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Editors

Carmen Lamboy

Research Intern

And

Michael Simonson

Professor

Instructional Technology and Distance Education

Nova Southeastern University

Fischler Graduate School of Education and Human Services

North Miami Beach, FL

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1985	Anaheim	256301
1986	Las Vegas	267753
1987	Atlanta	285518
1988	New Orleans	295621
1989	Dallas	308805
1990	Anaheim	323912
1991	Orlando	334969
1992	Washington, D.C.	347970 – 348041
1993	New Orleans	362144
1994	Nashville	373774
1995	Anaheim	383284
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Preface

For the twenty-fifth 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 25th Annual Proceedings of Selected Papers On the Practice of Educational Communications and Technology* Presented at The National Convention of the Association for Educational Communications and Technology held in Dallas, TX. A limited quantity of these Proceedings were printed and sold. It is also available on microfiche 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 (25th Annual, Volume #1), which also contains over 60 papers.

REFEREEING PROCESS: Papers selected for presentation at the AECT Convention and included in these Proceedings were subjected to a reviewing process. All references to authorship were removed from proposals before they were submitted to referees for review. Approximately fifty 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.

M. R. Simonson
Editor

Table of Contents

Does It Translate? Promulgating the Revised AECT Code of Professional Ethics Worldwide

Annette Sherry, University of Hawai`i

Clarence Chu, National Taiwan University

Candido Manuel Varela de Freitas, Universidade do Minho

Jose Diaz de Rabago, S.J., Universidad de Santiago

Abbas Johari, Cameron University

Francois Marchessou, Universit_ de Poitiers

R. W. Burniske, University of Hawai`i

Abstract

Educators from universities around the world examine challenges faced in translating the revised AECT Code of Professional Ethics into various languages. Issues related to dissemination of the Code at College of Education on a multicultural university campus are also explored.
Translation is an imperfect science. In many instances, finding equivalent words in another language can be impossible. The situation is apt to be confounded even more when concepts that are generally accepted by one national or cultural group are unknown or puzzling in other cultures.

Translation Project

Despite such challenges, a team of educators from universities across the globe who were also members of the International Council (IC) of the Association for Educational Communications and Technology (AECT) initiated a process to disseminate the AECT Code of Professional Ethics worldwide. As the original Code was revised in November 2001 by that Committee and with the renewed emphasis in AECT on international issues, the time for providing translations appeared propitious.

Participants

Seven IC members began the initial process. Although this first group was formed on a voluntary basis, they do address five of the nine languages most frequently used on the Internet: English, Mandarin Chinese, Portuguese, Spanish and French (Global Reach, 2002), along with a less frequently used one, Farsi. Besides doing the actual translations, each translator was asked to reflect on the task of accurately expressing the essence of the concepts and terms of the Code in those languages.

Code of Professional Ethics

The English version was examined in terms of "translating" the Code for a mass audience, that is for faculty, staff, and students at a College of Education at a Research I university. In this latter situation, graduate students in an educational technology program developed a display to focus attention on the new version of the Code that had expanded from 23 to 25 principles and includes modifications for five of the original ones.

Those principles are expressed in three sections related to commitment to the individual, to society, and to the profession. Three principles follow to exemplify the expectations for professional behavior within these three categories. Each section begins with the phrase, "In fulfilling obligations to the individual, the members," (AECT, 2001, para. 5) and is followed by pertinent statements. For example:

Commitment to the Individual. 1.7. "Shall make reasonable efforts to protect the individual from conditions harmful to health and safety, including harmful conditions caused by technology itself." (AECT, 2001, para. 5)

Commitment to Society. 2.6. "Shall promote positive and, minimize negative environmental impacts of educational technology." (AECT, 2001, para. 6)

Commitment to the Profession. 3.3. "Shall avoid commercial exploitation of that person's membership in the Association." (AECT, 2001, para. 7)

Dissemination

Having a code is one step, promulgating it worldwide to members and others who become involved with instructional technologies is another. If the Code is to be disseminated globally, having an English-only version of the Code does not contribute to widespread usage.

Spoken Languages Worldwide

Considering that there are approximately 6,500 languages spoken by the 6 billion plus people in the world today, the task may seem insurmountable. Size becomes somewhat more manageable when it is realized that 2,000 of those languages are spoken by less than 1,000 people (Infoplease, 2001). The task becomes become infinitely more manageable when languages that prevail on the Internet are identified in conjunction with online choices of languages officially used at the Web site for the United Nations (UN).

Language Usage on the Internet

In the case of the former, it is estimated that nine languages are used by 3 percent or more of the online participants (Global Reach, 2002). In terms of the latter, four are selected by visitors to the UN Web site (United Nations, 2001) at a rate of 3 percent or more. As shown in Table 1, when those data are compared, the most frequently selected language is English. Although Chinese is not selected as frequently among visitors to the UN site, it is the next most frequently selected language based on global Internet usage figures. This ranking is not surprising, as Mandarin Chinese is the most popular spoken language in the world (Infoplease, 2001). It can be seen that percentages for use of Spanish and French on the Internet as a whole, as well as at the UN site are fairly similar.

Table 1.
Comparison of Languages Selected for Internet Use Globally and at the UN Web Site

Language	Percent of Global Internet Use	Percent of UN Site Use
English	36.5	84.6
Chinese	10.8	0.5
Japanese	9.7	0
Spanish	7.4	8.0
German	6.6	0
Korean	4.5	0
Italian	3.8	0
French	3.5	4.7

Portuguese	3.0	0

Note. Table is based on figures from Infoplease, 2001 and Global Reach, 2002.

Initial Translation Team

It was fortuitous, then that these initial translators who are educators in the field of educational technology, are fluent in Mandarin Chinese, Spanish, French, and Portuguese. Given that Arabic is one of the official languages of the UN, having a translator who has a Mideastern language, in this case, Farsi, as his first language reflects the spirit of the UN.

Translators in the virtual world like their "real world' counterparts are concerned with avoiding cultural loss and misunderstandings, providing choices, addressing concerns about equivalent concepts, and reaching broad audiences through their work. Many translators who prepare materials for the Web are also faced with avoiding products that result in "overweight" Web sites, that is sites that exceed 40 K in recognition of slow connection speeds in many parts of the world (Yunker, 2002). This latter concern was not a problem in preparing the translations of the Code for the Web site of AECT, given its brief Preamble and 25 one-sentence statements. This team does, however, present some issues specifically related to their task, as well as concerns typically noted by translators.

Mandarin Chinese Translation

The translator for the Mandarin Chinese version of the Code, Clarence Chu from National Taiwan University, a native Chinese speaker, indicated that initially he thought the project would be easy. It was ultimately more difficult than he had expected, even though he is an experienced translator of many books

He saw his task being exacerbated due to the similarity of the Code to a legal document. As such it requires great precision in choosing the right words with every sentence being translated in a very exact manner. For example, in the title alone, the word "Code" has six or seven different meanings in Chinese. Referring to a book of interpretative case studies based on the earlier version of the Code (Welliver, 2001), guided him as he worked to express the key concept behind each principle. Although Chu sees a need for translating that casebook into Mandarin as a further project, he also cites the need to localize some of the scenarios to make them more readily understandable for the targeted audience, thus, offering examples closer to their own cultural experiences.

In Mandarin, it is not simply a matter of characters, but the meaning of the word itself. For example, the word, "technology" means "techniques" in Mainland China and something else in Taiwan. Not just the Mandarin characters, but also many scholarly terms are translated differently in both lands. For this reason Chu suggests that two versions may be necessary for the Mandarin Chinese translation.

Portuguese Translation

Candido Varela de Freitas from the Universidade do Minho, the native speaking Portuguese translator, also saw difficulties, noting that the Italians use a saying, "Tradutore, traditore," which means a translator is a traitor. He sees the truth of this saying since at any step of his work he faced difficulties in putting into Portuguese concepts he had in English.

Concepts cannot be translated, only words can, but words should be able to suggest the concept. The first dilemma he had to overcome, therefore, was "Should I do a literal translation or should I 'adapt' the Code to the Portuguese reality?"

Although Varela de Freitas thought that a literal translation would not be the ideal decision, an adaptation could become a problem because it could distort the real meaning of the Code. He, thus, began working to perform a literal translation, according the following procedures. He wrote a first draft and asked a colleague of his who has perfect command of English to revise his text.

He also had a few meetings with colleagues from his university who work in the field of educational technology. In those meetings he explained the scope of his work and asked for contributions, mainly about how readable the text was.

One of his colleagues found several statements "weird;" she could not understand what they meant. There was a consensus that although the objectives and ideas of the Code are understandable, the text itself made little sense to them as it was written. All of them, did however, recognize the need for such an instrument in Portugal, where each one working in the field of instructional technology has his or her ethics, but has nothing explicitly written.

Based on his work, Varela de Freitas identifies Principles 1.1, 1.5, 1.6, 2.2, 3.1, 3.3, 3.5, 3.9 and 3.10 for a thorough revision.

Considering this situation, he thinks that the translation of the Code into Portuguese is important but that his current Portuguese version should be reformulated to more of an adaptation, rather than being basically a literal translation. The problem is that such adaptation has to be validated to become an official version of the AECT. Despite all these concerns, he keeps his interest in this challenging task.

Farsi Translation

Abbas Johari from Cameron University in Oklahoma, a native Farsi speaker who has worked in the United States for the past twenty-three years, concurs with the difficulties facing translators of this Code of Ethics, as evidenced by the time it took him. His original estimate of a two-hour process in actuality took three days.

He was encouraged, however, when he saw that his colleagues had these problems, as he thought he was losing his language. For his translation he did not use traditional Farsi because he did not have that particular keyboard with him to create that version.

He selected Farsi-Latin because it captures the sounds of the Persian language and is used by so many young people on the Internet. In that form of Farsi, the title of the Code and acknowledgement of the language used appears as, "AECT Kode wojdani: tarjomeye farsi." In that way, the sounds of Farsi language are captured even though the traditional letters are not used. With 80 million people using Farsi, Johari sees the need for making such a version available, despite its not being perfect.

Much like Varela de Freitas, Johari sees the need to have like-minded colleagues in Iran polish it because of the potential for many different meanings. A particular challenge in his native language is that the word order is the opposite—progressing from right to left—as opposed to the left to right order of the English language. Furthermore, the order of words within sentences is reversed. For example, in Farsi, the verb usually appears at the end of the sentence whereas in English it typically appears in the middle.

Johari illustrated his painstaking translation process with a sample of the worksheet he used. Multiple meanings for each word were written and then examined to see what made the most sense. He went through numerous words to find the one that made sense in developing a usable version.

He notes the worry and responsibility he feels and assures all that it will be reviewed by competent translators in the tourist industry in Iran and by university friends.

French Translation

Expressing his perspective, Francois Marchessou from the Universite de Poitiers in France, a native French speaker with over forty years of experience doing translations, sees the Code as being too itemized. The French, he notes, would take much of it for granted. He sees its meanings as challenging. For example, translating "ethics" to the French "ethique" would be viewed as study in the philosophy department. "La morale" refers to ethics in everyday life; it is "built in;" it is the rules which govern your own life. Ethics is something that you practice, not something you publicize; it is personal. "Put it in a code, yes," he says as he acknowledges that there has to be a code. Marchessou, thus, sees the need for a translation and recognizes the consequences, but cautions against using the more theoretical term, "ethique."

To further explicate national differences in terminology, consider that Americans may say that they do not like someone's ethics, while the French would be more apt to say they do not like the person's moral sense. Similar to the concern noted by Varela de Freitas, Marchessou sees translation in some ways as being a betrayal or at times a poetic expression.

Context and background become problems. Who do translators have in mind as they translate? Considering translations for French speaking peoples in developing countries where he frequently consults (as well as some Spanish speaking ones where he also works), Marchessou draws the analogy of a split personality in regard to some aspects of the Code, particularly copyright. That concept is very alien to many people, who are the best of people otherwise. For example, when some of his clients ask to make copies of cassettes, CD-ROM's, and software, he explains the situation and gives the media to them instead. The concept is still a difficult one, even for people with decent incomes, as they view the authors as anonymous and the resources as coming from the rich north, while they themselves do not have the same resources.

Ethics also applies in not influencing people to obtain contracts where influence could be wielded. There is an ethical divide. Some people are not at the stage where they have that type of ethical awareness, although they do have a strong code of ethics within their own families and on person-to-person terms.

In northern French-speaking areas, the Code is seen as a little too itemized. People take ethics for granted. His future translation will attempt to address these aspects. Marchessou also urges examining ways to engage in a dialogue about the Code with people from emerging countries.

Multicultural "Translation"

Annette Sherry from the University of Hawai`i, a native English speaker from the United States, is involved in "translating" the Code on the campus of a large multicultural university in terms of disseminating its ideas widely in English. She challenges her graduate students in the College of Education to develop ways to communicate the concepts to a multicultural audience in a very visible way. Although distribution over a Web site would be her students' first choice, they are required to develop a semi permanent three-dimensional display in a prominent place on campus. That way they can readily reach a large segment of that educational community.

Models related to selected principles were constructed and placed in the entryway of a classroom building one semester. More recently, aspects from the three sections of the Code and the complete text were produced as the tops of three picnic tables. Participants at the grand opening event positively affirmed that the display did inform them about the Code, did encourage positive attitudes and moral behavior, and were visually pleasing. Challenges are to have ongoing evaluation to ensure that the message is being heard and, more importantly, formally assess the impact of this knowledge at the schools where the pre- and in-service teachers who view the display teach. Currently, only incidental anecdotal information is available from the few teachers who choose to share this information.

Spanish Translation

For the Spanish translation, there were two members of the team.

First Translator. The initial translator, Sr. Diaz de Rabago from Universidad de Santiago, a native Spanish speaker from Spain, noted that his first draft was a literal one. After joining AECT in June 1977 and realizing that the association was sound, had a charter, and a Code of Ethics, he presented these aspects at a Congress in Barcelona, including a translation of the Code of Ethics. It was not very useful in Spain, as the translated Code was viewed as being very precise and legal.

Time went on and this new request came. In a few weeks he had his first draft, but wanted second one. Some refer to philologists and some to the lawyers, which he sees as being worthwhile because ethics can differ from place to place.

When an association, such as AECT, says it is international it needs to deal with such a problem. Sr. Diaz de Rabago sees a need to move in a new, more realistic direction for the Code because it is good to attack this problem to provide a good, clear interpretation for those in the association. It should be remembered that there must be trust towards the translators that are selected.

Second Translator. R. W. Burniske from the University of Hawai`i, an English-speaker from the United States, approached revising Sr. Diaz de Rabago's translation as a non-native speaker. His is the perspective of one who learned formal Spanish in southern Spain in the early '80s, but later encountered a very different form of the language while working in Latin America.

? Whose Spanish is this? Is it the Spanish of northern Spain, southern Spain or a Latin American country?
? Who is the audience for this translation?
? What is the context?

In terms of whose Spanish it is, Burniske points out that the word, "shall" appears in the Code very frequently. In English "shall" is not "will." In Spanish it translates as "deberan" which is "should," "ought," or "must." "I couldn't help wondering," Burniske observed, "if our audience would ask why AECT has the authority to tell them what they should, ought, must do?" He further adds that it sounds almost biblical, as though the document were delivered in the form of commandments. What's more, a term such as "harassing" reveals a North American bias, carrying connotations which are absent from many translations. In the Spanish language, for example, "harassment "would be "poco respetuosa," which means "lack of respect," but fails to get at the kinds of issues implied in the English version.

In regard to audience, he questions whether the Code is being translated for K-12 or university professionals. For example in Section 3.1 of the Code, encourages diverse intellectual points of view. While this may seem a fundamental principle of Western, democratic societies and institutions of higher learning, secondary schools in developing nations might not readily embrace different points of views. In several Latin American countries, therefore, it might be difficult for educators to remain faithful to the Code while also maintaining an amicable relationship within their schools and communities

With regard to the final concern, that of "context", Burniske cites Section 2, Principle 2.4 which discourages the acceptance of gifts that "might impair or appear to impair professional judgment." At the conclusion of workshops he has conducted for the World Links program for educators in places as diverse as Ramallah, Uganda and Brazil, he has frequently received gifts from workshop participants. This presents a difficult conundrum for those who wish to abide by the Code: loyalty to the Code would suggest rejection of the gifts, but rejection of the gifts could be interpreted by local custom as a rude gesture that potentially damages the relationship that the gift was intended to nurture.

Burniske urges AECT to think of the document as a work in progress, a dynamic Code. To further contribute to its global impact he suggests that it be posted on the Web and input be sought from around the world through discussion forums where readers can contribute suggested revisions of the original document as well as the respective translations

Conclusion

Although many questions remain unanswered, these early translations of the Code of Ethics will be available at the AECT Web site to ensure that access to the principles is offered in languages other than English. Other languages will be added to the Farsi, French, Mandarin Chinese, Portuguese, and Spanish, translations as they become available. The translations will be saved as PDF files to retain the unique characters of each language.

Additional translators with expertise in both educational technology and the targeted languages are being identified. Exploration about ways to encourage debate about the viability of the translations within diverse cultures is underway. Collaboration between the members of the Professional Ethics Committee of the AECT, the translators, and interested members could result in the development of a Code of Ethics that is read by, and "speaks to," all within the profession worldwide.

References

Association for Educational Communications and Technology [AECT]. (2001). Code of ethics. Author. Retrieved November 4, 2002 from http://www.aect.org/About/Ethics.htm

Infoplease.com. (2001). Ask the editors. Family Education Network, NY. Retrieved November 4, 2002 from http://www.infoplease.com/askeds/5-24-01askeds.html

Global Reach. (2002). Languages on the I-net. Zephyr Cove, NV: Author. Retrieved November 4, 2002 from http://www.global-reach.biz/blobstats/index.php3

United Nations. (2001). UN Website statistics. New York: Information Technology Section, DPI UN. Retrieved November 4, 2002 from http://www.un.org/Depts/dpi/bulletin/1/stats.htm

Welliver, P. W. (Ed.). 2001. A code of professional ethics: A guide to professional conduct in the field of educational communications and technology. Bloomington, IN: Association for Educational Communications and Technology.

Yunker. J. (2001). Building Web sites without the wait. Multilingual Computing & Technology, 12(3), 35-39.

Virtual Reality Panoramas and Hyperlinked Digital Images: Tools for Qualitative Inquiry of Preservice Teachers' Technology Learning.

David S. McCurry

Monmouth University

Abstract

This paper reports on the use of hyperlinked digital images, including still images and 360-degree panoramas, digitized audio recordings and online reflections by pre-service teachers used as data in qualitative critical inquiry about preservice teachers' technology learning in a low socioeconomic district. Included are explanations of the process of image acquisition, elicitation of participant responses and issues related to working with this technology in analytic processes. Also discussed are the implications for qualitative methodology in classroom research. The latter are highlighted through issues related to existing development of visual ethnography and critical inquiry methods in contextual analysis of preservice candidates encountering populations and communities unlike their own.

