Sierra (2006), intended to confront the learner more directly with an engaging and motivating learning experience, as largely consistent with the goal to transform learners at a deeper level.

The larger point of our inquiry rests on a theme touched on repeatedly - that instructional design has nearly reached a dead end in its pursuit of dramatic learning gains via instructional strategy as its primary mechanism. The next significant step in advancement, we believe, will be in closer attention to crafting high-quality environments and interactions that tap into the learner's need for immerse or engaging experience. Achieving really high-quality instruction a largely open, creative process that, like any other design task, draws on the creative and problem-solving resources available.

Seeing ID as a careful crafting and controlling of elements – this brings it into line with other designers of experience such as architects, human-interface designers, industrial designers, and game designers. Because this area has been neglected in our field, we don't know a lot about how to do that. That leaves some exciting areas for continuing inquiry, such as:

- How do designers combine considerations of the local problem space with their repertory of strategies and models?
- How would we recognize truly gifted design work? How we would characterize design expertise, particularly the kind that leads to transformative learning experience?
- What marks the truly gifted design professional from his/her peers? Are there any approaches, beliefs, or strategies that could be useful to other professionals?
- What kind of professional rewards, programs, or exchanges might serve the interests of truly outstanding design work? Beyond refereed journals, how could the design community identify and acknowledge outstanding and creative design work (see Rowe, Smith, & Boling, 2005)?
- How can we better understand the links between designer intentions, instructor intentions and activities, and learner intentions, activities, and constructions?

To fully explore these areas of inquiry, we should be able to largely continue using present methods of research and inquiry. Accepted methods of cognitive analysis will continue to be relevant, broadly conceived and creatively applied. Design research should come increasingly into play. Proof-of-concept work – various kinds of prototype designs or tool-development projects – should also be relevant. And similarly to architecture and industrial design, we need to begin seeing exemplary design work itself as a form of inquiry and scholarly accomplishment, complete with jury-review processes and acknowledgement of excellence.

The three-layer design approach asks designers to consider issues they may not have recognized in their previous work. While we acknowledge the divergent conceptual bases presented by the three layers, we feel their serious consideration is completely relevant to ID practice. Effective ID models and practices must draw on eclectic ideas and theories, and should reflect the whole person, not just a narrow construal of behavior or cognition (Wilson, 2005b; Merrill & Wilson, 2007).

Finally, we acknowledge again that transformative learning experiences cannot be targeted and induced as more common learning goals can be. Even when designing with all three layers in mind, a small number of students may have a transformative learning experience. Even so, we believe it very healthy and productive to build designs *as if* they will lead to transformative learning. Working toward that goal increases the likelihood that learners will indeed become more deeply engaged and experience transformative learning when they are ready for it. By raising the standard and challenging designers to create conditions for transformative learning, we can move from technically satisfactory instruction (cf. Sierra, 2006) to the kind of crafted learning encounter that leaves an impression and enters into people's stories about themselves and their stance toward the subject matter.

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Online Conferencing and Blogs: Which do I use for what and why?

David Winograd Ph.D.

Toward strengthening connections between theory and practice, this paper is concerned with asynchronous conferencing and weblogs or blogs. I will discuss the theoretical underpinnings of both mediums, the similarities between the two, how they are currently being used in schools, and offer suggestions for the implementation of each medium for specific outcomes and contexts as well as suggesting how both can be used in tandem, each for a specific purpose.

Computer-mediated communication has been defined as "communication between different parties separated in space and/or time, mediated by interconnected computers"(Romiszowski & Mason, 1996). The start of CMC (Computer Mediated Communication) happened in the late 1960's when scientists using the same mainframe computer found that they could leave messages for each other on that computer sharing ideas and information. This became the start of email (Sproull & Kiesler, 1991). Since its inception many modes of CMC have been developed ranging from synchronous chats and instant messaging to asynchronous weblogs, conferences and pod casts. This paper will discuss weblogs and computer conferencing.

Computer conferencing can be understood to support many-to-many communication by permitting groups to communicate at times convenient to the individual because of its inherent asynchronicity (Feenberg, 1986). (McIsaac & Gunawardena, 1996) explained a number of features of computer conferencing systems, "In these systems, messages are linked to form chains of communication, and these messages were stored on the host computer until an individual logs on to read and reply to the messages" (p. 417). (Eastmond, 1992) identified three components of effective computer conferencing in education: first, there is a match between or among the medium, teaching style, student characteristics, and course content; second was the overall course design; and third was the presence of a skilled moderator.

Weblog or blog is a term coined in 1999 (Catalano, 2005). The Wikipedia online reference defines a blog as a website in which journal entries are posted on a regular basis and displayed in reverse chronological order. The term blog is a shortened form of weblog or web log. Blogs are not a new medium, and should not be looked upon as a new mechanism as (Catalano, 2005) put it "Blogs are not the new papyrus" p.7.

There Are Many Similarities In The Structure Of Online Educational Conferencing And Blogs, Including:

* Asynchronicity
* Reflection
* Ease of set up: Setting up a conference today is most often a function of the Course Management Software that is used. There are many options for this, the largest being BlackBoard, which contains a threaded discussion space as one of its many features. Conferencing in BlackBoard is only one of the modules, while other software such as FirstClass, having a far better and more flexible conferencing structure than does BlackBoard, offers little else. With the proper software, computer conferencing is easy, but blogging can't be done within the Course Management Software. FirstClass provides only a subset of the BlackBoard feature set toward course management. It does however, as does Ichat for the Macintosh, allow you to drag and drop any attachments into the conference window and seamlessly transfer files.

A major reason that computer conferencing is used, is because the school has already bought the software and hired a server administrator to make sure things work. With the administrator doing the "heavy lifting", bringing teachers up to speed on existing conferencing software, it's time consuming but easy to set up a conference. The concept of Course Management Systems and dedicated administrators are not a part of the blogosphere.

Blog owners don't worry about such complexity or cost since blogspace is free or very cheap. If you download the software and follow the instructions, presto! You have a blog. Fill in the blanks and start blogging.
* Lack of the requirement of HTML skills: Although a rudimentary knowledge of HTML is quite useful in course problem solving, today it is far from required.
*Being easily publishable: One click publishing is standard for blogs. When conferencing (and not using other modules) posting to the conference also takes no more than one click.

*A high degree of maintenance: This is the reason that many blogs and large computer conferences fail. Years ago I ran the Macintosh Community Club Forum for CompuServe, an early online service. This was an online community of a few thousand people. Some days we would get as many as five hundred messages per day. I had to read them all and respond to many. As time went on it became bigger and wound up taking me three to five hours a day to go through everything. Most people just don't have time to run something that big. I gave it up when I started my doctorate since I didn't have the amount of free time I enjoyed earlier. A good blog is similar. It takes time to write everyday or most days, keep up with your links, and monitor the comments daily. It's more work than first expected and often gets old quickly after people find out what they are in for.

*A high degree of timeliness: This can be looked upon several ways. If a blog has anything to do with news or politics, it must be revised just about daily. The timeliness of a computer conference relates to how often it is being used. Usually discussing a topic requires a predetermined set of rules including: frequency of posting, grading issues, how long the asynchronous conference will last, when to take it down (Murphy *et al.*, 1996), and who will moderate the conference.

Aspects Attributable To Online Educational Conferences But Seldom To Blogs Include:

* Specific topic orientation**:** Instead of being interested in a larger subject, the conference is most often concerned with one topic.
* A closed ended structure: When a subject is finished, the conference closes down.
* Structural limitations to inclusion of multimedia: In most conferencing software, such as that found in BlackBoard, the only thing that can be input or uploaded is plain text or HTML.
* An egalitarian community of equals: Although there is a moderator in successful conferences, each participant is considered of equal value to the debate or conversation at hand.
* A trained moderator needed for success: A moderator is quite different from a blog owner. A moderator keeps things going while a blog owner provides the great majority of content.
* A degree of manipulation: This is not a bad thing. Often a moderator, or even a participant, plays 'devil's advocate' to keep the discussion flowing and thereby instilling some degree of manipulation.
* Often involved in problem solving: Since online discussions are closer to a debate than a journal, and feature equal participation, they are often used for brainstorming or problem solving.
* Structurally closed: For educationally oriented conferences, if you are not in the class, you are not in the conference.
* Private in nature: In most cases educational conferences are restricted to members of the class and require a password or other forms of authentication.

Aspects Attributable To Blogs But Seldom To Online Conferences Include:

* Individual ownership**:** A blog is owned and run by one individual.
* Easy integration of multimedia: Text is only one type of object that can be uploaded to a blog.
* Being individual based: A great deal of the success or failure of a blog depends on the general atmosphere, and personality of the blog. This, for good or ill, is dependent upon the skills of the author.
* Permanence: Conceivably, a blog can last forever while a computer conference is almost always closed down at the end of the semester or class.
* Good writing skills necessary for success: A blog is only as good as the quality of its owner/author.
* Theme but not topic based: Unlike a conference, which lives as long as the class, blogs are based around generally large themes of interest while a conference most often deal with specific topics within a theme. Different topics often spawn different conferences.
* Structurally open: You can add many more things to a blog than with a computer conference.
*Public in nature: A blog is open to the public while a conference is restricted to a particular group and often requires authentication to access.

Are Either Modalities Communities Of Practice?

The term: community of practice has been a buzzword since the early 1990s. The term, often shortened to CoP, is a process of social learning that occurs when people with like interests collaborate

over an extended period of time to share ideas and construct knowledge, when Lave and Wenger coined it in relation to situated learning. The concept of Communities of Practice were originally developed to describe face to face situations such as, in its initial research, recovering alcoholics in Alcoholic Anonymous, Meat Cutters and Army Quartermasters. It was soon found that CoPs could exist well online, which has encouraged a new strand of Computer Mediated Communication (CMC) research. According to (Wenger, n.d.) a CoP contains three key elements:

1. Domain of knowledge: creates common ground
2. Community: creates the social fabric of learning
3. Practice: a set of frameworks, ideas and tools that community members shared.

This would seem to suggest that both online conferences and blogs could easily be considered CoPs. However in 1998, Wenger extended the concept to include organizations and provided dimensions for differing types. In education, he proposed, there are three dimensions that need obtain to bring the experience of schooling to everyday life:

Internally: How to ground school learning experiences in practice through participation in communities around subject matters.

Externally: How to connect the experience of students to actual practice through peripheral forms of participation in broader communities beyond the walls of the school.

Over the lifetime of students: How to serve the lifelong learning needs of students by organizing communities of practice focused on topics of continuing interest to students beyond the schooling period (Wenger, 2001).

The third required dimension does not hold with educational computer conferences since when a class ends, so does the conference, which is typically kept on a University server and cleared to make room for next semester. A blog, however, does not always reside on a school server so it can go on as long as its creator would like it to survive. This is in tune with lifelong learning since the same blog can be used for many years of classes with each class enriching its information and utility. Therefore a computer conference cannot be a CoP while a blog can.

When To Use Computer Conferencing

Computer conferencing is an excellent way to discuss and debate specific issues, or themes. They are designed to allow members of the class to interact online in a moderator (often the teacher is the moderator) driven space. Unlike blogs, computer conferencing requires some form of Course Management Software, like BlackBoard, which is expensive but required to start a closed conference, while a blog can be run on software that is either extremely cheap or free. Although it is possible to run a computer conference without a Course Management System by finding a free system on the Internet, these are difficult to set up and look quite amateurish   Since having someone post something, someone else coming back later and responding to that message, is geared toward debate, online debates make for a great use of computer conferencing.

Computer conferencing is a good way to instill critical thinking into a curriculum. Often a classroom doesn't have time to spend on a macro view of a field of study. So for distance learning, classroom learning, and hybrid learning it's useful to have an online asynchronous discussion, based on information relevant to the class. It's also useful for the teacher who not only gets a better idea of how the students in her class think, but an idea of the concepts that are hard for the class to grasp. Once this is determined, the next conference can be built around what needs most work. If computer conferencing is used group size must be small. It has been found that a good size for a conference is between 12-15 people (Murphy et al., 1996). If the group is too small, people will become self-conscious and feel like they are always 'on'. If a group is too large, people get lost in the textual shuffle and if a requirement, such as three messages per week, is instituted the amount of messages to be read becomes unwieldy for both the students and the moderator or teacher. Large groups also make it hard to debate since a common complaint is that a student wanted to post a new idea but someone beat her to it.

In poorly designed computer conferences there is rampant case of "me-too-ism. This is when someone writes a thoughtful message with which another person agrees. That someone else might copy the entire multipage message into his clipboard and then post a message with the entire message copied to the new message and the only input that someone else has written is something like "I agree". I'm sure that you can see that group members would be disgruntled over such a time waster. So it is up to the teacher to set the ground rules. A few of these that have proven successful are to limit messages to only new ideas that

haven't already been posted, setting a no less than a certain number of messages per week, and having messages contain at least two paragraphs.

When To Use Blogs

Blogs are journalistic in nature. Journals are a common strategy to aid students with metacognition hoping that students will not only learn better but also learn more about themselves. Papers assigned by teachers are read by an audience of one and have a propensity of saying what the teacher wants to hear (Hernandez-Ramos, 2004). But by using a blog students often spend more time writing since along with the teacher, others both inside and outside the class can read it offering it up to an unknown audience (Levin & Camp, 2002). This also makes blogs more reflective than conferences, which are most often used for debating specific topics in a hit and run nature and need a trained moderator to keep the discussion flowing (Winograd, 2000). The vast majority of blogs are individually owned. It is in the skills, perseverance, and enthusiasm of the owner that contributes strongly to the success or failure of the blog.

The concept of the blog, in retrospect, was inevitable since in the discussion boards on CompuServe it was found that a tiny fraction of the people reading the discussions actually posted anything. They liked to read the prose of group of about 50 people who posted quite often. This is not the case with a blog, where the owner supplies most of the text. Blogs, and let's limit this to educational blogs, are created by the teacher and are often used in English Composition classes and other writing intensive courses for a start.

Ask a student if he or she often reads and writes outside of class. Chances are that they don't. But if you ask them if they use Instant Messenger and Email, you will receive a far warmer response. Often, what children learn through email and Instant Messenger can be transferred to blogs, which is a digital piece of paper to write upon. There are a number of reasons to have classroom blogs in the liberal arts.

What's In It For A Teacher To Run A Class Blog?

There are a number of things according to Jay Cross in an educational blog:
- Weblogs are a personal writing space, easy, sharable and automatically archived.
- Weblogs are easily linked and cross-linked to form learning communities.
- Weblogs can become a digital portfolio of students' assignments and achievements.
- Weblogs are a novice's web authoring tool.
- Via digital storytelling, weblogs play a role in personal development.
- Accumulated Weblogs become a content management system. (Elliot *et al.*, 2006)

The only part of this analysis is that I question is if an accumulation of blogs can be considered a Course Management System since I consider a CMS containing a highly sophisticated suite of features.

Anne Davis has some slightly more generalized reasons. She sees blogs as:
- A way to improve my writing.
- A just in time learning arena.
- A place to share.
- An easy way to create a website
- A way to connect with others and make connections to learning.
- A perfect spot for quick writes.
- A way to take ownership of a personal space.
- A writing room in which you can make it be what you want it to be.
- A place to go each day that provides elements of surprise and anticipation.
- A way to give students ownership of a personal space that encourages active engagement by the students and teacher.
- A place to collaborate
- An up close and personal way to include parents in the process (Elliot et al., 2006)

The last point is particularly salient. Blogs can be used to communicate with parents. As the student puts together a digital portfolio, his parents can check it on the class blog, which is not password protected or authenticated. Unlike computer conferences, blogs are open to anyone with an Internet

connection. Since a blog can be used as a digital portfolio both teacher and parents can keep abreast of a student's work.

Blogs, but not computer conferences, can last longer than the semester. That is usually a very good thing since over time a blog can become a repository of knowledge and the longer it runs, the deeper becomes its content. It can have permanence. Over time, a blog can become a database of knowledge based upon years of information students post on either the class, or their personal blog.

Educators are using blogs in all fields, but I consider it most appropriate for liberal arts and especially creative writing classes. In this case all assignments can be submitted via the blog either by uploading it or by posting it to their own student blog. A most interesting use of educational blogging is Exploring Techno/Literacy (Fornes, 2003). In this class, Fornes created a blog to serve as a central hub and then had each of his students start their own blog, which were linked to the main class blog. Also to be found on the main blog page are links to the syllabus, library and other classroom information. In effect this blog serves the same purpose as putting up a class webpage, but it's easier to create and interactive. Click on a student's name and section and you will be sent to that student's personal blog. In this case, the blog was used for submission of creative writing assignments and not much else. At the end of a semester the students have a digital portfolio of their work.

Blogs, unlike computer conferences, present the student with a blank sheet of electronic paper that can be used to journal, submit assignments, or just write about what the student feels is important. Obviously educationally oriented blogs created and run by students are more concerned with specific topics than are non-educational personal blogs, which can be used for just about anything.