Introduction

The classroom is a rich, cultural environment that reveals as much about the teaching process as it does about the cultural actors who inhabit it. One particularly significant intrusion into this environment in the past two decades has been the computer. Although much research has been undertaken in classrooms, understanding the complex realities of classroom use of technology is problematic. The characteristics of use have been linked to teacher attitudes and self-identity with pedagogical approaches (Becker and Riel, 2000). How teachers think about their own teaching and about technology are reflected in their classroom practices. Access to classrooms, for the researcher, is not always easy, especially in the current climate of increased security and concern for anything that detracts from tightly scheduled routines, adherence to structured curriculum programs, or activities not accounted for in school reform programs or local professional development opportunity. Even with these restrictions, many schools still engage in supporting observation, practicum and supervised field experiences for pre-service teacher candidates, typically matriculating in local college or university programs. For the university professor, these activities offer possibility for research collaboration, contact with local teachers and school officials, and opportunities to further the project of understanding education from the "inside".

While traditional approaches to observation in classrooms include such diverse approaches and methods as qualitative note taking, video and audio recording, and quantitative frequency counts of coded behavior, new technologies offer yet additional possibilities for data collection and analysis. Virtual Reality[i] (VR) panoramas, using available software and publishable through CD-ROM and web page development, provide a rich, contextual visual field which can link to document files, audio clip interview data, still images (which provide close-up, detailed image data of specific aspects of the learning environment), and other electronic resources. This paper describes both the use of this technology as a data collection and organizational method and preliminary findings from the use of this method in classroom research about technology.

The materials are generated and compiled into multimedia case studies, available on CD-ROM for teacher candidates to browse and develop their own critical reflections. Pre-service learners are involved in discussion and development of the materials with local cooperating teachers, students in classrooms, and with their university faculty. The research into classroom practices therefore yield important study material as well as rich document and data sources for analysis of classroom practices related to technology use.

The use of case studies to enhance professional development programs is well known in the fields of business, law and medicine but is a relatively recent innovation in teacher preparation (Lacey & Merseth, 1993). Case studies allow preservice and in-service professionals opportunities to explore critical issues through real examples, drawing on familiar contexts and situations, with an expected high degree of transfer to future practice. Traditional case studies are print text oriented, sometimes with supporting photographic, audio or video recording documentation. These are typically offered in a parallel construction where participants follow-along with the text. In these latter examples, cases are typically descriptive in nature, offering complete pictures of a specific scenario, actor/participants, assumed problems, which are pre-defined, or assumed to be obvious, and directed, expectant and narrowly defined outcomes. Multimedia technologies, especially digital images, video, audio and electronic text, offer the possibility of non-linear, hyperlinked constructions which allow learner-defined and directed as opposed to 'scripted' access to and organization of the information. Outcomes of scenarios, which are rich in detail and context, can be multiple and need not be pre-defined within the material itself.

Another aspect of the methodology of using cases in teaching is in the promotion of "case-based reasoning," where analysis of documented real, or near-real situations or scenarios lead to problem-posing, or "problematizing" (as a construct of critical pedagogical practice), hypothesizing, critically contrasting possible solutions, and problem-solving. Problems, in these contexts, are typically of the "ill-structured" variety (Simon, 1973, 1984; Voss & Post, 1988; Jonassen, 1997), where many variables may interact and multiple possible outcomes or solutions may present themselves. The application of problem solving structures and research has also been extended to interactive hypermedia scenarios (Gibson & Albion, 1997) and has drawn great interest in educational research that examines the cognitive foundations of learning and classroom practice.

Multimedia case studies also provide rich, complex, and contextually authentic examples of classroom practice and information for analysis, discussion and learning (Goldman, Barron & Witherspoon, 1991; Merseth & Lacey, 1993). Case examples are often used as discussion material to help candidates develop constructions of "right and wrong" approaches related to various methods and theory. Video case studies in particular are often constructed to represent "best practice" by simulating synthetically constructed scenarios (both good and bad) for the participant to interact with and to choose from a limited range of available outcomes. Less common, however, are the uses of case examples to facilitate critical inquiry, as most case studies are either fictional, focus on divining "appropriate" responses to fixed scenarios, or are otherwise removed from more immediate contexts of the learner. Reflexive, critical discussion between the new preservice teacher and the more experienced host teacher is often curtailed in typical field experience settings owing to time constraints, miscommunication and the relative inequity of university student and professional teacher relationships. Rather than exposing candidates to a collection of "right and wrong" exemplary cases on videotape, the use of a critical approach engages local teachers and teacher candidates in the self-critique and narration of their own practice. In this way, teachers are highly involved in the development of the material along with university faculty and preservice certification candidates.

The practices involved with collecting or creating scenarios for cases to be included in various case methods approaches are also varied. These can range from complete works of fiction (grounded in familiar realities and experiences) to cases representing actual events in classrooms and in schools. In the latter examples, the classroom events are documented through any one or a combination of video, photography (digital and analog), sound recordings, documents and narratives derived from observations, self-reflections and interviews. In selecting the classrooms to study, the researcher purposely did not position "best example" teachers or classrooms in the data collection process. The idea was to collect more of an authentic glimpse into classrooms and school environments which would further be open to analysis and observation by pre-service teacher candidates as well as the researcher.

Purpose of the study

This study is both an exploration of new methods of qualitative research using multimedia technology, and an inquiry into how teachers utilize technology resources in the classroom. The presence of technology, and the expectations for its use, are factors shown to be related to teacher's pedagogical method and self-efficacy (Becker and Riel, 2000). Through the use of these qualitative tools, a better understanding of classroom practice with technology might be revealed in teacher's own reflections on the technology as an artifact in the unique environment of the classroom. This research is directed at finding out two things: 1) What are teachers doing with technology in their classrooms and how do they think and discuss these practices when reflecting on and in their own classrooms, and 2) How can VR panoramic images be used in such qualitative inquiry to elicit teacher meaning (about technology) and provide better understanding about the relationship between pedagogical practice, technological interventions, and the school culture and environment?

Methods

The methods used in this inquiry are informed by ethnographic traditions, particularly visual ethnography (Collier & Collier, 1986; Collier, 1995; Pink, 2001) and methods used more typically in visual sociological studies (Banks & Morphy, 1997). Such methods seek to uncover and reveal patterns in meanings and definitions as represented in description and analysis of documents, interview transcripts, and elicited comments from visual stimuli, such as photographs and video or film and are broadly referred to as "image-based research" (Prosser, 1998). Recently, the availability of VR images (rotational objects, panoramic images), provide additional materials to use as data collection tools in interpretive inquiry. In particular, photographic images used as materials to elicit comments for analysis purposes have been used in teacher professional development (Kanstrup, 2002).

In collecting images and interview recordings for developing multimedia case materials, it became obvious that a rich source of data for inquiry into classroom practice, along many dimensions, were being accumulated. The computer software used to create the panorama images, hyperlinked environments, and output to multimedia content was The VR Worx™ by VR Toolbox. The software is available for both Macintosh and Windows platforms and can be used to create panoramas, rotational objects, and "VR scenes" where multiple panoramas are linked together. The implications of this feature are discussed below.

Qualitative software (QSR NVivo™) was used to encode participants' responses from audio and video interviews, university student online discussion postings, and other relevant documents. Such computer assisted encoding and analysis is becoming well established in qualitative methods (Kelle, 2000). Encoded texts were linked to visual nodes in the materials to establish data triangulation. Emergent discussion reveals (as an ongoing study) patterns in the self-efficacy of preservice teachers, working with rich multimedia technology and materials. Teacher's ability to relate the use of technology in their classrooms is related to their self-perceptions of the learning environments they create. In the particular context of the field study in which these case studies are drawn, the socioeconomic status of the district (low, working class) contributed to the motivation for innovation and school renewal. The latter is a response to external pressures from state and national government movements (court decisions and state educational policy), and an historical identity in the community, which positions the community as an "underdog" (underclass) community in the local region. The reflexive documentation of the school community by university students, classroom teachers, and university faculty provides a unique example of multimedia technology use in a qualitative study. Implications for collaborative study and research, using the qualitative software will be discussed.

Findings

The teacher interviews relate particular attitudes, anecdotes, and reveal value assumptions about technology and their own practice. The VR panoramas provide a very powerful way of letting the teacher manipulate the images and create a process of "self-elicitation" where they talk, during the interview process, about their own classroom practices and specific instances of using the technology. Such results are rich in detail, many more times than would be collected from surveys or structured interview results. One teacher reveals, for example, when viewing the classroom panoramic image, that the computers had been given to the classroom as part of the whole school reform program. The indications in her coded text reveal further assumptions about the non-investment which teachers feel when the technology is given from "the top down" (i.e. through administrative directive). Problems encountered with technology ("That new Dell over there, for some reason… which never seems to work") are also pointed out in the process of teachers reflecting on these VR models of their own classrooms.

The other data set, pre-service teacher candidate reflections provided through their online course support area, gives additional reason to believe that teachers do not utilize technology in accordance with emerging practices. Their observations, converted to text and coded in the qualitative software, are matched to nodes in the classroom teachers' elicited comments and reflections on their own technology use. Specific instances or events, with shared meanings, are open in these data constructions to intersubjective analysis. What teachers say about their own technology use may, or may not, relate to observations made by their pre-service teacher students. The process of reflexive dialogue, created through the use of the materials, holds potential for further developing the case analysis as a method of both pre-service teacher and professional teacher development.

Creating the multimedia materials is time-consuming and requires a relatively high level of technological skill with specific software routines. Familiarity with multimedia technologies is highly recommended. The cost of the software and the camera equipment (tripod, recording devices, etc.) was not exceedingly high.

Discussion and methodological implications

The technology described in this study has been widely used in developing "virtual tours" for the real estate and tourism industries through online marketing programs, and in product marketing and promotion where products (as objects) can be examined in virtual, 3 dimensional rotations. The use of this technology in qualitative study represents another advancement in building interpretive contexts that are founded on visual sociology and anthropology. As an exploration of new methods, the virtual images of the classroom created with the teacher' involvement become part of the process of eliciting meaning about technology practices and classroom culture. The resulting data in the form of hyperlinked nodal points within the images offer levels of interactivity and opportunities for exploring which far exceed static images or viewing analog videotapes of classroom practice. While the latter can be coded and analyzed using any one of many existing protocols, the "frame" of the image is fixed during recording. VR panoramas provide a moveable frame, giving control over the selection of objects and detail to the viewer. This is a departure from previous visual data collection and analysis tools.

New technologies usually bring one of several new characteristics to existing practice. One distinct characteristic of the panoramic material is in the ability to create a near-sensation of standing in the physical environment of a classroom, school hallway, playground, or one of the many other spaces of schools as cultural domains. Unlike static, still images - though these can be very rich, highly discrete forms of visual data – or video and film motion images, the visual panorama provides the ability for the viewer to control the frame of visual reference, scanning back and forth, up and down, while selecting specific points of interest in the visual field to locate and consider for analysis. Further, because of the digital ability to hyperlink the image to external sources (images, video, audio clips, or other panoramas), the possibility of creating virtual interactive maps of school cultural environments exist.

The "Scene" capability of the VR Worx software, in creating multiple, linked panoramic images holds great potential for building rich visual contexts for interpretive analysis. Such scenes can be joined to form a large-scale, visually documented and navigable "virtual" reality for elicitation of participant comments, analytic critique, and analysis within a variety of applied frameworks, such as program evaluation, cultural and communicative practices within the school environment, and more pragmatic concerns of pedagogical practice and efficacy.

In one potential application, internal scenes of classrooms can be linked to hallways, which are in turn linked to school exteriors, which are linked to further locations in actual community environments. In this way, an observer accessing this material could literally navigate his or her way from a point in a classroom, through the door leading into the hallway, down the school building corridors, perhaps stopping in the office to interact with recorded interviews with school administration, move out into the entrance, through the doors, and out onto the street.

The data, once collected and analyzed, can also be re-constructed into the ethnographic case-example for further exploration by other pre-service learners or researchers. The digital format of the materials is also potentially well suited for collaborative and distributed qualitative study. While standardization of qualitative practices is a problematic area in methodology, online collaboration is being facilitated through various projects (see Kanstrup) and could be used to form large-scale connected ethnographies of classroom studies with rich data sets, and intersubjective interpretation across large numbers of participants.

References

Banks, M. and Morphy, H. (Eds.). (1997). *Rethinking visual anthropology*. New Haven, CT: Yale University Press.

Bauer, M. W. and Gaskell, G., (Eds.). (2000). *Qualitative researching with text, image and sound*. London: Sage.

Becker, H. J. and Riel, M. M. (2000). Teacher professional engagement and constructivist-compatible computer use. University of California, Irvine: Center for Research on Information Technology and Organizations. Accessed online 11/02 at: [http://www.crito.uci.edu/tlc/findings/report_7/startpage.html].

Collier, John Jr. (1995). Photography and Visual Anthropology. In Paul Hockings (Ed.), *Principles of Visual Anthropology* (pp.235-254). Berlin: Mouton de Gruyter.

Collier, John Jr. & Collier, Malcolm (1986). *Visual Anthropology—Photography as a Research Method*. Albuquerque: University of New Mexico Press.

Gibson, I.W. and Albion, P.R. (1997). CD-ROM based hypermedia and problem based learning for the pre-service and professional development of teachers, in Conway, J., Fisher, R., Sheridan-Burns, L. and Ryan, G. (Eds.) *Research and Development in Problem Based Learning*, Newcastle: Australian Problem Based Learning Network, 4, 157-165.

Goldberg, B., and Richards, J. (1995). Leveraging technology for reform: Changing schools and communities into learning organizations. *Educational Technology, 5(*16).

Goldman, E., Barron, L., and Witherspoon, M. L. (1991). Hypermedia cases in teacher education: A context for understanding research on the teaching and learning of mathematics. *Action in Teacher Education*, 13(1), 28-6.

Hine, C. (2000). *Virtual ethnography*. London: Sage.

Jonassen, D. H. (1997). "Instructional Design Models for Well-Structured and Ill-Structured Problem-Solving Learning Outcomes". In, Educational Technology Research & Development, 1, 65-94.

Kanstrup, A. M. (2002). Picture the practice – using photography to explore use of technology within teachers' work practices. Forum: Qualitative Social Research, (3)2. Accessed 10/27/02 online at [http://www.qualitative-research.net/fqs-texte/2-02/2-02kanstrup-e.htm].

Kelle, U. (2000). Computer-assisted analysis: Coding and indexing. In Bauer, M. W. and Gaskell, G., (Eds.). Qualitative Researching with text, image and sound. London: Sage.

Lacey, C.A. and Merseth, K.K. (1993). Cases, hypermedia and computer networks: Three curriculum innovations for teacher education. *Journal of Curriculum Studies*, 6, 543-552.

Merseth, K.K. and Lacey, C.A. (1993). Weaving stronger fabric: The pedagogical promise of hypermedia and case methods in teacher education. *Teaching and Teacher Education*, 9(3), 283-299.

Pink, S. (2001). *Doing visual ethnography*. London: Sage.

Prosser, J. (1998). *Image-based research, a sourcebook for qualitative researchers*. London: Falmer Press.

Simon, H.A. (1973) The structure of ill-structured problems. *Artificial Intelligence*, 4, 181-201.

Simon, H.A. (1984). The structure of ill-structured problems, in Cross, N (Ed.), *Developments in Design Methodology*, pp. 145-164, Chichester: Wiley.

Voss, J. F., & Post, T. A. (1988). On the solving of ill-structured problems, in M. T. H. Chi, R. Glaser, & M. J. Farr (Eds.), *The nature of expertise*, Hillsdale, NJ: Lawrence Erlbaum. 261-285.

VR Toolbox. (1999). The VR Worx. Virtual Reality software for Windows, version 2.0. Pittsburgh, PA: VR Toolbox, Inc.

Walker, R. & Lewis, R. (1998). Media convergence and social research: The Hathaway Project in Prosser, J. (Ed.) *Image-based Research*. London: Falmer Press.

[1] Although the term "virtual reality" is commonly used, precise definitions do not yet exist. In this study, the panoramic images are termed "virtual reality" by the developers and vendors of the software used to create and transmit the images and the use of the term in this paper is consistent with that definition.

Evaluations of reflective practice: The design, development, and implementation of an advanced graduate course in Web-based instructional design

Marti Fyne Julian, Arizona State University

Valerie Ann Larsen, Indiana University South Bend

Ann R. Igoe, Arizona State University

Abstract

This paper discusses the design, implementation, and adaptations of a graduate-level course in Web-based instructional design and development. Emphasis was placed on learners' self-regulation and reflective practice as they explored the application of instructional design and development concepts and principles. These included pedagogical, technological, organizational, and ethical issues related to the design, development and assessment of Web-based instructional design.

Introduction

Design and Development of Web-based Instruction (WBI) is an advanced instructional design course. Employing the apprenticeship model introduced by Donald Schon (1987) to encourage reflective practice and later within the context of instructional design courses by Ertmer and Cennamo (1995), students engage in authentic design activities in a studio environment.

The intent of WBI is to equip students with a real-world experience that will help them transfer what they learn in graduate school to professional practice. In this case, the learning environment integrates classroom (face-to-face) and virtual (Web-based) environments. The unique skills and life experiences of each class member serve as the foundation for collaboration and productivity.

The objective of this course is the application of instructional design and development concepts and principles. These include pedagogical, technological, organizational, and ethical issues related to the design, development and assessment of Web-based instructional materials. Learners apply relevant instructional design principles that include the analysis of complex instructional design situation for a client and designing, developing and evaluating a Web-based intervention strategy. The students develop their interface design skills through the evaluation of Web-based instructional and resource materials and base the design of their instructional Web site functionality and look and feel on usability guidelines.

Background

The Reflective Practitioner

Preparation for professional practice, in any design profession, presents unique challenges to academic programs. While students of design readily grasp the technical processes and theoretical foundations that serve as the framework for their professional practice, many struggle to transfer what they learn to the instructional design workplace. As novice designers, they often adopt a mechanistic approach to the models that guide practice because they lack the experience that will enable them to reflect on and evaluate the multiple factors influencing a situation. The problem solving and generation of solutions in complex situations, which require components of reflective practice such as intuitive, creative and critical thinking, challenge the design students and their instructors (Schon, 1987). Reflective practice refers to the metacognitive processes, the internal and external conversations, that experts engage to improve practice by drawing connections between theory and practice while making judgements about ideas and actions (Hinett & Weeden, 2000).

Problems that mirror the complexities and issues that exist in real-world problems can promote reflective conversation among novices when accompanied with a variety of examples early in the learning experience and encouragement to share their perceptions on the process. Learners practice solving problems as they become aware of the metacognitive strategies that experts use identify and analyze complex situations (Gage and Berliner, 1984). In doing so, the learners explore relationships between cause and effect, the interdependence of the component parts of a design process, and begin to recognize the significance of the rules, theories and procedures that form the foundation for practice. The learners begin to internalize the design process.

Schon (1987) suggested using a practicum studio experience that promotes reflection under the guidance of an expert practitioner who coaches the students as they solve problems and generate solutions. He described the practicum studio as a virtual world, designed to approximate real-world situations, while providing novices a means to develop their skills without the consequences of making errors in an actual work environment. The expert-instructor's modeling of the thought process helps learners develop an awareness of quality and of the interdependence of the component parts of a systems. They begin to recognize the significance of the rules, theories and procedures that form the foundation for reflective practice. Schon felt that this provides a means for learners to internalize the design process.