Blogs create a personal space, owned by the author while computer conferencing is a communal space owned by the teacher or school. Continuing Fornes example, an author can post an assignment, which will only be read by someone accessing the individual blog. This provides more of a feeling of freedom and ownership than does the question and answer format of a computer conference, where everyone is supposed to read everything before responding. Blogs often need no response and in reading many blogs, people commenting on a blog entry are few and far between. Therefore blogs can be seen as a way to personally publish, while computer conferences are a way to discuss.

When To Use Both Blogs And Computer Conferencing

Using blogs and computer conferencing in a class is not mutually exclusive. Both serve different purposes and are used in different ways. Assuming that a school already has a Course Management System in place, a teacher can consider blogs and computer conferencing as two different tools to wear on their educational tool belt. Each teacher must decide what outcomes are desired and use the correct tool or tools to affect that outcome. Although it may sound confusing to use both conferencing and blogs in one class, it makes sense. Debates of issues by equal participants are well served by computer conferencing. Free or creative writing, assignment submission where it is not expected that everyone in class read everyone's entries are fodder for blogs. In the case of some course blogs, one of the links on the top of the screen is 'BlackBoard'. This makes it quite easy to go from a blog page to a computer conference by simply clicking the link.

Using both together adds a richness that can't be found in either one. In fact using them in tandem provides some interesting possibilities. An example of this would be that someone writes something provocative on his or her personal blog. The teacher or moderator decides that the message would be a good topic for discussion, so the teacher or moderator starts a computer conference discussing and debating the blog entry. Alternatively, when a computer conference is shut down since everyone has made their opinions known, a blog entry can be assigned to synthesize the discussion and show how each individual, having read all the messages, has come to a set of conclusions, which will be written to their blog. This can be quite useful since in computer conferencing the responses are usually much shorter than blog entries, so, students writing blog entries in places of pseudo-privacy are free to expand upon their conclusions. This is helpful since in computer conferencing, opinions are stated and sometimes even backed up, but not many people would remember each class member's position on the topic.

Above are some basic examples, but the best parts of using computer conferencing with blogs are yet to be discovered. Although blogs have been around for a number of years and they have been used in a myriad of different ways, no one, to my knowledge, has found the perfect symbiosis of both media. It's up to the teachers to find ways to make best use of the tools for his or her purposes. There is a huge body of literature relating to computer conferencing starting in the early nineties (Eastmond, 1992), but research

into blogs is at a very early stage. Hence, many teachers are using blogs by trial and error. There is an increase in teachers using blogs, so there will be more experimentation in blog use and its tie-in to computer conferencing. As time goes by I expect to see some exciting uses of the media by combining the two.

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STEP on Social Presence for Online Teaching and Learning

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Abstract

This paper presents how a sound practical approach incorporating with teaching presence has been designed and implemented in a graduate asynchronous on-line course, including: the *scaffolding* before starting new learning topics; the *transaction* during the learning process; the *evaluation* during and after each learning topic; and the *presentation* of outcomes online (STEP). The effectiveness of STEP on students' social presence is examined after the course.

Keywords: Social Presence, Teaching Presence, Online Instructional Modeling

Introduction

The term of *social presence* was first introduced by Short, Williams, and Christie (1976), which has been defined as the "degree of salience of the other in a mediated communication and the consequent salience of their interpersonal interactions" (p. 65). They regard social presence as "it varies among different media, it affects the nature of the interaction and it interacts with the purpose of the interaction to influence the medium chosen by the individual who wishes to communicate". Being in an early period of investigation, studies which represented by Short, Williams, and Christie emphasized social presence as a quality of the communication medium itself, thus the inability of a variety of media to transmit nonverbal cues would affect interpersonal communication (Tammelin, 1998; Rourke, Anderson, Garrison, and Archer, 2001). These "filtered-cues" studies postulate that users of communication media are in some sense aware of the degree of social presence of each medium and therefore tend to avoid using the particular medium for certain types of interactions (Tammelin, 1998; Richardson and Swan, 2003). Gunawardena and Zittle (1997), on the other hand, found that social presence can "be cultured" among teleconference users, "a position different from the view that social presence is largely an attribute of the communication medium" (Richardson and Swan, 2003, p. 70). Gunawardena and Zittle (1997) argued that "in reviewing social presence research, it is important to examine whether the actual characteristics of the media are the causal determinants of communication differences or whether users' perceptions of media alter their behavior".

Furthermore, Garrison, Anderson, and Archer (2000) developed the model of Community of Inquiry which identified three essential elements for a successful higher educational experience on online teaching and learning, particularly in the text-based asynchronous environment: cognitive presence, social presence, and teaching presence. In this model, cognitive presence has been defined as "the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication" (p. 89). Social presence has been defined as "the ability of participants in the Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as 'real people'" (p. 89). They claimed, "appropriate cognitive and social presence, and ultimately, the establishment of a critical community of inquiry, is dependent upon the presence of a teacher". In one of their further studies, Anderson, Rourke, Garrison, and Archer (2001) defined teaching presence as "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (p. 5). They classified teaching presence into three categories - design and organization, facilitating discourse and direct instruction, and provided indicators for each category.

This paper presents how a sound practical approach incorporating with teaching presence has been designed and implemented in a graduate asynchronous online course, including: the *scaffolding* before starting new learning topics; the *transaction* during the learning process; the *evaluation* during and after each learning topic; and the *presentation* of outcomes online (STEP). The effectiveness of STEP on students' social presence is examined after the course.

The course, entitled *Multimedia and Internet for Educators*, is an elective graduate course from the State University of New York at Oswego. It provides an introduction and guide to pre- and in-service teachers to current and emerging technology. It is intended to help PK-12 educators not only to use multimedia and Internet resources in their own education but also to integrate them into their work as teachers. In 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. Like most ALN courses, the Course Map of this course includes three areas: Course Information, Class Community, and Learning Modules (see Figure 1).

Figure 1: ALN Course Map

Strategies of promoting active learning community and enhancing social presence for this online course have emerged as a result of using a systematic approach to break the isolation between students and the instructor, students and students, and students and their learning environment; and to ensure the meaningfulness of Web-based communication. Figure 2 illustrates STEP is essentially a cyclic process and the four components of STEP are interrelated.

Figure 2: STEP Approach
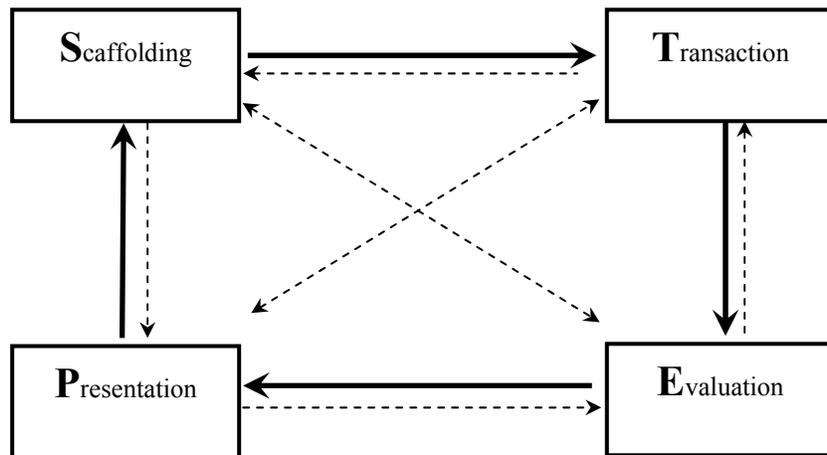
The S in STEP

The S in STEP stands for the scaffolding before starting new learning modules. The basic idea of scaffolding is "to gradually ease students into what are likely to be challenging tasks by creating a supportive structure to guide their work. In other words, as the educators we would initially do some of the work for students" (Grabe and Grabe, 1998, p. 217). A large amount of students participated in the course are either with little experience in asynchronous distance learning or with limited skills and understandings on this type of learning which has multiple threads with several discussions and interactions progressing simultaneously. To reduce the community anxiety among students, the instructor has constructed an open discussion on the bulletin board by sharing his own experience on distance learning and background on computer technology, and has invited students to participate in this activity. Since this activity is hosted at the beginning of learning modules, it helps in establishing a non-threatening atmosphere. On each "Mini-Lecture" in learning modules, the instructor has started with the related concepts/knowledge and particular technological skills that students need to prepare their undertaking actual assignments/projects; provided resources links and examples; and encouraged students to reflect and discuss the possibilities for extending the ideas and technological skills into real world situations. Overall, the learning sequence of this course includes three individual and group projects, with each project level of difficulty a little higher than the previous one and with each project building on the one before, they are: 1) using search engine and Web evaluation criteria to organize their own webliography, in which selected and listed Internet resources can be used for the future references or projects; 2) building on an inquiry-oriented WebQuest activity, in which some or all of the information that learners interact with come from resources on the Internet (Dodge, 1997); and 3) developing a Web-based portfolio, in which students engage in continuous, thoughtful analysis of their learning on this course with reflection, evidence, and collaboration.