Reflective ID Practice

Over the past decade, numerous instructional strategies, including Schon's practicum studio, have been implemented in graduate ID courses in an effort to increase the breadth and depth of the ID experience that novices can take with them into the workplace. Many of the strategies, adopted from other design fields, such as architecture and engineering, successfully implemented open-ended learning experiences that encouraged reflective practice. Their objective was to incorporate some of the skills that research into professional practice and cognitive learning theory uncovered such as collaboration, problem-solving, management, and effective, yet flexible implementation of the ID process. Other strategies for promoting reflective practice included methods such as real-world projects, apprenticeships, and case methods (Rowland, Parra and Basnet, 1994).

Studies into the effectiveness of these learning environments demonstrated that students were enthusiastic about the opportunity to practice their skills in novel situations under the guidance of expert instructors (Ertmer & Cennamo, 1995; Julian, Kinzie & Larsen, 2001). Ertmer and Cennamo (1995) also explored the use of real-world projects, but focused the students on their cognitive and metacognitive processes rather than simply on procedural skills engaged during the design and development process. The 'expert' instructors modeled their cognitive and metacognitive skills by talking aloud as they reflected on design issues and provided the students with feedback on their projects. Ertmer and Cennamo found that this was a positive learning experience for their students and observed them taking the time to think through the process before jumping to the generation of solutions. They felt this resulted in an increased understanding of quality design. While some students excelled in these open-ended activities, however, others struggled without a concretely-defined problem or failed to draw connections between the foundations they had learned and the process of solving ID problems in a complex situation (Julian, Kinzie & Larsen, 2001). Ertmer and Cennamo (1995) also found that the students required coaching throughout the process to keep them from getting too far off base and they benefited from frequent encouragement to consider multiple perspectives and reflect on their decisions. We have found that the instructional design of on-line materials increases this challenge, adding interface issues such as functionality, accessibility and look-and-feel as well as programming, monitoring and site-maintenance.

Our advanced instructional design course, *Design and Development of Web-based Instruction* (WBI), seeks to meet this challenge with strategies such as expert modeling and peer review that encourage behaviors characteristic of the reflective practice exhibited by expert designers. The students engage in authentic activities and develop products for actual clients as they consider the pedagogical, ethical, technical and organizational issues related to Web-based environments.

In this paper, we discuss the design and implementation of *Design and Development of Web-based Instruction*. We describe the adaptations we made prior to the second offering of this course to enhance the students' development of their reflective practice skills. This included the addition of practice on-line evaluation activities that introduced the students to self-regulation and reflective practice before they began their ID projects. When used in conjunction with objective evaluation criteria, we found that this provided the students with an experiential foundation that enabled them to organize and communicate their ideas as they designed and developed Web-based instructional modules. We also describe the evolution of the students' perceptions on evaluation, peer review and the instructional design process. While all of the students embraced the benefits of peer review and feedback, some continued to struggle with the cycle of feedback and revision, especially during the design phase of their projects.

WBI: Semester One

To facilitate reflective practice, we encouraged our students to apply their instructional design skills in a variety of situations. Teams of two to four members completed a real-world project for an external client, and participated in problem-solving activities based on project excerpts and case scenarios. Their process of reflective practice involved discussions and presentations that solicited facilitator and peer review and feedback. As facilitators, we used the think aloud process to model our analyses and reflections and the students were encouraged to provide each other with constructive feedback that would enable their peers to improve the efficacy of their designs. We introduced the students to the concept of reflective practice and invited them to read about it on our class Web site.

Authentic Design Projects

The students began the semester with the task of identifying a client with a problem-based instructional need that might be resolved using a Web-based environment. The students presented their project proposals, and the instructor facilitated selection of projects and teams based on the type of need and the feasibility of completing the project in one semester. The student teams then conducted a needs assessment in which they used the results of an environmental analysis to specify the need and describe the characteristics of the target audience, stakeholders and the practice and work environments. The project teams followed a timeline that integrated the generic instructional design model with prototyping and usability practices (Table 1). They presented their progress to the class and participated in review and feedback sessions with one or two teams each week. Following completion of the major components of each stage of the design, the teams also met with their clients to review the design and discuss revisions.

Instructional Design Project Timeline	
Week 2	Idea generation: Identify target audience prototypers and formative evaluators : Client/assumed need
Week 3	Instructional Design Needs Assessment
	Project Management: Design Schedule, Time Logs
Week 4	Goal Analysis/Task Analysis
Week 5	Objectives and Assessment Items
Week 6	Instructional Strategies: Development Needs Assessment
	Instructional Strategies: Selection
	Content Analysis: Content Map
Week 7	Functionality Design
Week 8-10	Prototype I
	Revisions/Prototype II: target audience, client, target audience instructor (if applicable), content expert
Week 11	Web Development/Project Management Development Schedule/Time Logs
Week 12	Formative Evaluation
Week 13	Revisions
Week 14	Final Submission/Final Presentations

Supplemental Activities

Although basic technology skills were prerequisite to this course, the students explored the framework and logic of Web development technologies. They completed mini-projects such as Photoshop collages, button and background graphics, and development of pages scripted in HTML. Discussions followed, and the students were encouraged to reflect on their design and Web-user experiences as they discussed the literature about current technologies and functionality design. Case scenarios, which were used to model new concepts and discuss complex situations, were discussed in the course on-line discussion area.

Initiating Reflective Practice

When we first implemented this course, we found that most of the students were enthusiastic about the studio environment. They saw this as an opportunity to design products in an environment where they could benefit from the guidance of an expert designer. The students exhibited reflective practice to varying degrees over the course of the semester and we found that it was most evident when they engaged in general discussions or the analysis of scenarios. We observed that they hesitated to engage this process, however, when they met to discuss and present their projects and related activities. They often struggled with their role as peer-reviewers and were apprehensive about offering feedback that did not praise their peers' work. Comments tended to focus on compliments about effort. The students also struggled to explain their rationale for design decisions and, when students did offer constructive feedback, some of the recipients were reluctant to consider the opinions of others.

Through facilitator coaching and modeling, however, the students' hesitancy to engage in reflective discourse began to dissipate as assignments neared completion. --By the end of the semester, several of our students engaged in discussions that focused on the tasks at hand and described their rationale for decisions and potential solutions. On an informal basis, some of our students shared their perspectives about their initial reluctance to discuss their reflections on their own projects or provide feedback to their peers. They noted that it had taken considerable time for them to regard themselves qualified to evaluate their decisions or those of their peers because this had been a new process for them and a new way of thinking about design and development. We determined that limited experience in this role, especially in the evaluation of on-line materials and, consequently limited confidence, created a barrier to effective participation in this process. --Just as designers draw upon prior experiences when analyzing problems and identifying solutions, novice designers require experiences that they can draw upon when engaging the metacognitive skills that define reflective practice.

A Model for Reflective Practice

We decided to adapt our course and build a model for reflective practice by:

- Introducing the students to the process of reflective practice before they were called upon to evaluate their designs or those of their peers, and
- Equipping them with objective tools for critical review and feedback so that they felt qualified and objective in their decisions.

The MERLOT Portal (www.merlot.org) is a collection of on-line instructional materials, expert and peer evaluations, and criteria for reviewing on-line instruction. Noting that these components could mirror our class project review and feedback system, we chose the MERLOT Portal as the springboard for our students' introduction to reflective discourse, and designed an experiential activity.

Activity Guidelines

The activity began with student creation of evaluation templates that were based upon Merlot’s on-line instruction criteria and the instructor's interface design guidelines. The templates then served as guidelines for individual, team and whole group evaluations of instructional materials linked to the Merlot portal. The students then compared their evaluations to Merlot’s expert and peer evaluations. Following each stage of this activity, the students participated in on-line discussions that were facilitated with questions about the evaluations and reflective practice. The first discussion focused on template design and the students' evaluation experiences and later evolved into a discussion focused on the interrelationships between reflective practice, evaluation, expert and peer feedback. In the final discussion, the students shared perspectives on transferring this experience to their project design and development.

Our first participants in this activity were nine students who were enrolled in Web-based Instructional Design and Development, an advanced ID course. The students worked in instructional design teams that had been formed for their semester projects. Their introduction to the activity described a process for critically evaluating on-line instruction so that they would be equipped to evaluate their own designs and offer feedback to their classmates. The students used the following guidelines (Table 2) to complete their activity evaluations. They presented their findings in class, compared them to the expert and peer reviews on the MERLOT site, and discussed the similarities and differences between the evaluations. The activity concluded with the final on-line discussion about transfer (Table 3):

Table 2: Site Evaluation

A. MERLOT Site Selection: www.merlot.org
   1. From the subject links, select the content area related to your ID project topic.
   2. Follow the sub-topics and identify two or three interactive Web-based instructional sites.

i) Do not select informational sites

3. Do not view the peer or expert reviews (We will explore these reviews at a later date.)

B. Template, Review and Evaluate

1. Download two documents for this activity: MERLOT Evaluation Criteria and Usability Guidelines
2. Work with your team to create evaluation templates based on the MERLOT Evaluation Criteria and Usability Guidelines.
   i) Leave spaces so that you can fill in the templates when you evaluate the sites you identified.
3. Have each team member evaluate one or more of the sites
   i) For criteria that does not apply to your site, mark, "N/A"
4. Exchange evaluations with your team members.
   i) Review the site(s) and add comments.
   ii) Second reviewer: you may want to use a different color ink so that you can remember what you added
   iii) Discuss your results with your team's members and create a final copy of your evaluation for the class.

C. Strengths and Weaknesses

1. Create a list of the primary strengths and weaknesses for each instructional site your team reviewed.
2. Create a discussion thread (linked to this discussion forum) for each site and enter the name in the subject line
3. Start your message with the site's address and follow with your list of the site's strengths and weaknesses
4. Prior to our next meeting, return to the discussion forum and review the evaluations.
5. Post a comment sharing your perspective on effective Web-based ID.
6. Prepare a brief five-minute presentation on the strengths and weaknesses of the Web sites you evaluated.

Table 3: Reflective Practice

Now that you have completed the MERLOT activity, evaluating content, design, usability, and comparing your results to the MERLOT evaluators, the next step is to consider your design and peer review of our class projects.

Please complete the following:

A. Literature summary on reflective practice

1. Review the three pages of literature on reflective practice in the "About" section of our course Web site
2. Consider what it means to:
   i) Reflect before you design (reflection before action),
   ii) During design (knowing and reflecting during action), and
   iii) When reviewing your project or peer projects (on action)

B. Post comments to the following discussion threads

1. How can your experience from the MERLOT evaluation activity transfer to self-reflection (Before, During and On-reflection) as you design and develop your project this semester?
2. How can your experiences from the MERLOT evaluation activity transfer to your critical peer feedback that you provide to the other teams about their projects?

How can your experience evaluating and reviewing critiques through the MERLOT activity help you process and apply feedback from peers when revising your ID project?

What did we learn from the MERLOT Experiential Activity?

Modified templates form objective evaluation tools

The production of templates required negotiation among team members and careful review of the evaluation tools they were adapting. In addition to negotiating the guidelines we provided, most of the participants explored the design Web sites we recommended, the most popular being www.usability.gov. All of the participants felt that this process helped them to explore and understand each criteria item. As one student noted, customizing the templates helped her team to become "so familiar with each concept" that they were able to use their template to objectively review a site and identify "not only what worked, but ways to improve the learning experience."

Another found that the template creation focused her evaluation.

> *I think one of the most important things that I learned from the MERLOT evaluation was from creating the templates. It forced me to read and extract the most important points from the guidelines and use those points to evaluate different sites that were totally different. Personally, it helped me focus on important aspects of the site without wasting time on superficial things. The result was a well-oriented and rich evaluation.*

Expert evaluation comparisons confirm qualifications

The class discussion on Merlot's expert and peer reviews focused on the subjective nature of evaluation and the students' recognition that they were qualified to share their perspectives on effective design. This was evident in the on-line discussion about important characteristics of effective Web ID. In addition to listing instructional and interface characteristics of effective on-line instructional design, seven of the nine participants noted characteristics that are commonly overlooked when sites are designed or evaluated.

> *I think it is important and often overlooked that the content is appropriate for the medium. If objectives state a learner will be able to <u>do</u> something, then it must be testable via the medium. Otherwise, a blended solution should be offered that allows assessment as an off-line activity.*

> *We used complex criteria to evaluate the site, but it shows how the type of evaluation criteria can affect rating results.*

> *We think the MERLOT evaluator could have focused on a variety of criteria that are important from a teacher's point of view (see our attempt to categorize those criteria in our evaluation templates).*

Six of the participants also noted that the comparison provided ways they could "add to their review guides" and improve their evaluation tools.

Self-reflection means self-awareness about the development of expertise

The participants felt that the MERLOT activity was a springboard for their development as Web-based instructional designers. They shared comments on ways that it advanced their ability to engage reflective practice.

> *The MERLOT evaluation activity allowed me to reflect on my own actions; it challenged my view on characteristics of Web-based instruction… I am a little bit closer now to my goal to become a reflective practitioner who is not afraid to experiment or change.*

> *The activity has helped me frame web site design into three general areas: content, potential as a teaching/learning tool, and usability. This gives me a framework for dealing with web design in chunks instead of one overwhelming creation. These areas help me focus my solution.*

The students expressed in class discussion and again on-line that the "MERLOT activity provided structure for the review and feedback process,"

> *The MERLOT activity gave us a vocabulary that we accept and experiences to draw upon.*

The MERLOT activity will help me to build a mental map of my site in my head…an internal library and a talking reference tool we can draw upon. It is important to call on this information as we evaluate obstacles and identify solutions in our own projects.

Peer review is a conduit to effective communication

The participants focused on methods for communicating constructive feedback without insulting their peers. Again, noting that the template enabled them to be objective, they shared ideas for encouraging their peers by "discussing problems as opportunities for improvement."

Our templates and the MERLOT site gave us a language and structure for the exchange of ideas, which is likely to make feedback more constructive and objective. With detailed specific feedback, those who receive criticism have of better chance of incorporating improvements.

Having guidelines will help to be more thorough in peer reviews because we have specific things to look for rather than offering vague "looks good" types of feedback.

The majority of the participants also noted that they now realize that peer review is a part of regular practice.

Some of us may be reticent and we may not want to critique others, but knowing this is an accepted professional activity makes it easier.

Transfer to Instructional Design Practice

When the students began producing drafts of their work on their ID projects, we directed them to mirror the MERLOT activity by posting their projects on-line and soliciting peer reviews. Only one team posted a draft and one participant offered comments. The teams brought drafts of their projects to our next class meeting, however, ready and eager to solicit feedback from their peers. They explained that they had not felt comfortable posting drafts on-line. They wanted the opportunity to share their reflections on their designs with those reviewing their work. The face-to-face peer review of the ID project drafts was productive; the teams helped each other identify critical revisions that would improve their designs. They accompanied each comment with a rationale for their perspective or decision.

In our follow-up discussion, the students discussed why they felt that peer review of their own projects should be facilitated in face-to-face meetings. The students felt that their evaluation templates gave them a common and reliable vocabulary for peer review, but they wanted to be able to accompany their opinions with an explanation for their decisions. They also explained that it was easier to discuss practice activities such as the MERLOT evaluation on-line because there were no consequences if their recommendations were inappropriate. They felt that reflection on action when reviewing actual ID projects should involve face-to-face discussion where designers and reviewers could evaluate and solve problems together. On a personal level, they felt uncomfortable putting drafts on-line because, "we are still learning how to design" and they noted that the instructor played a significant role as a reflective practitioner during project discussions. This informed us that we needed to help the students transfer the reflective practice they engaged during the MERLOT activity to their ID projects by allowing the students more time to review each others' work in face-to-face sessions.

Student participation in on-line peer review increased, especially when the students approached project deadlines and posted requests for assistance. In addition to critical reviews of projects, some of the class members posted references to Web sites and articles that they thought would help their peers on other projects.

Grades and Reflective Practice

When the students began to prototype and develop their instructional Web sites, both face-to-face and on-line venues were populated with drafts, links to sample Web pages, calls for feedback, and recommendations. As the students moved into the final phase of production, however, the students became concerned with the encroaching deadline and the instructor's final evaluation of their modules, which would result in their grade for the semester. They began to adjust their designs to what they "thought the instructor wanted" and called upon the instructor more frequently for revision guidelines. We met with each team to encourage the students to draw upon their own expertise as well as that of their peers. As one student expressed, the feedback he received from each of the students and the instructor presented such a wide range of recommendations that he had been uncertain "who to listen to."

Next Steps

A reflective model for practice

As a first step to reflective practice, the novice designers gained experience reviewing instructional materials and making recommendations. The students were able to recognize the value of their own prior knowledge through practice and discussion activities. And finally, the evaluation guideline templates provided them with a tool that served as a structured format for evaluation and a common vocabulary for peer review and discussion.

Refining Reflective Practice

Although we assured the students that the team projects should reflect their knowledge of instructional and interface design and consideration of peer critiques, the students did not trust this new process enough to carry it through to the final evaluation and their grade. We resolved this problem by using coaching questions to talk the teams through their final revisions, eliciting their ideas and working with them to evaluate and select those that would enhance the effectiveness of their design. We determined that we would need to identify a new grading scheme that more closely aligned our model of reflective practice with the criteria we used to evaluate the final project submissions.

Institutionalizing Reflective Practice

Further research into systemic use of reflective practice in graduate programs can help us determine its influence on problem-solving and the transfer of these skills to the workplace. We have begun to extend the use of our reflective practice model in two of the core courses in our educational technology program. We are finding that each environment demands different methods for the introduction and implementation of these skills and we continue to research ways to adapt this model for use in the applied courses throughout our program.

References

Ertmer, P. A., & Cennamo, K. S. (1995). Teaching instructional design: an apprenticeship model. Performance Improvement Quarterly, 8(4), 43-58.

Hinett K and Weeden P (2000) 'How am I doing?: Developing critical self-evaluation in student teachers' Quality in Higher Education 6(3) 245-257.

Julian, M. F., Kinzie, M. B. & Larsen, V. A. (2000). Compelling Case Experiences: Performance, Practice, and Application for Emerging Instructional Designers 13(3). Performance Improvement Quarterly.

Perez, R. S., & Emery, C. D. (1995). Designer Thinking: How novices and experts think about instructional design. Performance Improvement Quarterly, 8(3), 80-95.

Rowland, G., Parra, M. L., & Basnet, K. (1994). Educating instructional designers: different methods for different outcomes. Educational Technology, 34(4), 5-11.

Schon, D. (1987) Educating the reflective practitioner. Santa Barbara: Wiley.

Wired and Wireless Learning Environments at Minnesota State University/Mankato

Tim Kochery

Minnesota State University/Mankato

Abstract

Recently, some major technology integration projects have been completed at Minnesota State University/Mankato. These projects involve incorporating classroom multimedia equipment into many classrooms, as well as pursuing mobile learning experiences through wireless connectivity. MSU is a four-year comprehensive university that serves 13,000 students and offers more than 150 majors and 71 graduate programs. Over the past two years, MSU has progressed from having very few classrooms outfitted with contemporary A/V equipment, to the installation of state of the art presentation systems in every General Education classroom on the campus (102 rooms). Simultaneously, MSU has evolved from an institution without wireless connectivity, to a campus where faculty and students can be observed using portable computing devices to establish network connections anywhere, thus providing un-tethered learning opportunities. In a recent survey of 1,300 institutions across the nation, MSU ranked in the top 100 for wireless access and networking (www.wiredcolleges.com). Currently, we are engaged in faculty-sponsored projects that are investigating effective strategies for implementing mobile, hand-held wireless tools (Compaq/iPAQs) into a variety of instructional applications. Furthermore, we are working with our course management system provider, Ucompass/Educator to develop course content, articles and e-books for the small screen design, as well as expanding the capacity for portable wireless communications. These wired and wireless technology advancements have greatly influenced the instructional capacities of the faculty and afforded new learning environments for the students on the MSU campus.

Context and History

Over the past 5-10 years, MSU has been faced with many concerns regarding the purchase, implementation, and integration of electronic communications technologies that will best serve the academic goals of this institution. These challenging decisions are similar to the difficulties faced by many schools that are presently faced with declining budgets, while at the same time trying to respond to escalating demands from students for access to computer and communications technologies. For any educational organization, this situation causes much uncertainty, which leads to the need for a re-evaluation and possible re-alignment of the goals and services that can be maintained. MSU encountered these same obstacles and was also plagued by concerns about the costs of these technologies, plus how these tools and applications would continue to transform. In addition, many people questioned the validity of making considerable investments in technology, and advocated that these expenditures would have insignificant impacts on the teaching and learning environment. This created a hesitant campus culture towards technology and very cautious advancements had been made regarding hardware and software purchases. Furthermore, because there was a lack of campus consensus and commitment, many Departments engaged in a variety of uncoordinated and independent initiatives. These projects and implementations achieved limited success, because they lacked centralized support and suffered from dubious objectives and vision.

These past failures and expenses caused MSU to re-examine its vision of the educational services that would be the primary objectives of this institution. It was agreed that the majority of the students that we served were residential or local students who attended classes at our physical campus. Therefore, although expanded distance learning programs are certainly a fundamental aspect of our future plans, our primary needs involved improvements to the technology capacities of our existing bricks and mortar environment. A needs assessment was conducted to identify the technology constraints and resources that existed at MSU. Many interviews and observations were performed, as well as open-meetings with both faculty and students were conducted. The conclusion of this evaluation process was a campus-wide survey, which helped create the critical technology objectives that matched to the educational missions of this institution. These objectives became the foundation for establishing central goals and a meaningful technology plan for the entire campus. One of the primary goals that emerged was the necessity of improving the computer technologies available in the existing classrooms. This was considered a priority because these enhancements would enable the integration of web-based and multimedia resources into course instruction.

Upgrades to Wired Classroom Environments

As of January 2000, only 3 classrooms existed with built-in computers, and/or A/V equipment configured with a permanently installed video/data projector. Mobile carts outfitted with presentation equipment were available, but these needed to be reserved in advance and delivered to the appropriate classroom. In essence, this dependence on reserving multi-media carts penalized early faculty adapters, because they needed to remember to make these scheduling arrangements, plus rely on that equipment arriving on time and in good working order. Furthermore, while training sessions on PowerPoint, Adobe Photoshop, Authorware and other software programs were provided, there were no readily available facilities to incorporate these applications into classroom instruction. This created severe barriers towards faculty interest in learning about these technologies or using them as a delivery tool.

It became very apparent that a critical need was to make emerging computer presentation equipment ubiquitous and accessible throughout the university. Our goal was to make this multimedia equipment as prevalent and seamless a "tool option", as the whiteboards that instructors have used for many years in the classrooms. Open-campus meetings were conducted to obtain both student and faculty feedback on what technology should be made available. This input and participation was critical as these were the clients who would be most affected by these implementations. We began our installation process by focusing on twenty of the larger classrooms that are most heavily used, and introduced the concept of "classroom tiers" to identify the type of equipment that would exist in certain rooms depending on their size and media requirements.

In the summer of 2000, we began the installation process and created 6 Level III classrooms and 14 Level II classrooms. Every equipment configuration is comprised of an instructor control station, a media controller/switcher, a ceiling-mounted projector plus screen, and an audio system for media playback. Included in each control station are video, audio and power cables for a laptop computer interface and Internet access. The Level III classrooms are upper-end rooms with a more complete set of equipment and controls including built-in computers (both Mac and PC format), as well as the plug-ins for interfacing with a personal Laptop computer. Another feature of these rooms is that they contain both a console mounted microphone, as well as a wireless remote microphone for amplifying the instructor's voice. These Level III rooms have a full-size, color, "touch screen" for controlling and switching between the presentation equipment: the ceiling-mounted video-projector, audio levels of the various media and microphones, and electronic projector-screen controls. Besides the two built-in computers (Mac and PC), the following presentation equipment is included in these rooms and integrated through the Instructor Console with the projection system: VCR, DVD player, LaserDisc player, and Document Camera. Each piece of media equipment can operate stand-alone (through the touch screen controls), or in conjunction with a selected computer. In addition, an audio-cassette machine is available for recording lectures or presentations when necessary.

The Level II classrooms introduced a major design shift regarding what equipment would be made available in these classrooms. These Level II rooms are equipped with "laptop only" presentation systems, meaning that they do not include any built-in computers. This was decided for cost and on-going maintenance issues, but also to introduce the concept of instructors having all course materials accessible in a portable format and self-contained on his/her laptop computer. We wanted to encourage the notion of mobile faculty members who could be flexible about the location "where" they taught, because all the required class resources are readily available and always configured in the most appropriate manner for each practitioner. These classrooms have a basic Instructor console that contains the plug-ins for interfacing with a personal laptop computer, and a smaller B/W "touch screen" for controlling the built-in VCR, DVD player and Document Camera. Because these Level II presentation systems are placed in smaller rooms, no microphone is provided for voice amplification, but there is an audio system for selected media playback.

During the summer of 2001, we began the planning phase of a project to create and install a baseline presentation system in every General Education classroom on the MSU campus. These Level I rooms are "laptop only" presentation systems similar to Level II, but do not include a touch-screen control panel. A simple switch/button interface allows the presenter to select between a personal laptop computer and the other media-equipment. These Level I rooms are designed to serve as multimedia "docking stations" for each user's laptop computer which should include a DVD and CD-ROM player. In August of 2002, we completed the installation of 82 classrooms in 12 different buildings. This provides multi-media capabilities in every General Education classroom (102) throughout the MSU campus.

Our intention was to make this equipment as uniform and simplistic as possible, in order to promote ease of intuitive operations and facilitate maintenance. Already, we have noticed a favorable impact on faculty instruction and student learning on our campus. The equipment is readily available, omnipresent and has a standard interface that is common to most rooms. This has greatly improved equipment operations and has encouraged new users to integrate multimedia resources into classroom instruction in a seamless and user-friendly fashion. One major observation is that faculty are liberated from being classroom or location-dependent to access certain electronic materials. Furthermore, instructors are feeling flexible, mobile, and comfortable knowing that important course content is constantly available and tucked under his/her arm in the form of a personal laptop computer.

Opportunities for Change

Besides these existing conditions and further developments at MSU, other events were occurring that provided additional stimulus to re-examine the technology plans of our institution. The MSU College of Business (COB) began to move forward with a plan to require that all students admitted to their program purchase or lease a laptop computer. The laptop initiative was based on survey information COB compiled, as well as feedback from potential employers and private-sector partners. In conjunction with this initiative, MSU was also working with a regional, wireless-phone service provider to create a wireless distribution system on the campus. In partnership with Midwest Wireless Communications, this was accomplished through the installation of a digital 800-megahertz cellular communications site provided on the MSU campus. This cell site allowed MSU to have robust cell phone connectivity, including a portal to SMS (Short Messaging Service) and WAP (Wire Application Protocol) capabilities. Because of this existing infrastructure and the creation of the research based Institute for Wireless Education, Nokia phones selected MSU to become its model wireless campus in North America. This provided free phones and services to MSU students, including a WAP development server to create and test applications. In return, MSU serves Nokia as a research and test-bed site for cell phone applications, content, and services.

These circumstances provided an opportunity for MSU to investigate other approaches for integrating the capacity of wireless communications. Because of the interest in the COB laptop program, momentum was generated to create a campus-wide wireless network that could provide mobile connectivity for laptop computers equipped with wireless Internet cards. In January, 2000 MSU began to install a wireless ethernet infrastructure utilizing products based on the IEEE 802.11b DSSS (direct sequence spread spectrum) standards. In the beginning, MSU experimented with Lucent WavePoint II access points (10) and Apple AirPort base stations (60). Initially, the Lucent products were chosen because they were the premier solution at that time. However, when the Apple AirPort product became available it was discovered that these wireless hubs could be configured to coexist with the Lucent products and at one third the price. The Apple AirPorts were extensively tested and these hubs performed well for the MSU configuration. MSU installed a variety of indoor and outdoor external antennae to maximize coverage across the campus. The technology solutions that were selected for implementation were based on the following needs:

- Simple connectivity to the Internet for laptop users
- Access to the internet from virtually anywhere a student would be on campus
- Cost effective way to connect off-campus sites to the network: All Seasons Ice Arena hockey Astronomy Observatory (one mile distance), and Mankato Airport computer lab (8 miles away)

Wireless Learning Environments

Our initial focus for wireless connectivity was on common gathering areas that received a high amount of student traffic. Next, 80 additional AirPort hubs were purchased to expand the wireless infrastructure to as many classrooms as possible. Currently, MSU has achieved coverage for 90% of the campus indoor classrooms and outdoor common areas. For the off-campus connections (e.g. Mankato Airport)-, wireless point-to-multipoint connections were installed to replace over-loaded ISDN connections. Although the current system is widespread, additional AirPort hubs are being established to improve connectivity in certain dead zones on the campus. Many of these zones exist due to location or construction barriers (basements, upper floors, wall structures, or electronic interference). We have discovered that overlapping signals from multiple access points makes it difficult to cover all areas without some degradation of service. Additionally, interference from other wireless providers affects our outdoor coverage, while 2.4GHz phones and other products can disrupt some of our indoor coverage. Moreover, we have experienced user-authentication plus security challenges, and we are discovering that existing methods need improvement for our current environment.

Nonetheless, the evidence of wireless connectivity is pervasive on the MSU campus. In the classrooms, students and faculty are not limited by proximity to hard-wired Ethernet ports and web-based content, discussion boards, or e-books can be dynamically accessed from any location in that room. We are employing an "audience response" protocol that allows faculty to administer on-line quizzes, or content questions in the classroom and provide rapid feedback to students, especially in large lecture classes. This interactive system serves as "check-in points" for faculty to quickly receive student responses that help ascertain what content areas are being understood, as well as what topics require additional discussion because the learners are finding them difficult to comprehend.

Over the past year, we are observing more evidence of how the wireless connectivity has expanded the locations where learning or instruction may occur. We are witnessing more faculty bringing their classes outside, either to supply additional exposure to real world content and context (field sites), or to provide a more casual setting than the classroom for exchanging information. However, unlike prior learning activities occurring beyond the classroom, both the students and the faculty member can still have connectivity to the network and other electronic resources through the wireless infrastructure. Throughout the campus, there are more indications of informal work groups gathering around a wireless computer or a hand-held device to collaborate in a variety of settings. Students form groups around a wireless laptop in a variety of outdoor settings on the campus, or cluster together near wireless devices at couches in the Student Union building.

It appears that this wireless capacity has promoted spontaneous and casual computing, which in turn has stimulated more occasions for social learning and the sharing of information. Increasingly, students and faculty are becoming more aware that they have the potential to conduct ad-hoc meetings and learning opportunities in a truly anytime/anywhere mode, while still maintaining full connectivity to Internet-based resources. At MSU, we are observing a proliferation of "un-tethered" learning environments that go beyond the constraints of a 4-walled classroom. Spontaneous instructional events frequently take place, because accessing digital information is not impeded by location-bound constraints. In fact, providing additional access points for technology interfaces is no longer a campus concern, that connectivity is mobile and pervasive throughout the wireless airwaves of MSU.

Mobile Learning Environments

With the establishment of our wireless infrastructure, MSU embarked on some trial implementations of portable hand-held devices to enable learning activities. MSU received a grant award to explore future capacities that might expand wireless transmissions. Through a campus RFP process, MSU faculty projects were selected that proposed strategies to integrate the use of hand-held wireless tools into their teaching and assist student learning. These projects developed case-based educational research opportunities that explore the ways that wireless technologies may effectively influence student processing of information.

The technology tool provided for the accepted proposals is the Compaq iPAQ 3650, which operates on the Microsoft Pocket PC platform. These iPAQs are equipped with a wireless network card, full color display, a 206 MHz Intel Strongpoint processor, and 32MB of RAM. Over 200 of these hand-held devices (pre-loaded with Microsoft Word and Excel) were distributed to selected faculty and their students. We believe that it is essential to place these iPAQs in the hands of educational practitioners and learners to experiment with the ways these tools may promote more effective instruction and learning. Some of the areas we asked faculty to consider include:

- What learning activities will most benefit from access to the dynamic communications afforded by wireless hand-held tools?
- How could students improve their learning process by using this technology in and out of the classroom?
- What portions or units of a course have been particularly problematic or non-motivating for student learning?
- How could wireless tools create more exposure to real-world problem-solving experiences that students might face in this field of study?

Presently, there are 8 faculty projects that were intentionally distributed between different College disciplines on our campus. These projects seek to explore at a range of applications with a variety of learner audiences. In a course with Dr. Steven Case, graduate Computer Science students are creating software applications for the iPAQs and possible ways to integrate them with the Nokia cell phones. Dr. Kent Kalm's students use iPAQs in clinical and field situations during Athletic Training courses. The iPAQs afford "on-demand" access to information regarding appropriate diagnostic or treatment procedures for specific injuries and patients. At the Geography Department, Drs. Jiyeong Lee Cindy Miller and Martin Mitchell are collaborating to integrate the use of four emerging technologies: iPAQs, GPS, Internet GIS and wireless communication with a map server. Students are accessing Internet Mobile GIS information to determine exact locations and collect GIS soil pollution data that is dynamically stored and transmitted back into a master data system.

In other projects, Dr. Scott Fee's Construction Management students are experiencing real-time field simulations and using iPAQs to push and pull information from a web-based database. These learners experience that this type of connectivity allows them to make better work assignments, updated orders for materials, and perform estimating or scheduling decisions in real time. Drs. Ann Goebel and Lee Anderson are experimenting with distance students integrating these tools with cell phones to establish a LAN-line connection for receiving and sending information as part of Industrial Design teams. Dr. Robert Widner of the Psychology Department is examining the use of iPAQs as a feedback tool in large classrooms. These wireless devices enable students to respond to questions, take on-line quizzes in class, receive immediate assessment scores, or anonymously send inquiries.

This Audience Response project is developing a toolset that allows a lecturer to perform interactive polling of an audience. The intention is to allow an instructor to obtain anonymous, real-time feedback regarding the student's comprehension of the lecture material. For example, lectures at MSU are scheduled in 50-minute intervals. The instructor organizes the lecture so that the first 20-30 minutes of his/her presentation provides in-depth explanations for a rather complex concept. The instructor prepares several questions to ask the students, which indicate how much the learners understand important concepts presented during the class. An instructor posts questions on a web-site and the students use wireless-enabled iPAQs to respond to this material. The instructor receives a summary of these responses, and uses this information to adjust the remaining class time to clarify any misconceptions and review certain topic areas. This anonymous student feedback allows the instructor to respond to difficult content areas that have raised the greatest concerns or questions.

The Digital Image Translation project is developing a mobile system to assist in language translation of written information. A typical user scenario would be a business person traveling in a foreign country. Assuming the traveler does not read the native language, this person will need assistance translating street signs, billboards, or other textual information. Using a digital camera attachment for the iPAQ, the traveler can take a photo of the text, identify the specific portion of the image needing translation, and have the image transmitted to a remote server. The remote server will then translate the image and send back the correct interpretations back to the end-user's iPAQ. This system has been developed to the point that it is demonstrable using limited textual images. Translations have been performed for Arabic and Spanish images, both of which are translated to English.

The Real Estate Business Systems project is an entrepreneurial endeavor in which students have begun developing a prototype system to allow home buyers to browse the multiple listing service (MLS) databases for information on homes for sale. The MLS data is presented to the end user in a format suitable to the limited screen space available on the iPAQ. This allows users to efficiently navigate the system using the limited data entry capabilities of the iPAQ. In addition, the system includes a prototype interface suitable for access via the Nokia 7160 phones. This expert interface is suitable for Real Estate agents who are familiar with the details of the MLS system, but not for typical home buyers. The phone-based interface was developed in a manner that makes it suitable for use with iPAQ or other Pocket PC systems

Evaluation of iPAQ Projects

The MSU Faculty investigated a variety of methods for using these iPAQs to enhance the availability of instructional materials. Through our Course Management System provider (Ucompass/Wireless Educator), course materials were made accessible in a small screen design format. This allowed students to be very mobile and still connect with course materials in a truly anytime/anywhere fashion. Another key use of the iPAQs has been as a portable communications tool, which allows students and faculty to readily exchange and share information through emails, class announcements, chat rooms and discussion boards. The faculty have noticed some achievement gains in these courses, primarily due to the increased availability of these modes to interact. We are finding that these projects encourage student activity, increase learner involvement, and lead to higher-levels of cognition and understanding. The iPAQs provide "just in time learning" opportunities through the rapid transmission of information resources or tutorials anytime/anywhere. More evident has been the level of student satisfaction and positive attitude towards the courses that have used these portable tools. Students appear to enjoy the increased opportunities for feedback with their instructor and dynamic access to test and quiz results.

As expected, we discovered that the wireless computing tools enhance certain types of learning activities, while other educational applications are marginally affected. Certainly, our experiences have re-enforced the notion that the successful use of any technology must evolve from a sound instructional design process. A thorough analysis of critical content and learning objectives is critical for determining the appropriate applications of any emerging computing tool. For dynamic access to mission-critical information and point-in-time communications, the wireless tools have proven to be a very appropriate technology. For prolonged computing interactions, such as retrieving course materials that involve streaming video or high-end graphics - wired ethernet connections work best.

We found that the hand-held IPAQs performed best as a "viewer" or "window" of information, but it is not very appropriate for intensive computer operations. As a mobile tool that provides dynamic access to "bits" of information from web-pages or databases for short bursts of time - the iPAQs works very well. However, these same tools are not very appropriate for reading an entire E-book or creating a lengthy PowerPoint presentation. The hand-held wireless devices are effective as a technology to gather physical data, create field notes, and push and pull information very spontaneously between data resource sites. Students are able to access "just-in-time" information for assistance, and send updated materias to web-based databases, which other project participants can access immediately.

Therefore, the most successful applications have been those that used the hand-held iPAQs as a tool to gather field data. When observing and recording information at a field-site, the students were greatly enabled by the portability of the hand-held wireless tools. Participants could capture written notes and make audio recordings of interviews, as well as collect and tabulate physical data about biological or geographic information. The iPAQ wireless devices not only provide a user-friendly tool to gather data, but also expedite the sharing and dissemination of this information. Learners are able to "push" new findings into web-based data systems, and "pull" information from these data inventories for current updates. In this manner, these hand-held devices afford simulated learning activities that emulate real world problems involving rapid access and transfer of information.