As Table 1 shows, this component encloses categories and indicators of teaching presence, which Anderson, Rourke, Garrison, and Archer (2001) have defined.

Table 1
Scaffolding via Teaching Presence

Categories	Indicators
Design and organization	Setting curriculum
	Designing methods
Facilitating discourse	Setting climate for learning
	Drawing in participants, prompting discussion
Direct instruction	Presenting content / questions
	Injecting knowledge from diverse sources

The T in STEP

The T in STEP stands for the transaction during the learning process. ALN brings some new challenges in practice: on one hand, students have to deal with the lack of personal touches, no-verbal cues, and delayed responses; on the other hand, instructor may carry off the real discussions among students if he or she merely acts as "sage on the stage" (Yang and Maina, 2004). Moore (1972) found that distance education was characterized by the amount of control exercised by the learner (dialogue) and the amount of control exercised by the instructor (structure). "Additional structure tends to increase distance (decreases community), and more dialogue tends to decrease distance (increase community)" (Rovai, 2002, p. 44). To meet these challenges and to keep students actively participating in learning activities, the instructor of this course has used "Private Folder" serving as the "On-line Office Hours" to promptly respond to students' questions, and to privately acknowledge those students whose ideas have been posted without many or any responses and feedback. Meanwhile, when common questions/concerns appeared, the instructor has interacted with students by posting his thoughts on the bulletin board or discussion area. Below is an example of a message from the instructor that has been used in early stage of the course to encourage students on establishing a socially responsive discourse with the course discussion (see Figure 3).

Figure 3: A Message from the Instructor

As Table 2 shows, this component encloses categories and indicators of teaching presence, which Anderson, Rourke, Garrison, and Archer (2001) have defined.
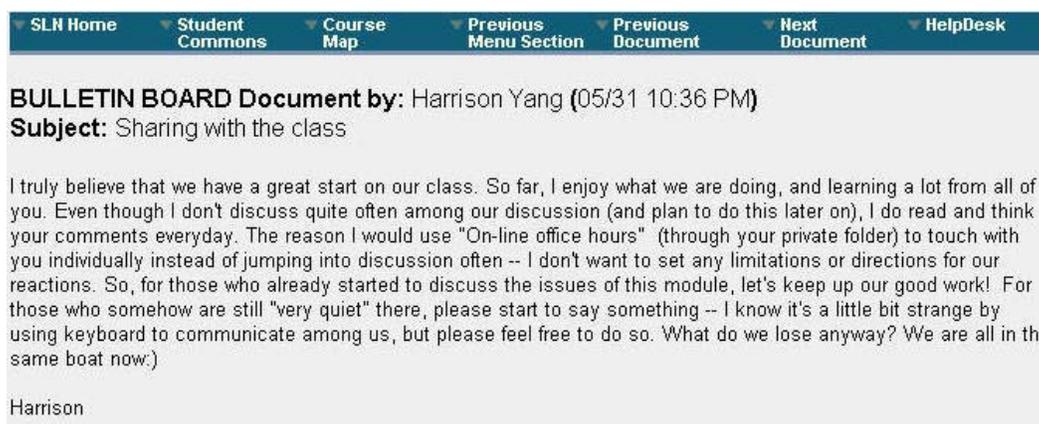
Table 2
Transaction via Teaching Presence

Categories	Indicators
Design and organization	Establishing time parameters
	Utilizing medium effectively
Facilitating discourse	Seeking to reach consensus / understanding
	Encouraging, acknowledging, or reinforcing student contributions
Direct instruction	Focusing the discussion on specific issues
	Diagnosing misconceptions
	Responding to technical concerns

The E in STEP

The E in STEP stands for the evaluation during and after each learning module. Periodically evaluating students' performances serves two ends: to remind inactive students to contribute ideas and/or react to others' contributions; and to reinforce interactive students continuing their journey on their knowledge and skills from emergent to mastery (Jonassen, 2000). Previous research of teacher immediacy has found that having a high regard for students work, actions, or comments can contribute to teacher immediacy and subsequently to affective, behavioral, and cognitive learning (Gorham, 1988; Gorham and Zakahi, 1990). Further, Rourke, Anderson, Garrison, and Archer (2001) pointed, "reinforcement is the object that fuels the development and maintenance of interpersonal interaction. Complimenting and acknowledging, and expressing appreciation are ways of communicating reinforcement in a text-based medium". From this perspective, the instructor of this ALN course has privately sent every student a brief evaluation report every other week to comment the frequency and gravity of her or his postings. Meanwhile, the instructor has publicly encouraged students to periodically summarize the discussion to avoid it becoming too fragmented or drifting off the theme.

As Table 3 shows, this component encloses categories and indicators of teaching presence, which Anderson, Rourke, Garrison, and Archer (2001) have defined.

Table 3
Evaluation via Teaching Presence

Categories	Indicators
Design and organization	Establishing time parameters
	Utilizing medium effectively

Facilitating discourse	Identifying areas of agreement / disagreement
	Encouraging, acknowledging, or reinforcing student contributions
	Assessing the efficacy of the process
Direct instruction	Summarizing the discussion
	Confirming understanding through assessment and explanatory feedback

The P in STEP

The P in STEP stands for the presentation on outcomes. There are a variety of ways to launch active, reflective learning. Providing opportunities for students to present their ideas, methods, and products is one of the most powerful ways. This is essential not only at the conclusion of a project, but also as the project grows. Presenting projects is an authentic activity that provides an enormous motivation for students (Wheatley, 1991; Grabe and Grabe, 1998; Yang, 2001). "Presentations, coupled with authentic outcomes and fairly explicit criteria for what counts as a good plan, can provide a strong incentive to prepare and revise" (Barron and the Cognition and Technology Group at Vanderbilt, 1998, p. 286). Due to the nature of asynchronous learning, instead of the face-to-face presentation, students' projects have been opened on the online course periodically with the permission from students. Through this activity, students could share and compare their projects with projects generated by their classmates, which might inspire them to revise and communicate further more.

As Table 4 shows, this component encloses categories and indicators of teaching presence, which Anderson, Rourke, Garrison, and Archer (2001) have defined.

Table 4
Presentation via Teaching Presence

Categories	Indicators
Design and organization	Establishing time parameters
	Establishing netiquette
Facilitating discourse	Encouraging, acknowledging, or reinforcing student contributions
	Drawing in participants, prompting discussion
Direct instruction	Focusing the discussion on specific issues
	Injecting knowledge from diverse sources

STEP on Social Presence

To assess the effectiveness of the STEP approach on social presence for online collaborative learning, the final self-reports of students from spring 2006 (n = 23) and summer 2006 (n = 25) were collected and examined, which were based on their own experiences on the course *Multimedia and Internet for Educators*. Findings from students' final written reports reflected positive student reactions in the effectiveness of utilizing the STEP approach on the course *Multimedia and Internet for Educators*. Student responses related to use of the STEP approach for asynchronous online collaborative learning were extremely encouraging on the aspects of social presence, which has be classified into three categories by Garrison, Anderson, and Archer (2000) - *emotional expression, open communication,* and *group cohesion*, as was evident in the following students' comments,

All who participated were extremely courteous, professional, helpful, understanding, and tolerant. Discussions were in-depth and thought-provoking. It was almost hard to be "silent" even if one wanted to since there was such diversity in the discussions. Any time I posted a question or needed clarification of some sort there was always someone who would respond – and most of the time I got more than one response. I also enjoyed the sharing of real life experiences by fellow students, most of whom are teachers. It's great to hear firsthand accounts about what different schools are doing with respect to new technologies. I was introduced to many new concepts because of it.

I have taken one other online course. It was a general education requirement for my undergraduate degree. By comparing the two courses, I can easily tell that this course is at the graduate level and that the participants are "experts" in their field. The discussion topics and responses that were posted throughout the duration of this course were thorough and well thought out. The issues and topics that my classmates raised forced me to think critically.

An interesting spin was to have group work assignments. I did not expect group work in an online class. At first I was a little apprehensive of the online groups, but despite my skeptic attitude in the beginning the group was very productive. The computer has become such a large part of our communication in everyday life; it was almost like second nature.

This type of setting allows some additional time needed to foster a more thoughtful and developed response. This response, once formulated, can then be expressed in the manner that the creator had envisioned. If anything, I believe this course to be more inclusive. For better or worse, human beings have many biases and preconceptions about others. The anonymous nature of this course effectively removes many of the shallow biases and prejudices that exist.