Conclusion

The climate for learning and teaching is changing at MSU due to the impact of a diverse range of technology enabling tools. In the wired classrooms, the readily available equipment and connections allows for a wide range of media resources to become integrated into lecture presentations. Our campus wireless capacity has provided flexible learning opportunities through the omnipresent connectivity to the network. Informal learning groups are forming in a variety of settings that are not location-bound to access ports and power supplies. The hand-held wireless iPAQs are already demonstrating that highly mobile communications and computing can be very productive for data gathering and fieldwork. Faculty projects that are currently using these wireless devices continue to explore and discover innovative applications that benefit the delivery of instruction and promote active learning experiences. At MSU, having the wireless infrastructure, the portable technology tools, and the capacity to provide web-based course content anytime/anywhere has certainly pushed the educational experience beyond the confines of the physical classroom. These wired and wireless learning environments certainly appear to facilitate collaborative work by student teams, support innovations for classroom delivery, and help enhance the personal education and productivity of our participating students.

User and task analysis are keys to successful implementations of any technology, and this observation was borne out time after time with the iPAQ projects. The iPAQs are a part of an emerging toolkit, meaning that they are not appropriate for all computing or communication tasks. Yet, at other times, the iPAQs fit the users' needs, and served as effective technology tools for many learning tasks. Our experiences with these hand-held wireless devices confirm that this technology promotes productive instructional applications, which enhance and expand student-learning opportunities. Our goal is to expand this initiative and obtain additional mobile computing tools.

It appears that the wireless capacity has promoted spontaneous and casual computing, which in turn has stimulated more occasions for social learning and sharing of information. Increasingly, students and faculty are becoming more aware that they have an increasing potential to conduct ad-hoc meetings and learning opportunities in a truly anytime/anywhere mode and still maintain full connectivity to Internet-based resources. At MSU, we are observing a proliferation of "un-tethered" learning environments that go beyond the constraints of a 4-walled classroom. Spontaneous instructional events are taking place because the participants are not impeded by location-bound constraints to accessing digital information in various formats. In fact, providing additional access points for technology interfaces are no longer a real constraint - that connectivity is mobile and omnipresent in the wireless airwaves surrounding the MSU campus.

A Multimedia Database to Improve Teaching with Technology: The "Best Practices" Digital Video Project A Brief Report

Wilhelmina Savenye, Arizona State University

Thomas Brush, Indiana University

Terri Kurz, Arizona State University

Ann Igoe, Arizona State University

James Middleton, Arizona State University

With assistance from:
Marti Julian, Arizona State University
Michael Blocher, Northern Arizona University
Patty J. Horn, Arizona K-12 Center
John Chadwick, Museum Web Services
Jean Brush, Arizona State University
Christine Ziobrowski, University of Redlands
Ashley Tan, Indiana University
Barbara Berg, Arizona State University
Cumali Oksuz, Arizona State University
Jiahong Li, Arizona State University
Kathy Perko, Arizona K-12 Center
Gloria Llama, Arizona State University
Everett Louis, Arizona State University
Jean Sutton, Arizona State University

Introduction

New teachers during their professional development must gain considerable complex knowledge. Yet as preservice teachers they have little experience and so little knowledge about real classroom contexts. At the same time our nation is increasingly experiencing an increasing need for well-trained teachers (Bransford, Brown, & Cocking, 2000.)

Studies continue to indicate that teachers feel ill-prepared to use technology in their classrooms (Schrum, 1999; Strudler & Wetzel, 1999; Topp, Mortensen, & Grandgenett, 1995.) Yet Bare and Meek (1998,) for instance, have reported that while 78% of K-12 school teachers and students can access the internet. School administrators, too, report that students should have access to and be able to use technology (Brush, 1999; Brush & Bannon, 1998.)

One way to help educators develop skills in solving complex problems is the use of cases (Stepich, Ertmer & Lane, 2001,) or the use of stories (Jonassen and Hernandez-Serrano, 2002.) Although cases traditionally have been presented in text form, educators are increasingly turning to the internet to deliver digital resources (Hill and Hannafin, 2001,) although such resources should include aids to enable learners not to become disoriented (Hill and Hannafin, 1997.)

Videocases to be delivered over the web have begun to be developed recently; such cases have been used to help teachers gain technology skills and knowledge (cf. Hayek & Tanase, 2002;) Talley (2002) notes that cases may include teacher interviews. Others have begun to include experts' reflections as well as lesson plans and materials (Savenye, Brush, Middleton, Blocher, Horn, Oksuz, Li, Ziobrowski, Tan, Brush, Kurz, Chadwick & Perko, 2002.)

Several researchers have suggested that rich, case-based video databases can help teachers (Chaney-Cullen & Duffy, 1998; Lambdin, Duffy, & Moore, 1997.) They may also serve as discussion starters (Barab, MaKinster, Moore, & Cunningham, 2001.)

Several projects have been developed that use videocases to aid teachers. One is the Inquiry Learning Forum, designed to help teachers use inquiry practices in science and mathematics (Barab, MaKinster, Moore, & Cunningham, 2001.) Another is INTIME (Integrating Technologies into the Methods of Education,) a database of several hundred short videos specifically designed to help teachers learn to use technology in their instruction (Hayek & Tanase, 2002.) INTIME also includes notation tools.

At Arizona State University a Preparing Tomorrow's Teachers to use Technology (PT3) grant has enabled us to build a database of videocases that focus on technology integration for K-12 teachers and students (Savenye et. al.., 2001.) We have partnered with the Arizona AK-12 Center and Northern Arizona University to develop a prototype database of "best practices."

The Digital Video Database of Rich Cases

The database provides preservice teachers with sets of instructional materials and methods for utilizing these materials. The K-12 Center is hosting the database, so that it is accessible not only to project teachers, but to teachers throughout the state.

Exemplary teachers who integrate technology well are included in the database. They were identified by educational technology and methods faculty as well as by mentor teachers. There are currently five prototype cases, although ten to fifteen more are currently in development. The teachers worked with our personnel to develop each case which includes the videotaped lesson, pre-lesson and post-lesson interviews, commentaries, and instructional materials.

The teachers all use the same, systematically-designed lesson format to ensure that others teachers will have enough information to teach the lesson themselves (cf. Dick, Carey & Carey, 2001; Sullivan & Higgins, 1983.) Teachers viewing the lessons also learn through the commentaries and interviews more about instructional technology as well as instructional design for multimedia, web and distance education (cf. Eastmond, D., & Ziegahn, L., 1995; Hirumi, A., & Bermudez, A., 1996; McManus, 1998.)

Format of the Lessons

Each lesson is built along a "model" or "timeline" of a lesson, which allows for all types of teaching styles and philosophies. Preservice teachers access the lessons and lesson materials by clicking on components along a timeline that serves as a metaphor for the lessons. Components of the model include:

-- <u>Timeline Components</u> - For each lesson the videos include -

- Introduction
- Inquiry and Content Development
- Instruction
- Student Participation and Teacher Facilitation
- Assessment and Evaluation, and
- Wrap-up.

Preservice teachers can access any or all components of each lesson and can review any sections they wish.

-- <u>Reflective Interviews and Commentaries</u> -

- pre- and post-interviews with each teacher, using a semi-structured interview protocol
- a text-based reflective follow-up by the teachers after they view the final tape of their lessons.
- commentaries by one subject-matter and one technology expert, as well as a peer-expert teacher.

-- <u>Teacher's Lesson Plan</u>

-- <u>All Lesson Materials</u>

Example Lessons

Fifth-sixth grade mathematics. To teach fifth-graders a teacher wrote a lesson on Archimedes Spiral for her class of gifted students. In her introduction she helped students recall what they had learned about natural spirals earlier.

She then showed a PowerPoint presentation she developed in which she used illustrations and an animation to show how the spiral has been used in history and today. She also developed a Quicktime movie to show students how to build their own Arichimedes-type spirals, which formed the basis of the student activity. Students also searched the web to answer questions about the spirals and developed their own short presentations. (See Figure 1.)

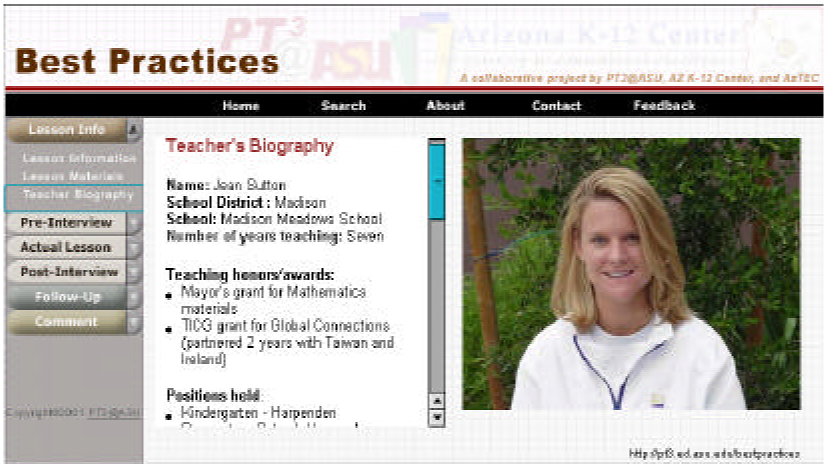


Figure 1. Prototype Example of Teacher Biography

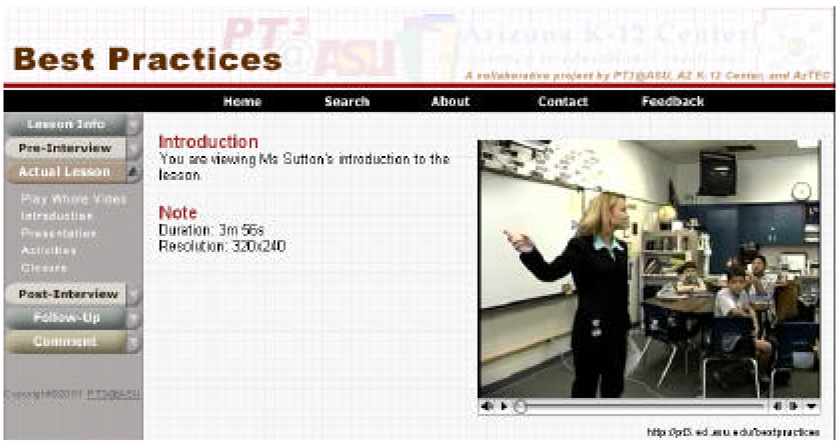


Figure 2. Prototype Example of Lesson Introduction

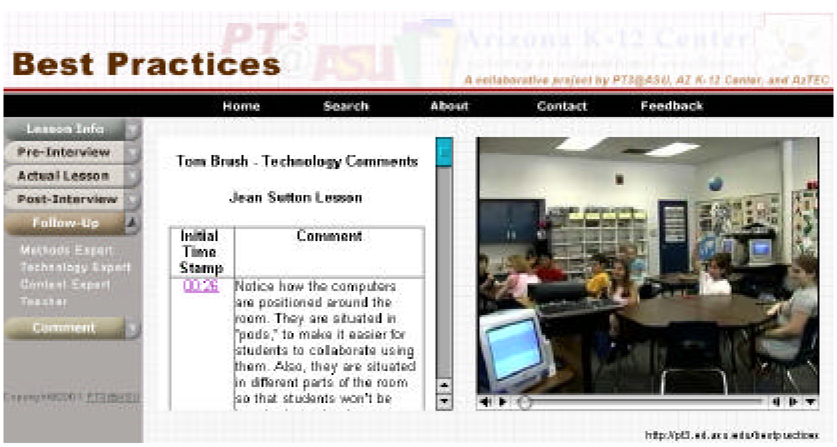


Figure 3. Prototype Example of Expert Commentary

High-School Language Arts

A high-school teacher used technology to motivate lower-level students in an English class. She has found that building challenging lessons using the web has helped her increase these lower-achieving students' successful completion of this English class. The teacher used a PowerPoint presentation to introduce her students to their four-day what she called "focus lesson," about King Arthur. She suggested web sites students could use in their challenge, but students explored beyond these sites as well. Students built cases for who King Arthur might have been, and where Camelot might have been. They used "Inspirations" software to plan their case, and then were tasked with making a presentation to the class presenting their ideas with supporting rationales.

First-Second Grade Mathematics

An elementary-school teacher used a Smartboard to teach her students about finding the area of rectangles using coordinate grids and rows and columns.

Junior-High Technology

An eighth-grade teacher taught students in her multimedia journalism class how to use digital cameras to produce images and then how to edit those images using vector graphics programs, thus working on state technology skills standards.

Implications

Formative evaluation is an integral part of the field-based PT3 project. The first three sets of "Best Practices" lessons, interviews and critiques are currently being evaluated. Both preservice and inservice teachers are reviewing the materials. Surveys and interviews are being used to collect learning and attitude data.

Our future plans also involve refining the interface and developing web-based delivery systems that will allow users to comment on segments of video, by time-code, and share their comments with others. It is hoped that these types of discussions will support technology integration instruction in methods courses.

We also look forward to conducting research on ways to scaffold and support teachers learning about effective teaching in math and science and about technology integration.

We anticipate that access to the "Best Practices" videos, lesson materials, reflective interviews and commentaries, both by PT3 teachers and all teachers in the state, will enhance teachers' success in integrating technology into their classrooms. Their use of technology will go beyond using computers as tools to allowing their students to learn in innovative ways using a full range of technologies.

(The "best practices" videocase database can be accessed at http://129.219.22.87:89/index2.html using username and password "web" and via the Arizona K-12 Center's web site.)

References

Barab, S. A., MaKinster, J. G., Moore, J. A., Cunningham, D. J., & The ILF Design Team (2001). Designing and building an on-line community: the struggle to support sociability in the Inquiry Learning Forum. Educational Technology Research and Development, 49(4), 71-96.

Bare, J., & Meek, A. (1998). Internet access in public schools (Report No. NCES98-031). Washington, DC: National Center for Education Statistics.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.) (2000). How People Learn: Brain, Mind, Experience, and School. Washington, D. C.: Committee on Developments in the Science of Learning and Committee on Learning Research and Educational Practice, Commission on Behavioral and Social Sciences and Education, National Research Council.

Brush, T. (1999). Technology planning and implementation in public schools: A five-state comparison. Computers in the Schools, 15(2), 11-23.

Brush, T., & Bannon, S. (1998). Characteristics of technology leaders: A survey of school administrators in the United States. International Studies in Educational Administration, 26(2), 47-56.

Dick, W., Carey, L., & Carey, J. (2001). The systematic design of instruction. 5th Ed. New York: Longman.

Eastmond, D., & Ziegahn, L. (1995). Instructional design for the online classroom. In Berge, Z., & Collins, M. (Eds.), Computer mediated communication and the online classroom (Vol. 3, pp. 59-80). New Jersey: Hampton Press, Inc.

Ginsburg, L. (2002). Captured Wisdom. Paper included in the Proceedings of the annual convention of the Society for Information Technology and Teacher Education (SITE), Nashville, Tennesee, March 18-23.

Hayek, D., & Tanase (2002). InTime: A Video Archive for Integrating Best Practice Technology into Classroom Curriculum. Paper included in the Proceedings of the annual convention of the Society for Information Technology and Teacher Education (SITE), Nashville, Tennesee, March 18-23.

Hill, J. R., & Hannafin, M. J. (2001). Teaching and learning in digital environments: the resurgence of resource-based learning. Educational Technology Research and Development, 49(3), 37-52.

Hill, J. R., & Hannafin, M. J. (1997). Cognitive strategies and learning from the world wide web. Educational Technology Research and Development, 45(4), 37-64.

Hirumi, A., & Bermudez, A. (1996). Interactivity, distance education and instructional systems design converge on the information superhighway. Journal of Research on Computing in Education, 29(1), 1-16.

ISTE. (2000, March). ISTE Recommended Foundations in Technology for All Teachers. [Online}. Available: http://www.iste.org/Standards/NCATE/found.html.

Jonassen, D. J., & Hernandez-Serrano (2002.) Case-based reasoning and instructional design: using stories to support problem solving. Educational Technology Research and Development, 50(20), 65-77.

McManus (1998). Special considerations for designing internet based instruction. http://ccwf.cc.utexas.edu/~mcmanus/special.html.

Savenye, W., Brush, T., Middleton, J., Blocher, M., Horn, P., Oksuz, C., Li, J., Ziobrowski, C., Tan, A., Brush, J., Kurz, T., Chadwick, J., & Perko, K., (2002). Improving Teaching with Technology: The “Best Practices” Digital Video Project. Paper presented at the annual convention of the American Educational Research Association, New Orleans, LA, April 1-5.

Schrum, L (1999). Technology professional development for teachers. Educational Technology Research and Development, 47(4), 83-90.

Stepich, D. A., Ertmer, P. A., & Lane, M. M. (2001). Problem-Solving in a Case-based Course: Strategies for Facilitating Coached Expertise. Educational Technology Research and Development, 49(3), 53-69.

Strudler, N., & Wetzel, K. (1999). Lesson from exemplary colleges of education: factors affecting technology integration in preservice programs. Educational Technology Research and Development 47(4), 63-81.

Sullivan, H., & Higgins, N. (1983.) Teaching for competence. New York: Teachers College Press.

Talley, S. (2002). Video Cases. Paper included in the Proceedings of the annual convention of the Society for Information Technology and Teacher Education (SITE), Nashville, Tennesee, March 18-23.

Topp, N. W., Mortensen, R., & Grandgenett, N. (1995). Building a technology-using facility to facilitate technology-using teachers. Journal of Computing in Teacher Education, 11(3), 11-14.

Alternatives for Assessing Learning in Web-Based Distance Education Courses: A Brief Report

Wilhelmina Savenye, Arizona State University

Introduction

The World Wide Web is increasingly becoming the technology of choice for delivering courses and programs at a distance. The web offers us many means for delivering materials, including those developed using multimedia audio, visuals and video, along with providing internet-based telecommunications tools. At the same time distance delivery necessitates careful instructional design and use of evaluation to ensure quality of instruction and student success in learning (Moore & Kearsley, 1996; Simonson, Smaldino, Albright & Zvacek, 2003.)

Distance education can be defined in many ways. Rumble (1997,) for instance, stresses the physical separation of learner from teacher, and adds that often distance courses use self-study or independent-learning approaches. McIsaac and Gunawardena (1996,) too, emphasize the distance between learners and instructors. Moore and Kearsley's definition of distance education provides details to engage us in our discussion of systematic design and evaluation of web-based learning:

Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements (1996, page 2.)

Calvert (1989) broadens the definition of distance education to include learning that occurs not just at a distance, but asynchronously. Many students in higher education today, for instance, enroll in distance courses not because they live far from campus, but because they prefer the scheduling flexibility such courses allow.

Web based courses for distance delivery may take many forms. McGreal (2000) describes a thirteen-level taxonomy of courses which vary in their degree of distance capability and mediation. Courses may typically, however, be fully web-based, or hybrid courses that include some campus meetings, or may include web materials only as supplements.

Whatever form a distance course via the web takes, formative evaluation can improve its instructional design, activities and materials. Rumble (1992,) for instance suggests that four main categories of factors to use in evaluating the success of distance courses include opportunities for access, completion rates, quality of the output and cost-effectiveness. Freeman (1997) adds that baseline data such as data from other similar courses may be collected, as can market share information, enrolments, and graduation and placement rates. Thorpe (1988) recommends determining the effects of counseling, advising and student guidance.

Evaluating the success of counseling, advising and guidance provided to students. Kahn and Vega's (1997) suggest additional factors to consider in evaluating web-based courses.

In the upcoming sections of our paper we will first focus on evaluating web-based materials that form all or part of courses or training programs. Then we will discuss methods for evaluating stand-alone web-based learning software.

Evaluating Distance Education Courses

While the focus of this paper is on assessing student learning as part of evaluating web-based courses, a brief review of other data useful in evaluating courses enriches the context of course evaluation.

Instructional Design Reviews

The American Council of Education's "Distance Learning Evaluation Guide" (1996) describes guidelines for evaluating distance courses, in an approach that Dick and Carey and Carey (2001) would call "instructional design review." In this approach evaluators review factors including the learning design, objectives, materials, technology, and the content material. In more data-based approaches to evaluation, data are gathered regarding the effectiveness of the course related to various factors, including course implementation, student and instructor attitudes and student learning.

Course Implementation

Data may be collected to determine how well the course is implemented. For instance students might be asked their perceptions of the technical quality of multimedia materials, and how easy it was for them to access these materials, given the various types of internet providers, with related bandwidth, they may use.

The success of marketing efforts and the students' success in using, and access to, support services may also be measured. In addition to surveys and interviews, archives of use data may be examined.

Attitudes

Typically student satisfaction with a web-based course and materials is a concern in evaluating the success of the course. Satisfaction of other participants, such as instructors, technical staff, and eventual employers may also be determined. Overall satisfaction and perceptions of value are important, however, often just as important are student attitudes toward specific aspects of the course. Student attitude data may be used to improve access to the course materials, specific materials and activities, etc.

Attitudes of students, instructors and staff are usually measured using questionnaire and interviews, however observations, and transcribed online discussions may also be used.

Assessing Student Learning in Web-Based Courses

Student learning is arguably the most important determinant of the success of a web –based course. Learning can be measured in many ways, depending upon the course goals, subject matter, institution, students and setting. Students in courses such as these, that require considerable student motivation and self-discipline require ongoing feedback from assessments. In addition, different measures of learning are valuable to a broad range of students (Dabbagh, 2000; Ko & Rossen, 2001.) Multiple measures of performance also enhance security, as instructors can compare student achievement across several measures (Ko & Rossen, 2001.) It is often useful to collect baseline data to later determine the quality of a course. Pre and posttests can also aid instructors.

It is also recommended that assessment measures match the varieties of learning outcomes taught in a course. For instance, Bloom and his colleagues built a taxonomy of cognitive outcomes (1956.) Gagne (1985) has classified varieties of learning as cognitive strategies, attitudes, motor skills, verbal information, and intellectual skills, which are further subdivided.

Gagne (1985,) Dick, Carey and Carey (2001,) Smith and Ragan (2000,) and others have developed research-based strategies to help learners master objectives which fall into these categories of learning. For instance, they discuss strategies, based upon the social learning theory of Bandura (1969,) for learners to master attitudinal objectives. Another view of learning design is that that uses multiple measures and fosters many categories of learning is that of DeNigris and Witchel of the University of Phoenix (2000.) They suggest developing lessons that include individual study, online lectures, open-ended discussion, group projects and weekly summaries.

Keeping in mind the many types of learning outcomes that might be measured, in the following discussion we will outline various types of assessments that can be employed both in measuring student progress and in evaluating the effectiveness of web-based courses.

Exams

Many courses, subjects, settings and learners lend themselves to quizzes and exams. These are especially useful for assessing background knowledge, verbal information and concepts, but may also be employed to measure intellectual skills. Freeman suggests developing assessment systems (1997.) Whether instructor or computer-scored, the format of the assessments may include closed-book, or open book exams, portfolio assessments as well as learner-negotiated assessments. It should also be determined whether the exam is to be taken at a fixed time or on demand. In web-based courses instructors or the development team can determine for how long a test will be available, such as 24 or 72 hours only. Also a choice is whether it may be taken once only, a limited number of times, or, especially with multiple forms of the exam, until the learner masters the content. It may also be determined that students need only retake parts of mastery exams.

Test security, plagiarism and cheating are issues in most educational settings. Some instructors and administrators are concerned that students might share answers to exams or that the person submitting an exam (or even an assignment) is not the student enrolled. For these reasons, though exams may be taken online, some instructors and organizations, such as in many open universities, have regional centers to which students travel to take proctored exams. In the United States many university testing centers are collaborating so students enrolled in distance courses may complete proctored exams at a university center nearby. It could even be arranged that someone proctor an exam in a trainee's work setting.

Many instructors with large numbers of students and little help choose to rely on computer-scored exams. These need not test only verbal knowledge, of course, as sophisticated multiple-choice tests, if well-designed, can measure all levels of intellectual skills and deep knowledge. Many web course-development software systems include a system for building and scoring exams. Usually items need to be multiple-choice, true/false, matching, or short-answer. However, most systems allow for combining these test items with instructor-scored open-ended or essay items.

These tests may take considerable time to develop, however they save the instructor from many hours of scoring. Most systems also provide immediate feedback to students, a feature students value. These systems also typically provide considerable aggregate data to instructors and designers about student performance and the exam itself, which can aid in improving the exam.

Many good resources exist for test question design. Dick, Carey and Carey (2001,) for instance, provide guidelines for types of test items which can be used with various types of behavior stated in objectives, such as "identify," "discuss," "solve," "develop, and "generate." Harrison's book on designing self-directed learning provides suggestions for how to write multiple-choice, true/false, and free-form questions (1999.)

Self-Evaluation

Several open learning specialists recommend developing self-assessment questions for students. Race (1994,) for instance, describes open learners' need to learn by doing as a powerful incentive. He then adds that they must regularly find out how they are doing. He suggests that self-assessment questions may also be called exercises, activities, or self-checks or self-tests. Some designers might consider all of these practice, rather than assessment, activities, however they are useful not only to students, but to instructors and designers in evaluating student progress. Race suggests helping learners to apply what they are learning by making decisions, extending their knowledge, and diagnosing what they still need to learn. He concludes by providing guidelines for writing, using and providing feedback on self-assessment questions.

Thorpe (1988) suggests that learners regularly be asked to monitor their learning, often with the aid of forms. This is likely to prove very effective, as learners' self-study and self-regulation skills are critical to their success in web-based courses. Hansen (1998) recommends using self-evaluation with young students, helping them monitor their own learning, often by using portfolios.

Some instructors require students to keep weekly journals or logs, in which they reflect upon what they are learning and how they put the course ideas into practice.

Online Discussions

Online discussions may be used simply to enhance participation in a course, or for both practice and assessment. In our course we use Blackboard, which has an easy-to-use discussion component. We set up Discussion Forums for each topic in the course, as well as for socializing (our Online "Café," as suggested by Muffaletto, 1997) and in which students "meet" to choose projects and partners. Early in the course the instructor moderates the discussion by posting study and provocative questions for each week. Later in the course, students do the moderating. We have found in all our courses, that some points must be given to keep the discussions going, though many students go beyond the required discussion postings. We require them to post at least once during the first half of the week to answer the discussion questions, and then at least once during the second half of the week to reply to another student's posting. (cf. Savenye, 2000.) Conferencing systems can also be used to hold discussions.

Moderating

By moderating a discussion, students tell us they learn far more than by simply answering the instructor's study questions. Usually they work in pairs, as, again, we have found they feel more a part of the course, if they do not always work in isolation. Typically moderators must read the topic readings and resources ahead of time and post study and discussion questions by the first night of the week the rest of the class will be discussing the topic. A few days after the conclusion of the week's discussion, moderators post a summary of the key points discussed during the week.

Individual and Group Projects, Papers, and Portfolios

In many web courses students write research papers and essays as they do in campus-based courses. They typically submit papers either via email or a "digital drop box," in the case of Blackboard 5.0. We have found the drop box is very expedient, in that it keeps all submissions from one course together and not mixed in with our hundreds of emails, keeps our email account from filling too quickly, and allows us to easily send feedback to students. It is important to aid students' learning by sending them feedback in a timely manner. We have found it critical to focus on this, as it is easy to neglect students we don't see face-to-face, when those on campus are clamoring for attention.

An advantage of a web course is that students' papers can be posted for other students to enjoy, learn from and discuss. Instructors may wish to allow students to revise papers before posting them for others to read. Longer papers may be uploaded to course content areas; we have also asked students to post shorter essays in the Discussion Forums, to promote deeper discussions on some topics. (For additional views of web-based learning in composition courses, see Savenye, Olina and Niemczyk, 2002.)

In many courses, students are required to develop projects that are not strictly papers. For instance, in one of our courses students develop instructional plans. They also may develop instructional software, such as multimedia software for learning, using the web, or using development software such as Authorware or Director. Other students develop PowerPoint presentations to use in lessons. For any projects, it is a good idea to develop very clear directions and assignment guidelines, as well as to make clear rubrics, checklists or rating scales available to students at the start of the project, so they know what is expected of them and how they will be evaluated.

In fully web-based courses projects can be submitted via the web system to the instructor, but it is usually beneficial to have students post their projects, if possible, for others to view. Usually these are posted on their student web pages, but instructors may choose to post projects to the course web site.

In all of our web-based courses we support and require that students develop some projects as members of groups. Not only does this enhance the social aspects of the course and make it more enjoyable (usually) for students, but they may learn from each other as much as from the instructor in this type of setting.

Many schoolteachers now have extended this idea of group collaboration to having students work with others from around the world. For instance, many teachers pair students up with electronic pen pals, not only to learn about cultures and language, but about science topics, for instance, in which students collect ecological data in two environments and compare them.

All students in a group may be awarded the same grade, or the instructor may have them submit some documentation regarding what each person did. Some instructors also have students rate each other's participation on the team. DeNigris and Witchel provide an evaluation form which students can use to rate the performance of their group and of group members (2000.)

Portfolios are sometimes used to assess student learning in individual courses or as the culmination of their learning in an entire degree program. Freeman contends that portfolios are ideal assessments in open learning systems, as the student determines to a large degree how to portray his or her achievements (1997.) He suggests that managing portfolio assessments can be accomplished provided learners are given clear directions and guidelines and that the assessment criteria be made clear to them. .

Reviews

In some of our courses, especially those in which students write research papers or essays, students indicate they benefit greatly from peer reviews. Usually students send each other these early drafts via email. We have found it useful to make this a required component of the course and to provide students with a certain percentage of points for participating in these reviews. In some courses such on Composition or Literature, criteria may be used to assess the quality of students' reviews of each other's work.

Another type of review is exemplified in courseware reviews. For instance, in our course for instructors who wish to learn how to integrate technology into their teaching, students are required to evaluate instructional software, videos, web sites and other technology products. We have developed an evaluation form for them to use in doing their reviews. This type of project could easily be adapted to other subject areas, such as students in advertising courses reviewing ads, art students reviewing art works, or students in design or architecture reviewing projects, materials and designs, all of which could be in "real" or "virtual" form on the web.

Other Assessment Methods

In web-supplemented or hybrid courses learners are often expected to come to campus regularly to make presentations to their colleagues. In fully online courses we have found a version of this can be accomplished by having students post their projects for all to view and moderate a discussion about their project.

"Live" chat in many systems can also be used for students to make presentations. In Blackboard, for instance, a student can draw on a white board or go to a web site they developed and/or wish to show for all to view. At the same time students can then hold a live discussion. With our system students send the instructor PowerPoints to post, but in some systems, students can also make such "live" visual presentations.

Conferencing systems can also be used to allow students to make presentations.

In training settings it is becoming increasingly more common for evaluators to be called upon to determine the degree to which the web course is successful in helping trainees perform well on the job, not just while they are training. With careful planning and diplomacy it is often possible for evaluators to conduct observations of trainees' actual performance on job tasks or sometimes in closely-related simulations. Such observations can be conducted using some of the methods of qualitative researchers (cf. Savenye & Robinson, 1996.)

To our discussion Ko and Rossen add suggestions for using computer and web-based simulations to both provide practice and assess learning. They add that role-playing and live or written simulations can be used, as well, as online debates (2001.)

In some open systems learners negotiate their assessments. Freeman recommends management decisions are made as to the parameters for these assessments, what can be negotiated, and the recording systems for course progress as well as for units of credit (1997.) He adds that instructors and tutors then are responsible for explaining the parameters to learners, agreeing together on learner plans, monitoring and recording progress and "signing-off" at completion.

Conclusion

It is hoped that this discussion of the wide variety of means to measure student learning in distance courses may aid instructors and designers in developing web-based courses, as well as evaluating their success. The range of tools and techniques available for distance learning will continue to expand in the years to come. At the same time, the convergence of technologies may enable our courses to become more powerful and more easily delivered. We expect our choices for assessing student learning to expand and become more powerful as well.

References

American Council on Education (1996.) Distance learning evaluation guide. Washington, DC.

Bandura, A. (1969.) Principles of behavior modification. New York, NY: Holt, Rinehart and Winston.

Bloom, B. S., Englehardt, M. D., Faust, E. J., Hill, W. H., & Krathwohl, D. R. (1956.) Taxonomy of educational objectives: handbook I, the cognitive domain. New York: Longmans-Green.

Calvert, J. (1989.) Instructional design for distance learning. In Johnson, K. A., & Foa, L. J. (Eds.) Instructional design: new alternatives for effective education and training. New York: National University Continuing Education Association, American Council on Education. MacMillan Publishing Company, 92-105.

Dabbagh, N. (2000.) Multiple assessment in an online graduate course: an effectiveness evaluation. In Mann, B. L. (Ed.) Perspectives in web course management. Toronto: Canadian Scholars Press, 179-197.

DeNigris, J., Witchel, A. (2000.) How to teach and train online: teaching the learning organization with tomorrow's tools today. Needham Heights, MA: Pearson Custom

Dick, W., Carey, L., & Carey, J. (2001). The systematic design of instruction (5th ed.). New York: Longman.

Freeman, R. (1997.) Managing open systems. London: Kogan Page.

Gagne, R. M. (1985.) The conditions of learning and theory of instruction. 5th Ed. Fort Worth, TX: Holt, Rinehart and Winston, Inc.

Hansen, J. (1998.) When learners evaluate. Portsmouth, NH: Heinemann.

Harrison, N. (1999.) How to design self-directed learning programs: a guide for creators of web-based training, computer-based training, and self-study materials. Boston, MA: McGraw Hill.

Kaufman, R. (2000.) Mega planning: practical tools for organizational success. Thousand Oaks, CA: Sage Publications.

Khan, B. H., & Vega, R. (1997.) Factors to consider when evaluating a web-based instruction course: a survey. In Khan, B. H. (Ed.) Web-based instruction. Englewood Cliffs, NJ: Educational Technology Publications, 375-378.

Knott, T. (1994.) Designing & evaluating distance education: a guide to collaboration. Memphis, TN: Diasphera Publications, Publishers for American Academy for Distance Learning and Training.
Ko, S., & Rossen, S. (2001.) Teaching online: a practical guide. Boston, MA: Houghton-Mifflin Company.
McGreal, R. (2000.) The tele-campus online course directory. In Mann, B. L. (Ed.) Perspectives in web course management. Toronto: Canadian Scholars Press, 103-115.
McIsaac, M. S., & Gunawardena, C. N. (1996). Distance education. In Jonassen, D. H. (Ed.). Handbook of Research for Educational Communications and Technology. New York, NY: Simon and Schuster McMillan, 403-37.
Moore, M. G., & Kearsley, G. (1996). Distance education: a systems view. Belmont, CA: Wadsworth.
Muffoletto, R. (1997, March). Reflections on designing and producing an internet-based course. TechTrends, 50-3.
Race, P. (1994.) The open learning handbook: promoting quality in designing and delivering flexible learning (2nd Ed.) London: Kogan Page Ltd.
Rumble, G. (1997.) The costs and economics of open and distance learning. London: Kogan Page.
Rumble, G. (1992.) The management of distance learning systems. Paris: UNESCO: International Institute for Educational Planning.
Savenye, W. C. (2000.) Reflections on developing a web-based Teaching with Technology course. In Spector, J. M., & Anderson, T. M. (Eds.) Integrated and holistic perspectives on learning, instruction and technology: understanding complexity. Dordrecht, Netherlands: Kluwer Academic Publishers, 35-60.
Savenye, W. C., Olina, Z., & Niemczyk, M. (In Press, 2002.) So you are going to be an online writing instructor: issues in designing, developing and delivering an online course. Computers and Composition.
Savenye, W. C., & Robinson, R. S. (1996.) Qualitative research issues and methods: an introduction for educational technologists. In Jonassen, D. H. (Ed.). Handbook of Research for Educational Communications and Technology. New York, NY: Simon and Schuster McMillan, 1171-1195.
Simonson, M., Smaldino, S., Albright, M., & Zvacek, S. (2000). Teaching and learning at a distance: foundations of distance education. Upper Saddle River, NJ: Merrill, an imprint of Prentice Hall.
Smith, P. J., & Ragan, T. J. (1999). Instructional design. (2nd ed.). Upper Saddle River, NJ: Merrill, an imprint of Prentice Hall.
Thorpe, M. (1988.) Evaluating open and distance learning. Harlow, Essex, UK: Longman Open Learning.

VizIt: A Visualization Tool to Scaffold Learning

Lauren Cifuentes

Texas A&M University

Susan Pedersen

Texas A&M University

Doug Williams

University of Louisiana at Lafayette

Abstract

We describe VizIt, a visualization software program we are prototyping to serve two audiences: 1) learners, and 2) instructional designers. VizIt facilitates learners' construction of meaning and provides instructional designers with tools to create visualizations of concepts. Given VizIt, students and instructional designers are able to illustrate causal, sequential, oppositional, hierarchical, chronological, mathematical, comparative, and categorical relationships. They can also directly represent concepts whose physical attributes have been clearly described in text.

Theoretical Framework and Background

Quality instruction provides learners with opportunities for practice with feedback, revision, and reflection (Cognition and Technology Group, 1999). Students need to actively engage in learning activities that provide them with opportunities to negotiate meaning internally as well as socially, rather than passively receive explanations of phenomenon from those in the know. Constructivist learning theory suggests that students need to build understanding in the context of mentoring from their teachers who help them find interrelationships among concepts (Bransford, 2000; Fosnot, 1996, Reigeluth, 1999).

Complex concepts presented in texts often contain interrelationships that are difficult for students to understand. Braden (1982) reported that inherent structure exists in a verbal text and that rendering the subject as a visualization of the text's structure supports understanding. Text structures include causal, sequential, oppositional, hierarchical, chronological, mathematical, comparative, or categorical interrelationships. Learners can use visual conventions to organize their thoughts and represent these structures as they construct knowledge of concepts (Dodge, 1998). Students who are unable to construct representations of concepts to display their understanding probably do not deeply understand that concept. According to Perkins & Unger (1999), in order to constitute a good understanding of concepts, students must construct their own mental representations. One strategy to accomplish this is student-generated visualization. This strategy has the added benefit that after students visualize concepts on paper or on computers, teachers have concrete representations of their students' understandings that allow them to identify misconceptions, assess learning, and provide feedback.

Visualization is a difficult but powerful study strategy. When students are able to manipulate images during knowledge construction, they tend to engage in the meaning-making process and understand and remember concepts (Jonassen, 2000). Research provides evidence that students can study efficiently by generating concept maps, which demonstrate their understandings of how concepts are related to one another (Anderson-Inman & Zeitz, 1993). In a meta-analysis exploring the effects and impact of concept-mapping on learning, Horton, McConney, Gallo, Woods, Senn, & Hanelin (1993), found that concept-mapping raises achievement and improves attitudes toward learning. Also, Cifuentes (1992) and Cifuentes and Hsieh (in press-a, in press- b) found that college students who visualized interrelationships among science concepts in their hand written study notes performed significantly higher on a test than those students who did not visualize such interrelationships ($p= .02$, $d =. 57$).