I have time to formulate a response to my classmates' questions without feeling "on the spot" during that awkward moment of silence, with all eyes fixed upon me.

Through my distance learning experience, I have had the opportunity to interact with my peers located all over New York State. Together, we created a learning environment that was comfortable and appreciative of others thoughts, ideas and experiences. The discussions are very appealing to a new teacher. The comments made by teachers with their own classrooms help out the teachers that are not in that position just yet. Some comments made push our thoughts to be out of the box at times, I think that reflects our comfort level with our classmates and the professor.

Before this course I must say I hadn't explored WebQuests in depth. I am so excited to have the WebQuests my classmates created. I feel that they will be a valuable resource in the future. Exploring their WebQuests really opened my eyes to the amount of possibilities which lie in using them in the classroom.

I was also anxious to see my peer's final projects. I really liked that we could see each others' projects. I printed off some of my peers' work that I thought might be beneficial to an elementary classroom environment. The sharing of resources really helped me see others' amazing computer talents as well as organization skills.

The assignments in this course gave me the opportunity to create projects using the Web. Interacting with classmates through discussions within modules was enlightening and reaffirming.

In conclusion, the findings of this study indicate that in order to establish social presence and active learning community for ALN courses, the systematic approach with a variety of strategies incorporating with teaching presence should be designed and implemented. The effectiveness of STEP approach, which includes: the *scaffolding* before starting new learning topics; the *transaction* during the learning process; the *evaluation* during and after each learning topic; and the *presentation* of outcomes online, has been shown in this study. Specifically, the results of this study reveal that students perceive extremely positive on: *emotional expression, open communication, and group cohesion* in an asynchronous text-based course.

This study yields results consistent with previous research related to social presence and teaching presence in asynchronous learning environment (Garrison, Anderson, and Archer, 2000; Anderson, Rourke, Garrison, and Archer, 2001; Rourke, Anderson, Garrison, and Archer, 2001). Instructors of asynchronous learning courses can design and manage learning sequences, provide subject matter expertise, establish a positive learning environment, and facilitate active learning.

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Self-regulation and Hypermedia: Undergraduate Students' Self-regulation in Hypermedia Learning Environments

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Abstract

Recent widespread use of hypermedia in education may be challenging to some learners because of information overload, technical novelty, and multiple levels of decision making, requiring their more self-regulatory learning ability. In scaffolding learners to be more self-regulated, it would be critical to expand our understanding about how learning with hypermedia relates to self-regulation. This paper reviews major theories of self-regulation and discusses recent research findings and their implications for facilitating undergraduates' self-regulated learning with hypermedia.

Introduction

Learning with hypermedia has the potential to help learners' understanding of complex knowledge because it enables learners' flexible, dynamic, and non-linear access to a wide range of information represented as text, graphics, animation, audio, and video (Jacobson & Archodidou, 2000; Jonassen, 1996). In addition, hypermedia allow learners' control over access, and this increased control may motivate learning (Dillon & Gabbard, 1998; Kinzie, 1990; Steinberg, 1989).

Despite these benefits of learning with hypermedia, interacting with hypermedia may be challenging to some learners, particularly novice learners in an academic domain, because of information overload, technical novelty, and required multiple levels of decisions making. These difficulties of hypermedia integrated learning probably require a more strategic learning ability from learners. According to Zimmerman (1989), self-regulated learning occurs to the degree that a student can use personal process, such as goal settings, self-efficacy perception, and metacognitive process, to strategically regulate behaviors in the immediate learning environment. Therefore self-regulated learners are goal-oriented, and tend to monitor their academic performance to evaluate their own progress against the learning goals or objectives.

In a hypermedia learning context, learners have to frequently decide which content to branch and what scope to limit the content. Therefore, it is important to help learners promote their cognitive and metacogntive control over their learning that is characterized by the behaviors of planning, monitoring, and evaluating their own learning process. However there seems to be lack of understanding about how learners can learn effectively in such environments (Azevedo & Cromley, 2003).

In respond to this need for expanding our understanding about effective learning and instruction with hypermedia, this paper discussed on theoretical assumptions of self-regulation and the function of self-regulation in various hypermedia learning contexts. Additionally recent research findings were overviewed and their implications for facilitating undergraduates' self-regulated learning were discussed.

Theoretical Foundations

Self-regulation

Learners are self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning process (Zimmerman, 1986). According to Zimmerman (2001) self-regulation involves awareness of the potential usefulness of self-regulation processes in enhancing their academic achievement, monitoring of the effectiveness of learning methods and strategies, and responding to this feedback either perceptually or behaviorally. Self-regulation also entails self-evaluation of capabilities and progress in information acquisition, which is judged against their own goals or standards (Schunk, 2004).

Concerning how and why students choose to use particular self-regulated process, strategy, or response, there are different theoretical perspectives. From the behaviorally oriented view, all self-regulated learning responses are under the external control of reward or punishment contingencies; from the cognitive perspective, students are motivated primarily by a sense of self-esteem or self-concept; from the social cognitive perspective, effective self- regulation demands goals and motivation.

Information Processing Perspectives

From the information processing perspective, learning is a set of processes by which we acquire information (Winne, 2001). Information is processed in three locations: sensory register, working memory, and long-term memory. Once the new information received through the sensory register is attended to and perceived, working memory processes the input by rehearsing or associate it with information in long-term memory. Since working memory is very limited in capability and duration, information is organized and encoded in a way to accommodate retrieval in long-term memory. Long-term memory forms network of nodes and links of chunks of knowledge.

We can retrieve information back to working memory through *spreading activation* (Anderson, 1991). A knowledge unit in long term memory is connected to other knowledge units relevant to it forming a knowledge network. When a knowledge unit is activated, it spreads to all the other units connected to it. Metacognitive monitoring and control involve all steps of the memory process; attention, perception, encoding, and recall. Over the memory process, metacognition plays a critical role in regulating acquisition of information. Metacognition has been simply defined as thinking about thinking (Hacker,1998). According to Flavell (1976), metacognition is "knowledge and cognition about cognitive phenomenon" (p.906) and involves deliberate, intentional, and goal-directed mental operations. Metacognition occurs through actions and interactions among four components: metacognitive knowledge, metacognitive experiences, goals, and strategies.

Hacker (1998) described four components of Flavell's Metacognition:1) Metacognitive knowledge including a learner's stored world knowledge, their cognitive tasks, goals, strategies for achieving them, actions, and experiences; 2) metacognitive experiences including one's awareness of his cognitive and affective process and how the progress toward the goal of a current process is being made; 3) Adaptation of metacognitive knowledge in response to the metacognitive experiences; 4) Adjustment of the goal or the strategies to be used to accomplish the goal. From Flavell's view, self-regulation is metacognitive control over the learning process.

On the basis of the information processing perspective, the four phases Self-Regulated Learning (SRL) model was recently introduced (Winnie and Hadwin, 1998; Winne, 2001). The SRL model includes four components: conditions, products, standards, and evaluations. Conditions refer to resources available for work on a task and constraints that may affect information process. Among the resources, the most significant resource is considered prior knowledge. The second component, products, is new information created when information is processed. Successive products build toward the goal, which may reside in memory or in the environment as overt outcomes. The third component is standards (goals) that current learning processes are judged against. The final component is evaluations, which are made by the monitoring process.

All components go through four phases: 1) Defining the task, 2) setting goals and planning, 3) enacting tactics, and 4) adapting metacognition. In the defining the task phase, the learner processes information about the conditions that characterize the learning task. In the setting goal and planning phase, the learner frames a goal and specifies plans to approach it. In the enacting tactics phase, the learner applies tactics and strategies that were identified in the setting goal and planning phase. In the adapting metacognition phase, the learner makes major adaptations to their schema that structure how self-regulating is carried out.

Constructivist Perspectives

Vygosky's zone of proximal development (ZDP) strongly influences self-regulation. ZDP is defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under guidance or in collaboration with more capable peers"(Vygotsky,1978, p.86,cited by Schunk, 2004). In the ZDP, an adult with expertise and a learner work together on a task that the learner could not perform independently because of the difficulty level (Schunk, 2004).

Instructional scaffolding refers to the process of controlling task elements that are beyond the learners' capabilities so that they can focus on and master those features of the task that they can grasp quickly (Burning, Schraw, & Ronning, 1999). In this approach, a teacher provides support, and gradually fades aid as the learners acquire the skill and control of their own learning.

Implicit theories bring a new perspective to self-regulation. Learners construct theories about self-regulated learning (Schunk, 2004); therefore self-regulation is highly contextualized (Paris, Byrnes, & Paris 2001). Learners can formulate theories about what contributes to success in performing different tasks (Schunk, 2004). Self-regulatory strategies that the learners bring to their learning might be either effective or misleading. Learners might believe they are capable of learning some tasks or they might doubt their ability to complete them. The ideas underlying implicit theories suggest that it is important for educators to understand what beliefs and feelings that the learners initially have about their own learning of specific tasks so that any instructional intervention for self-regulated learning is adjusted to the needs of individual learners.

Goal Orientation and Self-regulation

In addition to learner's beliefs and needs, learners' goal orientation can also affect what and how learners approach learning material. The type of goal that a student adopts may impact the student's perception of progress, self-efficacy, and self-evaluation (Schunk, 2004). Researchers have identified two different goal orientations, task-mastery and performance goals. Task-mastery goals focus students' attention on processes and strategies that help them acquire knowledge, behaviors, skills, or strategies. On the other hand, performance goals direct students' attention to completing tasks. Research supports that pursuing task-mastery goals enhance intrinsic motivation and active cognitive involvement characterized by self-regulatory activities (Meece, Blumenfeld, & Hoyle, 1988)

Hypermedia and Self-regulation

Hypermedia learning environments enable either linear or non-linear presentation of knowledge. Knowledge presented in a non-linear fashion allows learners to navigate freely from one concept to another, without concern for predetermined order or sequence (McManus, 2001). Linked structure of hypermedia may accurately represent the associative network that makes up the human memory and may allow realistic representation of expert semantic network (Jonassen, 1993). Semantic networks and concept maps represent the structure of the information within the hypermedia environments (Reed & Steven, 1995). However, the knowledge representations that learners construct from hypermedia may be incomplete resulting in misconceptions or misunderstanding, unless the learners are provided with additional modeling or instruction about the knowledge structure is provided.

Additionally the non-linear trait of hypermedia learning environments lets the learners control the organization of the information (Liu, 1992).Thus the learning situations with more control and options involve multiple levels of decision making ,probably requiring higher level of ability to control learning processes from the learners.

As referred in the previous section, regulating learning involves learners' metacognitive awareness of their learning process. Metacognitive awareness is possible when the learners have conditional knowledge, knowledge about when and how to use declarative or procedural knowledge relevant to a given learning task. Conditional knowledge allows learners to metacognitively monitor their learning progress toward their learning goals and evaluate the effectiveness of their learning process against the goals. The self-regulatory learning process in hypermedia environments seems to be a dynamic process involving interaction among learners' self-regulatory ability, learners' prior knowledge, traits of hypermedia, and the learning tasks. While monitoring their learning processes with hypermedia, learners change or revise their learning strategies or tactics to make their learning more effective. This also implies that research can be designed taking into account interaction of such diverse factors.

In the following review, special attention was paid to determining how the studies handled those factors relevant to self-regulation in hypermedia learning environments and what the findings about the relationship among those factors are, and what their findings imply for helping self-regulatory learning. The studies included in this review were selected because they all related to undergraduates' self-regulatory learning with hypermedia.

However, the included studies do not exhaust all studies pertaining to undergraduates' self-regulatory learning in hypermedia learning settings.

Current Research on Self-regulation and Hypermedia

Hypermedia environments can provide learners with more freedom to control pace, order, and sequence of learning (Liu, 1992), with more autonomy, some learners in hypermedia environments may feel disorientated or less efficacious. Learning with hypermedia would be challenging especially to the learners who have less domain knowledge. In deriving implications for effective instruction for learning with hypermedia, current research appears to focus on addressing two dominant aspects: 1) relationship between the feature of hypermedia and self-regulation and 2) the effects of various scaffolds on promoting self-regulation ability and learning. Thus, this paper reviewed several studies that were thought to dominantly address those two aspects. The included studies were issued from 2001 to 2005 and all relate to learning with hypermedia of undergraduates who were novices in a content domain.

Non-linear Structure of Hypermedia and Self-regulation

When the demands that a task creates on a learner are high, or the task is complicated, the learner's working memory is overloaded, leaving little and sometimes insufficient resources to apply to self-regulating (Zimmerman, 2001). Particularly in hypermedia learning environment, the cognitive load that the non-linear structure of hypermedia may impose on learners would be a great concern.

Eveland and Dunwoody (2001) tested if hypermedia learning environments bring higher cognitive load than traditional print-based learning environments. In this study, levels of cognitive load were conceptualized as being directly consistent with the variation of non-linearity in the Web. Different levels of media conditions, control, print, linear web, non-linear web and advisement web, were compared on the performances of recognition and cued recall respectively as measuring of learning. Motivation, web expertise, and self-reported cognitive load were taken into account as covariates. The result revealed that learning was greater for print than the web conditions on recognition performance indicating probably lower cognitive load in the print condition than other media conditions. To the contrary, there were no significant differences across media conditions on the recall performance. As expected, self-reported cognitive load negatively predicted the recall performance. Based on the findings, the author suggested that there was evidence to support the claim that hypermedia presentations may reduce learning compared to traditional print because of such factors as cognitive load (Oliver, 1996) and disorientation (Calvi, 1997; Darken & Sibert, 1996; MacDonald Stevenson, 1996). The result from the self-report about cognitive load also confirmed that non-linear feature of hypermedia could be an obstacle to self-regulatory learning requiring learners' extra cognitive efforts of navigating from a part of content to another. However, this finding is not conclusive because there might be other important variables that could influence learning. For example, learners possibly perform better because of their prior knowledge about the content (reading text) rather than different media conditions.

In this study the prior knowledge about the content of interest was not directly measured across the conditions. In addition, the failure in finding any difference among various media conditions on recall measuring might be because variation of the level of linearity across different media conditions were not be optimally established to determine any dissimilarity among them. Another possibility is that the reading material might not actually be differed in the level of freedom of control over navigation across various media conditions. As the author indicated, the perceived overload and actual cognitive overload are possibly unlike.

While Eveland and Dunwoody(2001)'s study focused on the feature of hypermedia and learning, McManus(2000) examined a more direct relationship between the non-linear structure of hypermedia and self-regulation. This study examined how non-linearity and an advance organizer together relate to self-regulation and learning. The results illuminated two types of interaction; one was the interaction between non-linearity and self-regulation (p=0.054), and the other was the interaction between non-linearity and advance organizer (p=0.052). It was suggested that highly self-regulated learners learn poorly in mostly linear hypermedia learning environments where they have very few choices, while medium self-regulated learners learn less in highly non-linear environments where there are too many options. The results also suggested that an advance organizer is more effective in highly non-linear web-based hypermedia than in mostly linear learning environments.

The results from the McManus (2000)'s study implied importance of adapting hypermedia to learners' self-regulation ability. A diagnosis of learners' self regulation ability should precede designing a learning unit with hypermedia. Additionally, repeated diagnoses of the learners' progress in their ability to regulate learning as well as assessment made prior to implementing a learning unit would be necessary particularly when learners' consistent change is anticipated. For example, if a part of the learning goal is learning about hypermedia technology itself, the learner will need less scaffolding or guidance as their expertise grows with the on-going use of the hypermedia. The non-linearity of hypermedia would become less of a cognitive load with time.

The variation of self-regulation may be associated with the ways the learners navigate hypermedia in a particular manner. Sweany (2000) attempted to determine if the particular pattern of hypermedia navigation interacts with strategic learning. This study investigated what the emerging patterns in undergraduate students' navigation behaviors are and how they are associated with strategic learning while the learners interact with material including a CD-Rom and the Internet designed for an introductory French course. For the navigation cluster analysis, the log files were automatically recorded while the students were using the computer in the class, and analyzed. Goal orientation, instrumentality, and metacognitive self-regulation were regrouped as a strategic learning variable. It was anticipated that combination of strategic learning and a particular pattern in using computer features would have the highest relationship with achievement.

This study revealed that students' achievement differed with the ways they navigate hypermedia. Based on these findings, it was suggested that strategic learning might mediate the relationship between hypermedia navigation and achievement. As the author noted, not all students will automatically use hypermedia programs effectively. Therefore, it would be important to help learners to be more strategic in using hypermedia integrated learning contexts. Furthermore, navigational design should be considered prior to integrating hypermedia into the classroom.

Puntambekar and Stylianou (2005) similarly attempted to examine the ways that students navigated through hypermedia. Although the study did not target undergraduate subjects, the study seems to provide insights into learning with hypermedia across diverse levels of subjects. The study found the positive effect of metacognitive

navigational scaffolding on students' understanding of organization of information and suggested that the metacognitive prompts reminded students of the goal and encouraged them to reflect on their decisions they made for seeking information. In a hypermedia system a student constantly makes decisions about which link to visit next and about what piece of information is relevant to their current goals of learning. Thus, it would important for readers to monitor and regulate both their comprehension and navigation strategies (Puntambekar & Stylianou, 2005).