In addition to the potential for visualization to facilitate learning, visual conventions need to be part of the repertoire of tools that instructional designers use when creating packaged instruction (Wileman, 1993). These professionals need to be able to create visuals that clarify concepts and illustrate interrelationships among multiple concepts. Visuals such as diagrams, timelines, tables, charts, and causal chains facilitate understanding for students, and therefore, instructional designers need to be able to use them flexibly.

Computer-Based Visualization

Computer-based programs such as Inspiration, VisiMap™, and AppleWorks Draw and Paint can be used to foster visualization. These programs have become pervasive in today's schools. They can be used to provide access to a variety of tools that might help students to visually organize and represent what they know. These tools make it easy for students to create, manipulate, and edit shapes and images to reveal interrelationships and information. In this capacity graphics programs function as "mindtools" extending and supporting learners in reorganizing their cognitive structures during learning (Jonassen, 2000). Computer-generated graphics created by learners offer several advantages over pen and paper, such as ease of manipulation of graphic representation, ease of subsequent revision, dynamic linkage of concepts, and generation of sophisticated looking graphics by students with undeveloped artistic skill (Anderson-Inman, Knox-Quinn, & Horney, 1996).

Several research studies have provided evidence that computers can be used to support and enhance independent study (Anderson-Inman, 1992; Anderson-Inman, Knox-Quinn, & Horney, 1996; Anderson-Inman, Redekopp, & Adams, 1992; Tenny, 1992). These studies explored the effects of computer-generated concept-maps and outlines on learning. The use of computers in the externalization of students' knowledge structures enriched individuals' mental models for organizing, retrieving, and using knowledge (Williamson, Jr., 1999).

Although visualization has been found to facilitate learning, studies indicate that most students are unskilled at visualization and require training and experience in visualizing throughout their K-12 experience (Cifuentes & Hsieh, in press-b). Application of metacognitive strategies such as visualization requires training, discipline, and lifelong practice. Therefore, training in metacognitive strategies in a computer-based learning environment can help children to use computers wisely and study more efficiently (Lee, 1997).

VizIt

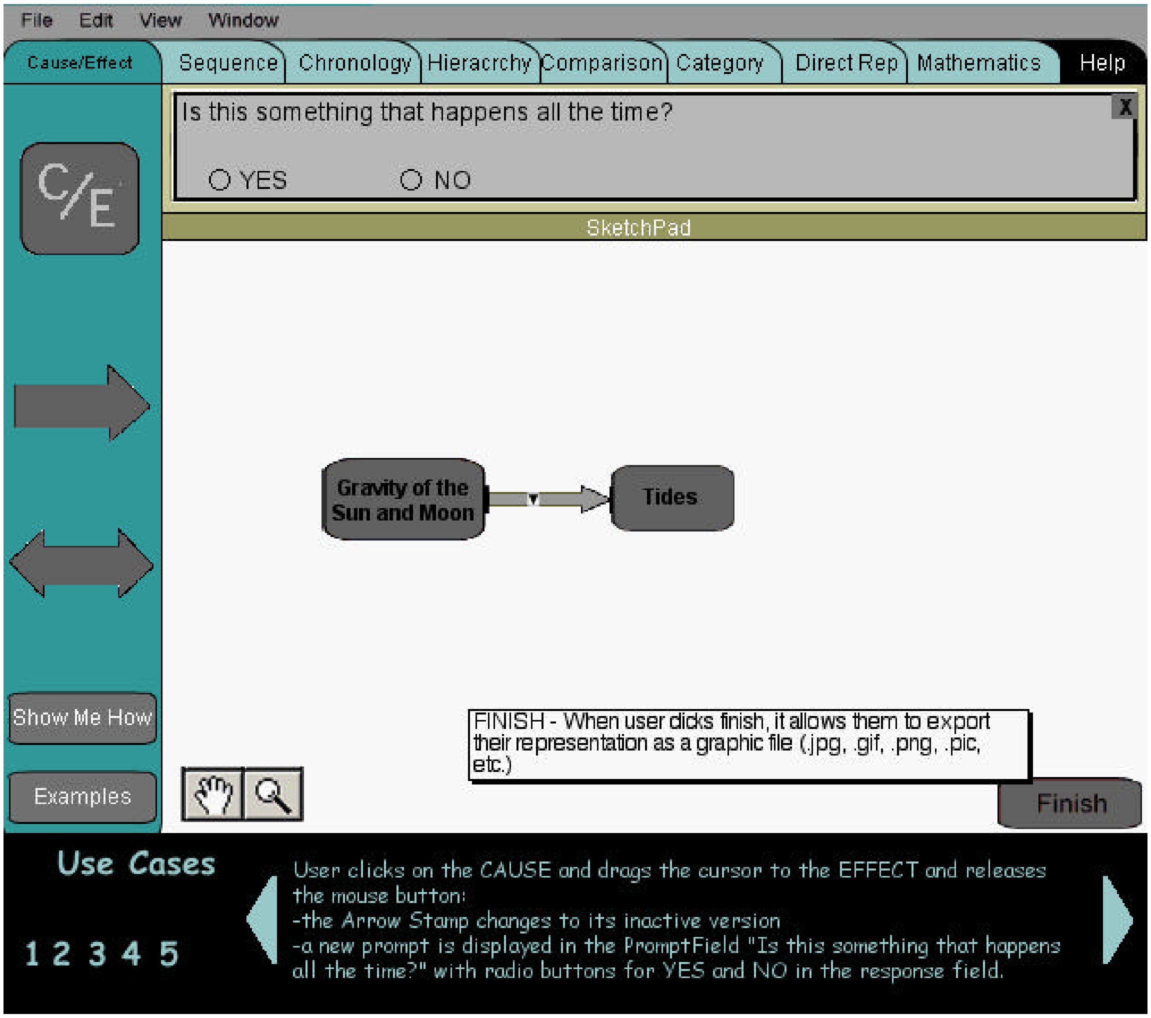
In response to the need for instruction in and experience with visualization, we are developing VizIt, a visualization software program that scaffolds students' construction of meaning while they study. It incorporates tools much like those in Inspiration™ and AppleWorks™. In addition, it offers a palette structure that requires users to identify the underlying structure(s) of a text-based concept, provides guidance regarding appropriate tools to select for visualizing that concept, and scaffolds decision making while the user visualizes. The program includes a database of examples designed to teach users how to distinguish and represent interrelationships within texts. Students can use the data-base to develop and practice visualization skills.

VizIt is designed to serve two audiences: 1) learners, and 2) instructional designers. Learners in grades four through college can use VizIt to analyze text and visualize concepts. Instructional designers can use the software to illustrate materials for diverse learners in many different types of settings.

Our Design Process

For our design of VizIt, we followed a rapid prototyping model (Tripp & Bichelmeyer, 1990). In our planning phase we focused on identifying the underlying structures we wanted to support, developing visualizations for each of these structures that could be used to represent a variety of relationships within those structures, and determining methods for supporting students in identifying underlying structures in text passages and creating accurate visualizations. This process led us to a number of design decisions. For example, we decided to include a tabbed palette that lists the underlying structures students can visualize so that students are constrained to think in terms of these structures. For each underlying structure, we created a set of "stamps" that students can use to create "instances" of that particular structure. For example, Figure 1 shows the stamps for the Cause/Effect structure on the left margin of the screen. These stamps constrain the number of choices students can make in creating their visualizations. Finally, we developed a number of scaffolds to guide students in the process of developing visualizations. These scaffolds include a "prompts" field, which suggests what students should do next and asks questions to promote reflection; a "Show Me How" feature, in which an expert models creating visualizations of relationships described in text passages; and an "Examples" feature in which students can look at completed visualizations from simple to complex.

Figure 1: The Design Document for VizIt, showing the project specifications and use cases.



The design phase of our process focused extensively on creating an interface for the tool, and on gathering and developing text samples for use in the scaffolds. One particularly challenging aspect of this phase was determining how to develop design documents that faithfully represented our designs to the project programmer. What made this aspect so complicated is that the programmer lives at a distance from us, so impromptu conversations were difficult. Our solution was to create an interactive design document in Macromedia Director. In addition to presenting a mockup of the interface for the tool, this document includes rollovers of each of the interface features that specifies what each does. It also includes a series of use cases. Each use case presents a task that users might want to perform, then lists the steps in performing that task. Use cases are effective at communicating functionality of the tools as they are used together. In this way, our design document functions as an "interactive storyboard," illustrating how various parts of the program appear, specifying how each element functions, and offering examples of how these elements are used together to create visualizations.

Currently, our project is in a prototyping phase. When programming is complete on the initial sections of the tool, we will test their effectiveness, make revisions, and then design additional sections.

Conclusion

VizIt software provides students with training and experience in visualization, a metacognitive skill that leads to learning. In addition, it provides instructional designers and teachers with tools for creating visuals for facilitating student learning. The VizIt interface includes “stamps” and “instances” that can be added to a content field to illustrate interrelationships among and within concepts. It scaffolds creation of visualizations thereby supporting metacognition and domain expertise (Reigeluth, 1999). Visualizers gain conceptual understanding (what?) and theoretical understanding (why?). With VizIt, students and instructional designers illustrate causal, sequential, oppositional, hierarchical, chronological, mathematical, comparative, and categorical interrelationships. The tool requires students and designers to address the question, “what is the underlying structure of a given text or written concept?” It then scaffolds their cognition through the process of clarifying the answer.

References

Anderson-Inman, L. (1992). Computer-supported studying for students with reading and writing difficulties. Reading and Writing Quarterly: Overcoming Learning Disabilities, 8, 317-319.

Anderson-Inman, L., Knox-Quinn, C., & Horney, M. A. (1996). Computer-based study strategies for students with learning disabilities: Individual differences associated with adoption level. Journal of Learning Disabilities, 29(5), 461-484.

Anderson-Inman, L., Redekopp, R., & Adams, V. (1992). Electronic studying: Using computer-based outlining programs as study tools. Reading and Writing Quarterly: Overcoming Learning Disabilities, 8, 337-358.

Anderson-Inman, L., & Zeitz, L. (1993). Computer-based concept mapping: Active studying for active learners. The Computer Teacher, 21(1), 6-8, 10-11.

Braden, A. B. (1982). The outline graphic. Paper presented at the annual meeting of the Association for Educational Communications and Technology, Dallas, TX.

Bransford, J. (2000). How People Learn: Brain, Mind, Experience, and School. Washington, D.C.: National Academy of Sciences.

Cifuentes, L. (1992). The effects of instruction in visualization as a study strategy. Unpublished doctoral dissertation, University of North Carolina, Chapel Hill.

Cifuentes, L., & Hsieh, Y.C. (in press-a). Visualization for construction of meaning during study time: A Qualitative Analysis. International Journal of Instructional Media, 30(3).

Cifuentes, L., & Hsieh, Y.C. (in press-b). Visualization for construction of meaning during study time: A Quantitative Analysis. International Journal of Instructional Media, 30(4).

Cognition and Technology Group at Vanderbilt. (1999). Technology for teaching and learning with understanding. Boston: Houghton Mifflin.

Dodge, B. (1998) A taxonomy of information patterns. Retrieved January 29, 2002 from http://projects.edtech.sandi.net/staffdev/tpss98/patterns-taxonomy.html

Fosnot, C. T. (1996). Constructivism: Theory, perspectives, and practice. New York, N.Y.: Teachers College.

Horton, P.B., McConney, A.A., Gallo, M., Woods, AlL., Senn, G.J., & Hanelin, D. (1993). An investigation of the effectiveness of concept mapping as an instructional tool. Science Education. 77(1); 95-111.

Jonassen, D. H. (2000). Computers as mindtools for schools: Engaging critical thinking. Upper Saddle River, N.J.: Merrill.

Lee, P-L. H. (1997). Integrating concept mapping and metacognitive methods in a hypermedia environment for learning science. Unpublished doctoral dissertation, Purdue University.

Perkins, D. N., & Unger, C. (1999). Teaching and learning to understanding. In C. M Reigeluth (Eds.), Instructional-design theories and models: Vol.2. A new paradigm of instructional theory (pp.91-114). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Reigeluth C.M. (1999). Elaboration Theory. In C.M. Reigeluth (Ed.). Instructional-design theories and models: A new paradigm of instructional theory. Mahwah, NJ: Lawrence Earlbaum Associates.

Tenny, J. L. (1992). Computer-supported study strategies for purple people. Reading and Writing Quarterly: Overcoming Learning Disabilities, 8, 359-377.

Tripp, Steven D.; Bichelmeyer, Barbara. (1990). Rapid prototyping: An altrnative instructional design strtegy. Educational Technology, Research and Development; 40(4); 31-44.

Wileman, R. E. (1993). Visual communicating. Englewood Cliffs, N.J.: Educational Technology.

Williamson, J. W., Jr. (1999). Mental models of teaching: Case study of selected pre-service teachers enrolled in an introductory educational technology course. Unpublished doctoral dissertation, University of Georgia.

Strategies for designers to support collaborative learning in online communities for professional development

Hong Gao

Florida State University

Amy Baylor

Florida State University

E Shen

Florida State University

Abstract

This paper will provide an overview of strategies to promote collaborative learning in online communities from the perspective of the designers or community facilitators, particularly the strategies to help establish and strengthen the connections between community members. Related theories and research findings will be reviewed briefly and the emphasis will be given to the demonstration of such strategies in existing online communities for professional development, especially how they are used by designers to achieve the desired goal of connecting members to construct knowledge collectively in the online communities for professional development.

Introduction

One major difference between online communities for professional development and other virtual communities is that they are mainly concerned about how members will gain some advances related to their professional field by constructing knowledge through online interaction. The created knowledge is meaningful not only to the members in the virtual community where it was created, and but also to all the professional practices and knowledge base of the field. This is achieved with the joint effort of community designers and members. Specifically, online knowledge construction is one of desirable results of the process where designers provide various support to members to ensure the success of human-computer interaction and human-human interactions (Barab, in press). The latter has been given more attention (Barab, 2001) in that it has been realized that it is in such interactions that members conduct task-driven or social-emotional communications (Hare & Davies, 1994), create their identities and build their online social networks. These interactions significantly impact the growth of the group and the construction of knowledge.

The paper will focus on design strategies to support collaborative learning in online communities for professional development. Special attention is given to strategies to support newcomers, help establish connections between old-timers and newcomers to create "apprenticeship" learning opportunities, and to facilitate members in locating information for their practices or personal knowledge construction. Examples from several online communities for professional development, such as TAPPED IN, Math Forum, and MediaMOO as well as examples from other virtual learning communities are used to illustrate how the strategies are realized in those communities. The strategies include: (1) the use of metaphorical design to create a shared context; (2) the use of virtual objects to establish connections; (3) designers' support for visitors and novices; (4) designers' support for communication; (5) designers' support for knowledge construction.

Metaphorical Design: Creating a Shared Context

In physical communities of practice, the socialization structures such as buildings, plans, and schedules have been so integrated into the traditional learning process that they become tacit and almost "invisible". A challenge for the designer is to create a shared context for members with diverse background. One approach to address this issue is to use metaphorical design and making the socialization structures transparent (Dirckinck-Holmfeld et al, 1999). For example, designers of TAPPED IN (www.tappedin.org) use a building metaphor to create a sense of time and space. The floor plan (see Figure 1) provides a layout with objects that members are familiar with, such as whiteboard, elevator, café, and library. A corollary of such design is that it is intuitive for members to navigate and natural to define their roles since the virtual world bear great resemblance with the physical world that members encounter in their daily practices.

Figure 1. Floor Plan of TAPPED IN (from www.tappedin.org)

Similarly, like any other organizations in physical settings, online communities can have their own event calendars and newsletter to inform members of coming events of the community to provide a shared context.

Another strategy that is common in many communities is that members are allowed to inherit or even create objects. These objects serve important purposes that will be described in detail in the following section.

The Use of Virtual Objects to Establish Connections

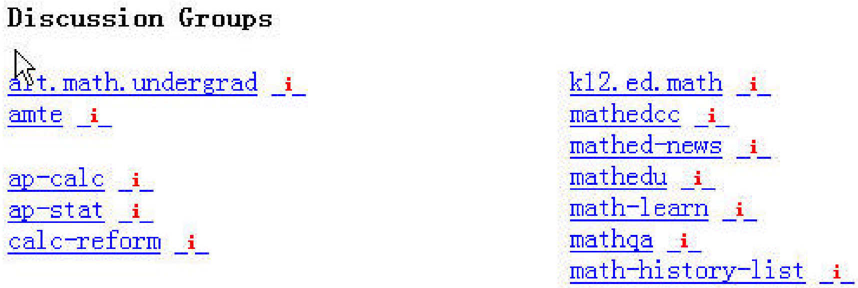
Designers can use virtual objects in various ways to establish connections in the community. In some communities, artifacts such as virtual objects are provided by the designers and members can make a copy and edit them while in other communities members who get permissions from community administrators can program their own objects (Bruckman, 1995, 1997, 1998). The use of virtual objects serves several purposes. First, virtual objects especially pets, personal items give members companionship and alleviate their loneness since they can interact with objects before they establish connections with other members. For instance, in Tapped In, there are commands available for members to look at an object, give an object to somebody, take an object from another person or simply drop the object. More importantly, they are important in building connections. For instance, old-timers may have their own virtual offices that they can introduce newcomer to. It also can be a place where they give virtual classes to their students or have workshops for their colleagues. Sometimes such offices can gradually become public places where many members/friends have gatherings or where community events are conducted. These offices, not only help building the relationships between community members, but as the offices become part of the community possession, the bond between the member(s) who created them and the community has been strengthened. The process can be more rewarding if some members join the designers in creating objects for the community such as member directory, as documented in MediaMOO project (Bruckman, 1995).

Thus, virtual objects can be a powerful tool for designers to build relationships between members and strengthen the connections between members and their community.

Support for Visitors and Novices

Every member in the community starts as a visitor and then a novice before they become "formal" members of the community. This means that the assistance that designers provide to support "peripheral participation" (Lave and Wenger, 1991) greatly affect the growth of the community. The following are various supports available for visitors and novices.

For visitors and newcomers of a community, it is sometimes overwhelming to find some many newsgroups, mailing lists, and Web-based discussions that are conducted in them. Devices for them to find their way to their subgroups should be available. For instance designers of Mathforum (www.mathforum.com) provide "**i** " at the end of each discussion group for newcomers' reference.