There is also empirical evidence that learners perceive metacognitive structural cues distracting rather than helpful (Lee *et al.*, 1997). Processing metacognitive scaffolds may take additional cognitive efforts from learners, therefore adding more cognitive load rather than promoting learning. As a result, in designing navigational support tools, it should be considered how to minimize the demands from such structural cues.

An issue raised from this study was the potential mediation of the students' prior knowledge on the content topic of interest. The navigational behaviors may be associated with the student's semantic organization of their existing domain knowledge. If this is the case, how should hypermedia semantically intervene individual domain knowledge in such a way that further learning occurs more effectively with hypertext? A particular issue would be how to tailor self-regulatory monitoring support to different students and when is the right time for providing it (e.g., providing whenever asked by the learners or automatically after certain amount of time has past)?

Effective Scaffolding of Self-regulation

The studies previously reviewed indicated that learners might be cognitively overloaded or disoriented with the non-linear structure of hypermedia. Additionally, it was suggested that goal-based navigation and matanavigational scaffolding intended to promote metacognitive monitoring of navigational behaviors enhanced learning in the hypermedia learning environments. In the following section, how self-regulatory scaffolding learning with hypermedia influences self-regulation and learning were reviewed based on recent findings.

Debowski, Wood, and Bandura (2001) examined the impact of guidance over search of electronic database on self-regulation. In this study, self-efficacy, satisfaction, and internal motivation were conceptualized as major predictive factors for self-regulation on the student's performance. It was found that the guided search mode of electronic database was more effective than the self-guided search mode in developing post-training self-efficacy and satisfaction; however, intrinsic motivation was not affected by exploration modes. The guided search mode included instruction on the order for completing database searching tasks, reminders of the steps to follow in developing a strategy for each task, and modeling of responses that followed problems and mistakes in the use of strategies during practice. On the other hand, in the self-guided (or enactive) search mode the sequence of tasks, the steps in the strategy process, and the responses to problems were left to the discretion of the individual searcher. It was revealed that guided search produced higher levels of perceived self-efficacy, satisfaction, strategy quality, and performance and a lower level of wasted effort on electronic search tasks than self-guided search did. The author concluded that self-enactive learning would be most effective when structured tasks are given to learners who have greater expertise on dynamic tasks along with more informative feedback. Among theorists, goal setting and planning were considered as critical stages for self-regulated learning. Social cognitive theorists claim that self-set goals promote self-efficacy. Azevedo *et al.* (2002) examined how the different instructional goal setting conditions influence students' learning of complex science concepts with hypermedia based on the SRL model (Winnie *et al.*, 1998; 2001). The SRL model explains learners' recursive cycles of control and monitoring during the four phases of learning: perceiving tasks, setting goals and planning, employing tactics, and enacting tactics.

In this study forty undergraduates were randomly assigned to four different goal setting conditions: the bottom-up condition, the learner-generated sub goal condition, the strategy instruction condition, and the co-regulation condition. The pre- and post -tests comparison group design with a think-aloud methodology was used. It was revealed that both the co-regulation (with tutor's guidance) and strategy instruction conditions facilitated students' learning. The data from all conditions were analyzed over the five main SRL categories: planning, monitoring, strategy use, handling task difficulty and demands, and interest. Findings revealed that the co-regulated goal setting condition promoted learning of complex science contents. In the co-regulation condition, the tutor assisted learners in regulating their learning by using various strategies, scaffolding their learning, and intervening when they asked for assistance. The tutors helped the students plan sub-goals, monitor their cognitive processes, and provided feedback

In the subsequent study, Azevedo and colleagues (2003) examined the effectiveness of adaptive scaffolding on self-regulated learning. The subjects were assigned to one of three conditions: adaptive content and process scaffolding (ACPS), adaptive process scaffolding (APS), and no scaffolding (NS) and were trained to use a hypermedia environment to learn about the circulatory system. In the adaptive scaffolding condition, students could access a tutor who provided scaffolding to help with their content understanding (content scaffolding) or self-

regulated learning process (processing scaffolding). Based on the analyses from the pre-and post-tests, and verbal protocol data, the author reported that the adaptive scaffolding, both ACPS and APS, facilitated learning more than NS. An interesting finding from the data was the differences of self-regulatory behaviors while learning between the two adaptive conditions. Participants in the ACPS condition regulated their learning by engaging in help-seeking and over-relying on the tutor to regulate their learning. While, participants in the APS condition regulated their learning by planning and monitoring their emerging understanding, and handled task difficulties well.

In summarizing the studies conducted by Azevedo and his colleagues, it was suggested that scaffolding learners' use of self-regulation strategies in hypermedia learning environments is critical. In addition, such scaffolding would be most effective if adapting to learners' individual needs in controlling their learnt process. However, the scaffolding should not be in excess because support exceedingly provided may ruin the learners' desire to be active in controlling their learning process. How learners' prior content knowledge is associated with use of self-regulation strategies still remains to be examined in future studies.

The use of the SRL strategies has been suggested to be context dependent. Whipp and Chiarelli (2005) found that students adapted their use of self-regulation strategies to the unique feature of the web-based learning environment. Paralleling this finding, the study conduced by Dabbagh & Kitsantas (2005) discovered that learners facilitated or withdrew their intention to use SRL strategies in accordance to the unique features of learning environments. In this study it was determined that in distributed (blended) learning, students differed their use of self-regulation process depending on the types of web-based pedagogical tools provided.

Self-regulation is suggested to be particularly important in distributed learning settings because the students are often asked to complete tasks with limited interaction and support from the instructor and peers (Kauffman, 2002; Whipp & Chiarelli, 2005). Distributed, or blended, learning situations as rich hypermedia learning contexts, involves such features as enabling access of information, navigation through content links, web-links and information spaces, and the use of search engines (Dabbagh & Kitsantas, 2005).

Dabbagh and Kitsantas' study investigated how different categories of Web-Based Pedagogical Tools (WBPT) integrated into a Web-CT course management system (CMS) supported different SRL processes. Additionally, they attempted to determine students' perception of the usefulness of WBPT in evoking the SRL processes. The findings indicated that content creation and delivery tools supported the SRL processes of goal setting, help seeking, self-evaluation, and task strategies. While collaborative and communication tools (e.g., email and discussion forum), content creation delivery tools (e.g., tools for uploading contents and assignments and tools for students to access course resources and readings) supported goal setting, time planning and management, and help seeking. Administrative tools (e.g., tools to manage general course information and functions; and student information, and interactions) supported self-monitoring, self-evaluation, time planning and management, and help seeking while assessment tools (tools for announcing or tracing student progress) supported task strategies, self monitoring, and self-evaluation.

Based on the qualitative analysis it was suggested that when engaging students in problem solving tasks in distributed learning environments, content delivery tools should be used to provide a variety examples or sample solutions to enhance students' self-regulatory learning. The qualitative results also revealed that the students perceived that content creation and delivery tools, especially the reading, resources, and assignment/rubrics features, were useful in scaffolding help seeking and self-evaluation while completing assignments involving dialogical learning tasks. The author suggested that when engaging students in articulation and refection required in on-line discussions, content and delivery tools should provide relevant resources and allow an on-line access to the readings. Additionally providing students a rubric of how they will be evaluated was considered to be important in scaffolding the SRL process of self-evaluation.

Other implications derived from the findings included that a group discussion area should be provided to facilitate help seeking, time planning, and time management. It also found that a space to post working drafts should be provided to support evaluation and task strategies. A rubric should be available to help students' goal setting, and an access to resources should be made available to support the help seeking process. Students perceived that administrative, assessment, and collaborative and communication tools (e.g., e-mail and discussion features tools) were useful in time planning and time management, and self-monitoring.

However, the findings from Dabbagh and Kitsantas' study may be applied restrictedly to a web-based course that includes face to face interactions and also uses a CMS tool similar to Web-CT. Also, learners' self-report about use of WBPT is probably dissimilar to their actual use of WBPT. The study did not follow students' actual use of WBPT in terms of frequency; therefore, it was impossible to validate students' self-report with behavioral data.

Choi, Land and Turgeon (2005) tested the effect of a scaffolding tool on self-regulatory learning in a totally on-line learning context. This study attempted to determine if scaffolded peer questioning in on-line discussion

facilitated metacognition and learning   Meaningful verbal interactions and generating adapted feedback require a certain level of domain and metacognitive knowledge from a questioner. A learner in a new domain is often limited in domain and metacognitive knowledge; therefore they can neither ask the right questions nor generate constructive feedback (Land, 2000).

This study used a time-series control-group design. The study included and conducted in online introductory class targeted learning for turf-grass management with thirty nine undergraduates as the subjects. The results showed that there was a significant effect of use on frequency of peer-generated questions. However the peer-questioning scaffolds did not improved the quality of questions. The effect seemed to be dependent on the type of a question. The dominant portion of the peer generated questions was clarification /elaboration questions, which was defined as "questions seeking additional information to clarify or elaborate learners' initial ideas". Thus the findings were limited in generalizing other types of questions, such as counter-arguments (peer-generated ideas expressing disagreement with learners' initial ideas, which could address cognitive conflicts) and context- or perspective-oriented questions (hypothetical questions changing critical factors in a given problem situation or considering different perspectives on the problems). Further research may concentrate on how to develop more effective peer-questioning scaffolds to address diverse types of questions.

In general, findings from Choi and colleagues' study indicated that fixed (as apposed to dynamic) scaffolds were useful to increase the frequency of student questioning behavior during online discussion. Further studies may want to focus on the quality improvement of peer-generated questions using dynamic and adaptive scaffolding. As the author addressed how those factors (prior knowledge, metacognition, task complexity, and scaffolding type) interact in an online learning context would be an important research task in the future.

Conclusion

The studies reviewed in this paper shared the idea that despite of the usefulness of hypermedia because of its ability to display knowledge in a non-linear way, hypermedia integrated learning may be challenging to novice learners in a content domain. Therefore, learning with hypermedia may require higher self-regulation ability from learners. The findings from the studies included indicated that learners' self regulatory ability interacts with the feature of non-linearity of hypermedia. In addition, the ways that learners use their self-regulation ability with hypermedia is highly situational; some of those variables that probably interact with personal variables in hypermedia learning were support from teachers and peers, teachers' attitudes, characteristics of content or tasks, and instructional strategies intended to guide informational organization (e.g., navigational or organization clues). It was also strongly suggested that individualizing scaffolding for the students' regulation over their learning is critical to promote self-regulated learning. Although results from the studies reviewed need to be further tested, a few important implications for designing instruction in hypermedia learning contexts were addressed.

First of all, the findings implied that there were positive relationships between the level of non-linearity of hypermedia and cognitive load (Eveland and Dunwoody, 2001) and metacognitive navigational scaffolds was useful in reducing the cognitive load. As opposed to the traditional learning settings where content is provided in a linear order and often the teacher decides what sequence the learners follow to complete a task, learners in hypermedia learning contexts themselves should deal with the non-linearity in terms of the organization of content and the sequence for completing a task. Thus, learners need to be more strategic to metacognitively monitor their decisions for paths in relation to the learning goal. Particularly the studies conducted by Puntambekar and Stylianou (2005) and McManus (2000) indicated that metacognitive scaffolds such as navigational prompts and advanced organizers were effective for students' understanding of organization of information and goal-oriented navigational behaviors.

Another important implication for designing instruction integrating hypermedia was that when instructional strategies such as an advance organizer or navigational clues are employed as scaffolding tools, the level of non-linearity of content organization and learner' ability to regulate their own learning should be taken into account as the major concern. According to McManus (2002), not all learners seem to benefit from such scaffolds as advanced organizers. The study showed that highly self-regulated learners learn better in highly non-linear environments where there are many options of paths. On the other hand less self-regulated learners perform better in relatively linear hypermedia learning environments with few options of paths. This suggested that designing a course involving hypermedia should be adapted to individual level of self-regulation. The study also suggested that an advanced organizer is more effective in a highly non-linear hypermedia environment than in a mostly linear learning environment. As mentioned in the previous section, this implies constant diagnoses of self-regulation ability of learners should precede designing a course to include hypermedia. Additionally it would be important to encourage students to monitor their understanding and use of self-regulatory strategies by frequently prompting the learning goals.

However, the potential mediation effect of students' prior knowledge, such as goal orientation, instrumentality, and metacognitive self-regulation as Sweany (2000) determined, on students' navigational behaviors and learning still remains to be examined. The navigational behaviors may be associated with the student's semantic organization of their existing domain knowledge. If it is the case, how to semantically intervene individual domain knowledge in such a way that further learning occurs more effectively with hypermedia should be considered. In addition there is empirical evidence that learners perceived metacognitive structural cues were distracting rather than helpful (Lee *et al.*, 1997). Therefore, when including a navigational support tool necessary for learners' understating of information, it should be considered how to minimize cognitive demands from such structural cues while maintaining the benefits from those tactics. Particular issues addressed were how to tailor self-regulatory monitoring support to different learners and when the right time is for providing it (e.g., providing whenever asked by the learners or automatically after certain amount of time has past).

From the studies conducted by Debowski *et al* (2001) and Azevedo *et al* (2002; 2003), another important implication for designing instruction with hypermedia was addressed. The studies implied that guidance and informative feedback from tutors and teachers about how to regulate learning was effective for learners' planning their goals, monitoring their emerging understanding, and using effective strategies. The studies also indicted that there is a positive impact of guidance on learners' self-regulation in hypermedia environments. Guided search (Debowski, Wood, & Bandura, 2001) produced higher levels of perceived self-efficacy, satisfaction, strategy quality, and performance over self-guided search. A suggestion was that self-enactive learning is more effective when the learners are more trained in using hypermedia, the tasks are structured enough, and more informative feedback is provided to the learners. The informative feedback given by a teacher or tutor is critical for the learner to be more strategic in their learning. Simply knowing how to use strategies does not guarantee that students will use them, therefore it is important to help learners to formulate effective strategies for their learning (Schunk, 2004) with hypermedia. Instructional methods and educators' attitudes both possibly appeared to influence learner's self-regulation in hypermedia environments.

Research also suggested that self-regulation is context dependent (Whipp & Chiarelli, 2005). As more undergraduate courses integrate World Wide Web, or become web-based, learners have been situated in a hypermedia intensive learning context. In a rich hypermedia learning environment such as web-based or distributed courses, learning can be efficient in that learning can occur while students are separated by time and space from other students or the instructor. However, students may be misled if they do not know how to regulate in accessing resources and seeking information to complete learning tasks because they are often given little or very limited support from other learners or the instructor. Research showed that in distributed or web-based learning environments, different types of web-based pedagogical tools facilitated learners' enactment of different self-regulation processes (Kitsantas & Dabbah, 2005).

The findings from the studies carried out by Dabbagh & Kitsantas (2005) and Choi & Turgeon (2005) implied that teachers may decide what specific type of web-based pedagogical tools to include and how to provide it, in accordance to the learning goals, the nature of assignments, and the aspects of self-regulation targeted to promote. Also, the result from the qualitative analysis implied that when engaging students in problem solving tasks in distributed learning courses, content delivery tools should be used to provide a variety examples or sample solutions to enhance students' self regulatory learning. The analysis also indicated that content creation and delivery tools, especially the reading, resources, and assignment/rubrics features, were useful in scaffolding help seeking and self evaluation while completing assignments involving dialogical learning tasks. Additionally it appeared to be important that when engaging students in articulation and refection required in on-line discussion, content and delivery tools should provide relevant resources and also allow an online access to the readings. Providing students a clear rubric of how they will be evaluated it was also indicated as important in scaffolding the SRL process of self-evaluation.

A bit differently from the Dabbagh & Kitsantas 's study, which is conducted in a blended mode of learning context including face to face interactions, Choi and colleagues(2005) conducted a study in a totally on-line learning setting. It was revealed that the fixed (as apposed to dynamic) scaffolds for peer questioning were useful to increase the frequency of student questioning behavior during on-line discussion. However the guidance did not improved the quality of questions. The findings suggested that further studies may want to focus on the quality improvement of peer-generated questions using dynamic and adaptive scaffolding. How prior knowledge, metacognition, task complexity, and scaffolding type interact in on-line learning contexts was considered to be an important future research task .

Finally, it is notable that the findings from the studies reviewed in this paper are limited in being generalized to all type of hypermedia learning contexts. The findings are considered to be context specific in terms of the degree of task difficulty, the level of linearity or non-linearity of hypermedia, the type of support (personal or non-personal, and fixed or dynamic), and the type of delivery mode (on-line, off-line, or both). Therefore an

application of the findings should be cautiously made considering the details of the educational context in which the referred study is situated. Another limitation was addressed from those studies that examined the association between navigational behaviors through hypermedia and learning. All studies included could not highlight the influence of learners' prior content knowledge on hypermedia and self-regulation. Navigational behaviors determined in those studies might be mediated by learners' semantic organization of prior knowledge about the content domain of interest. Some researchers (e.g., Chen & Rada, 1996) suggested that spatial ability may be predictive of learning from hypermedia. Further studies may want to investigate how personal variables such as prior knowledge and spatial ability relate to navigational behaviors and self-regulated learning.

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