Discussion Groups

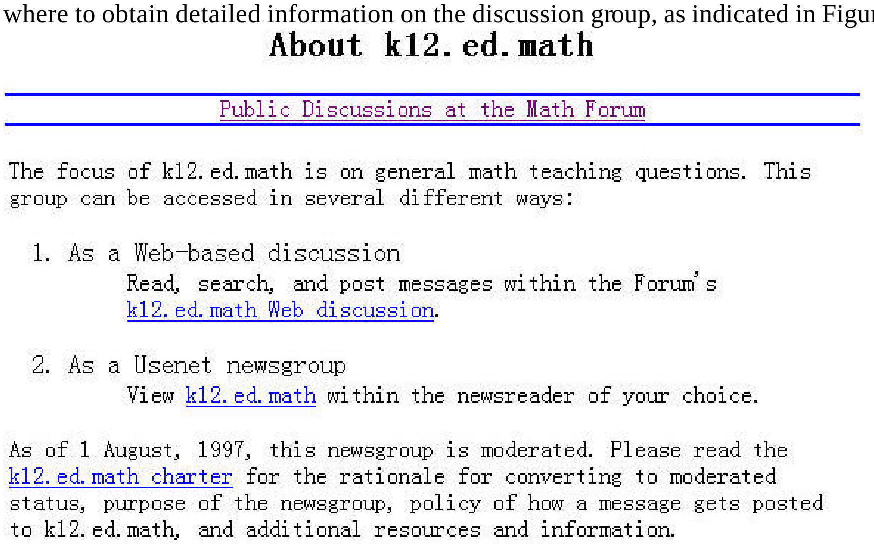
alt.math.undergrad i
amte i

ap-calc i
ap-stat i
calc-reform i

k12.ed.math i
mathedcc i
mathed-news i
mathedu i
math-learn i
mathqa i
math-history-list i

Figure 2. Screen shot for discussion groups (http://www.mathforum.com/discussions/)

If the user does not know what the discussion group is about, they can click on the "i" button for information on the purpose of the discussion group, how it can be accessed, whether it is moderated, as well as where to obtain detailed information on the discussion group, as indicated in Figure 3.



About k12.ed.math

Public Discussions at the Math Forum

The focus of k12.ed.math is on general math teaching questions. This group can be accessed in several different ways:

1. As a Web-based discussion
   Read, search, and post messages within the Forum's k12.ed.math Web discussion.

2. As a Usenet newsgroup
   View k12.ed.math within the newsreader of your choice.

As of 1 August, 1997, this newsgroup is moderated. Please read the k12.ed.math charter for the rationale for converting to moderated status, purpose of the newsgroup, policy of how a message gets posted to k12.ed.math, and additional resources and information.

Figure 3. Information on the discussion group of k12.ed.math from (http://www.mathforum.com/discussions/about/k12.ed.math.html)

Such tools can be built into the system, which makes it convenient especially for newcomers or visitor to check out the community.

There are other tools that can be used to help newcomers or visitors to get connected with more established members of the community. For instance, in TAPPEDIN, once you log in as a member or a guest, you can find out who is in the same place (café, library, your virtual office) and brief information on them, if he/she is a member of the community. The following is a screenshot of information I found out about BJB, a volunteer at help desk, when I registered as a guest and clicked on the "

" icon from the right (Figure 4. Note: permission was obtained from BJB). Novices who would like to know more about the old-timers they come across can click on the links to their homepage to find more about their work and life and start to build personal relationships offline. In some cases, members' picture is available and communication between novices and old-timers can become personal and interesting. Once apprenticeship (Collins, et al., 1989) has been formed between new members and old-timers, it is more likely that novices will come back for more information or to connect to other members of the community.

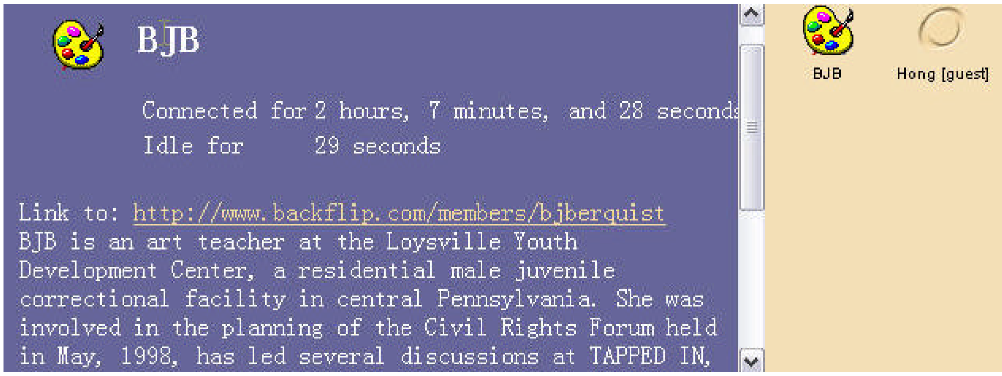


Figure 4. Information on an old timer of the community (www.tappedin.org)

Making communication commands from day 1 available for visitors and novices is always a strategy to help them to find assistance from other members and thus facilitate relationship building in a community. This will be elaborated in more detail in the following section --- support for communication.

Support for Communication

In virtual communities, most of the communications are text-based and it is difficult to get "personal" without sounds or pictures. To facilitate collaboration between members, it is necessary for designers to have a variety of communication channels as well as other devices that help members express their emotions and feelings in their online interaction.

Various channels of communication should be provided by the community, including asynchronous communication such as threaded bulletin boards, synchronous communication such as virtual chat, as well as traditional communication modes such as organizational conferences. Also commands for private and public communication should be made available. The commands in Table 1 are used in Tapped In and the mode of the communication (private or public) and how they are used for communication based on my personal experience as well as what other researchers have found about communication in MOO environment (Cherny, 1999).

command	Private or Public	Used for Talk…
/Say <text>	public	Within a room
/emote <action>	public	Within a room
/To <person> <text>	Public	Within a room
/whisper <person><text>	private	Within a room
/page <person><text>	private	Across room boundaries
/think <text>	public	Within a room
/sign <text>	public	Within a room

Table 1. Basic MOO communication commands

Although most of the available communication commands are for communication within the same room, /page <person><text> command can be used to talk to members at other locations. Also the command "/who" will provide a list of members who are online, for how long they have been connected, whether they are currently active online, as well as where to locate them. It should be noted that in Tapped In, the communication tools are available from day one and they are conveniently placed where users especially novices need to refer to from time to time for their online interaction.

Although commands such as /emote <action> enables members to show their feelings with behavior, graphic representations of facial expressions called " emoticons" have been widely used to express emotion and feelings in computer-mediated communication. Research indicated that though emoticons were not weighted as much as verbal content by the users, they had the same impact as verbal content of shifting interpretation in the direction of the negative element when there was a negative message aspect to the emoticons (Walther, 2001). Thus such devices to some extent add more emotional cues and "social presence" (Gunawardena, 1995; Gunawardena et al., 1997) and reduce potential misunderstanding in communication.

Some researchers (McLean, 1999) suggested that support be for "meta-communication", the communication about the process of knowledge building, in addition to the support for articulation of the "substantive" learning itself. This is more directly related to devices for reflection and support for knowledge construction, which is the focus of the following section.

Support for Knowledge Construction

Instances of knowledge construction occur in the most common discussions and chats. In online communities, most of communication is asynchronous and thus provides members with sufficient time to contemplate, speculate and reflect, which makes the quality of interaction superior to that of face-to-face interaction (Jonassen et al, 2001). In addition, various other devices should be employed by designers to foster knowledge construction that originates from valid argumentation which derives from logical processes and is based on established standards for argument form and content (Derry et al., 2000). The following is a review of such strategies that have been practiced in some communities.

One effective strategy in helping learners produce quality interaction is to provide scaffolding to guide online discourse. This strategy has been successfully implemented with young learners at LearningForumTM (Scardamalia & Bereit, 1996 from Jonassen, 1999) by having students select various names (my theory, I need to understand, new information) for preparation of their messages, as illustrated in Table 2. These names `serve as meta-cognition tools for learners to reflect their thinking process and meta-communication (McLean, 1999) for students to communicate with each other their thinking.

Problem (Andrea):	How does a cell function?
My Theory (Andrea):	I think a cell functions by oxygen coming into the cell and the cell then can do its work by breathing.
My Theory (Jane):	I agree with your theory, but when the cell functions I don't think it is breathing. I think that the oxygen you're breathing in is doing it.
My Theory (Sue):	I think a cell functions by the "things" inside itself. (organelles)
I Need to Understand (Andrea):	How does the oxygen get into the cell, if the cell really does breath oxygen?
New Information (Andrea):	I found out that the cell takes food and oxygen in through the membrane. This happens regularly. The cell then changes the food and oxygen into energy. It uses the energy to do its work.
I Need to Understand (Andrea):	How do the food and oxygen get to the cell's membrane?
My Theory (Andrea):	I think there are very small tubes that lead to each other and the food and oxygen go down those tubes and into the cell through the cell's membrane.
My Theory (Sue):	I disagree with your theory, Andrea. I think that the oxygen and food go into the cell automatically as a daily process.
I Need to Understand (Sue):	What does the oxygen do when it gets to the cell?
My Theory (Andrea):	This is what I think the oxygen does when it gets to the cell. I think that the oxygen goes into the cell through the membrane and then it goes to the nucleus where it is turned into energy.

Table 2. CSILE discussion note, from Jonassen (1999:129)

Along the same line, scaffolds specific to teachers' professional development can be developed based on research results. It was found that stories and narratives are good sources for teachers to exchange ideas and learn from each other. Thus a case-based database can be created to collect stories and help community members to share their experience. Figure 5 provides an illustration (Jonassen, 1999) of how this may look like.

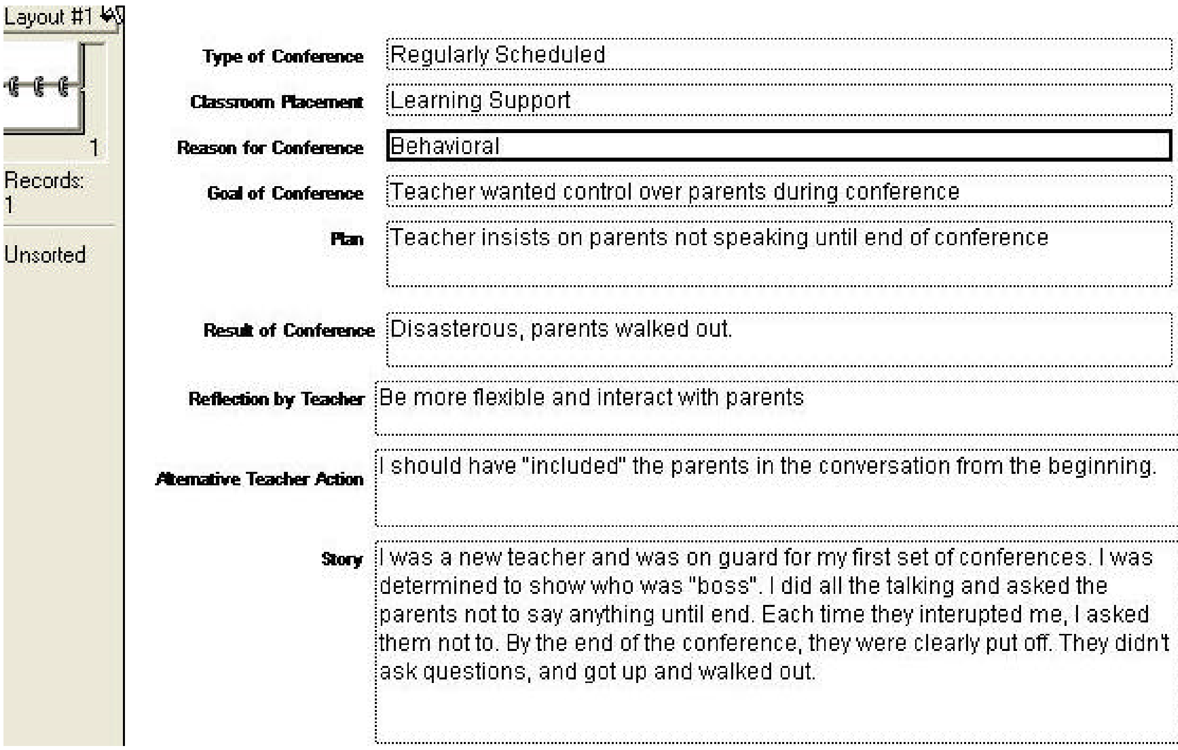


Figure 5. Database of teacher stories, from Jonassen (1999:161)

Once the database is in existence, knowledge maps or concept maps (Hewitt & Scardamalia, 1998) should be created by subject experts or assigned group members to assist members in locating information. Such maps give members a visual display of both the knowledge created by the whole community and the knowledge built by different groups in the community and members are more likely to recall more main ideas in maps (Hall et al., 1992, 1999; Rewey et al.,1991) since such maps “make the macrostructure of a body of information more salient.” (O’Donnell, Dansereau, & Hall, 2002).

Finally, it is beneficial to build the online community in partnership with other existing communities, being it virtual or real (Barab et al., 2001). This way the new community can use the established networks in the subject field and it can be easier for the community to be an integral part of the existing systems of the professional field.

Conclusion

There are various devices that are in practice for designers to support online collaborative learning in online communities for professional development. Table 3 is a summary of strategies discussed in the above sections.

Aspects	Example for specific strategies
the use of metaphorical design to create a shared context	Floor plan (Figure 1)
	Community calendar, newsletter
the use of virtual objects to establish connections	Pets, virtual offices, member directory created by volunteer members
designers’ support for visitors and novices	Devices for novices to check out the community (Figure 2 & 3), make the communication commands handy, make information on old-timers easy to access (Figure 4)
designers’ support for communication	Multiple channels for communication, allow both public and private communication (Table 1), use of emoticons, meta-communication
designers’ support for knowledge construction	Scaffolds (Table 2), case-based database (Figure 5), knowledge map/concept map, partnership with other existing communities

Table 3. Summary the strategies discussed

The above strategies are only some examples of different support that can be provided by community designers to help connect community members and facilitate the process of collaborative learning and knowledge construction. With the emergence of more successful online communities for professional development, it is expected that researchers and designers, with the input from community members, will find more strategies that can be used by designers to support collaborative learning in such communities.

References

Barab, S., MaKinster, J., & Scheckler, R. (in press). Designing System Dualities: Building Online Community. In S. A. Barab & R. Kling & J. Gray (Eds.), Designing for Virtual Communities in the Service of Learning: Cambridge, MA: Cambridge University Press.

Barab, S. A., Makinster, J. G., Moore, J. A., Cunningham, D. J., & Team, T. I. D. (2001). Designing and Building an On-line Community: The Struggle to Support Sociability in the Inquiry Learning Forum. ETR&D, 49(4), 71-96.

Bruckman, A., & Resnick, M. (1995). The MediaMOO Project: Constructionism and Professional Community. Convergence, 1(1).

Bruckman, A. S. (1997). Construction, Community, and Learning in a Networked Virtual World for Kids. Unpublished Ph. D dissertation, Massachusetts Institute of Technology.

Bruckman, A. (1998). Community support for constructionist learning. CSCW(7), 47-86.

Cherny, L. (1999). Conversation and community:: chat in a virtual world. Stanford, Calif: CSLI Publications.

Collins, A., Brown, J. S., et al. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.), Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser (pp. 453-494). Hillsdale, NJ: Erlbaum.

Derry, S. J., Gance, S., Gance, L. L., & Schlager, M. (2000). Toward Assessment of Knowledge-Building Practices in Technology-Mediated Work Group Interactions. In S. P. Lajoie (Ed.), Computers as cognitive tools, volume two : no more walls : theory change, paradigm shifts, and their influence on the use of computers for instructional purposes (Vol. II, pp. 29-68). Mahwah, N.J.: L. Erlbaum.

Dirckinck-Holmfeld, L., & Sorensen, E. K. (1999). Distributed computer supported collaborative learning through shared practice and social participation. Paper presented at the The Computer Support for Collaborative Learning (CSCL), Stanford University, Palo Alto, California.

Gunawardena, C. N. (1995). Social presence theory and implications for interaction collaborative learning in computer conferences. International Journal of Educational Telecommunications, 1(2/3), 147-166.

Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. The American Journal of Distance Education, 11(3), 8-26.

Hall, R. H., & , D. F. Dansereauet, al.(1992). Knowledge maps and the presentation of related information domains. Journal of Experimental Education (61), 5-18.

Hall, R. H., & M. A. Saling, et al. (1999). The effects of graphical postorganization strategies on learning from knowledge maps. Journal of Experimental Education(67), 5-18.

Hare, A. P., & Davies, M. F. (1994). Social interaction. In S. A. P. Hare & H. H. Blumberg & M. F. Davies & M. V. Kent (Eds.), mall Group Research: A Handbook (pp. 169-193). Norwood, NJ: Alblex.

Hewitt, J., & Scardamalia, M. (1998). Design principles for distributed knowledge building processes. Educational Psychology Review, 10(1), 75-96.

Jonassen, D. H., Peck, K. L., & Wilson., B. G. (1999). Learning with technology : a constructivist perspective. Upper Saddle River: N.J. : Merrill.

Jonassen, D. H., & Kwon, H. I. (2001). Communication Patterns in Computer Mediated Versus Face-to-face Group Problem Solving. ETR&D, 49(1), 35-51.

Lave, J., & Wenger, E. (1991). Situated learning: legitimate peripheral participation. Cambridge University Press.

McLean, R. S. (1999). Meta-Communication widgets for knowledge building in distance education. Paper presented at the The Computer Support for Collaborative Learning (CSCL), Stanford University, Palo Alto, California.

O'Donnell, & A. M., D. F. D., et al. (2002). Knowledge Maps as Scaffolds for Cognitive Processing. Educational Psychology Review, 14(1), 71-86.

Rewey, K. L., & D. F. Dansereau, et al. (1991). Knowledge maps and information processing strategies. Contemporary Educational Psychology(16), 203-214.

Walther, J. B., & D'Addario, K. P. (2001). The impacts of emoticons on message interpretation in computer-mediated communication. Social Science Computer Review, 19(3), 324-347.

www.mathforum.com

www.tappedin.org

GIS in Education: An Examination of Pedagogy

Aaron H. Doering

University of Minnesota

Abstract

Geographic information systems (GIS) have been identified as one of the most critical and important software programs for implementing computer-based technology in social studies and science education. Much of the research about effective GIS integration is "garnered from intuition." This study will present the results of three different teaching methods based on the Jasper Woodbury Problem Solving Series and provide a model for successful GIS implementation into any preservice teacher education program.

GIS in Education: An Examination of Pedagogy

"No exemplary models for integrating GIS into preservice teacher preparation programs exist."

Bednarz & Audet, The Status of GIS Technology in Teacher Preparation Programs, (1999)

The effective teaching of the National Geography Standards has been the focus of K-12 social studies curricula throughout the nation. It has been identified that in order to effectively teach the standards, teachers require a clear understanding of a geographic information system (Bednarz, 1995; Sui, 1995). A geographic information system (GIS) is software that allows a user to store, retrieve, manipulate and display geographic data about any place in the world (Environmental Systems Research Institute, 1998). Even though such an understanding of GIS is necessary, it has not been adopted in the K-12 American classrooms at a rate that the National Science Foundation, the Environmental Systems Research Institute (ESRI), and geography educators had once hoped (Environmental Systems Research Institute, 1998; Fitzpatrick, 2002). Fitzpatrick (2002) noted that ESRI's goal in 1992 was for K-12 educators to be the largest single group of users by 1996, a goal still not achieved. The key reason for this slow pace of GIS integration, according to Bednarz and Audet (1999), is that no "exemplary models for integrating GIS into preservice teacher preparation programs exist" (p. 65).

In response to this lack of exemplary models for teaching GIS, the purpose of this study is to develop and research the effectiveness of three GIS instructional models for university-level instructors to use within preservice teacher education courses.

State of Current Teaching of GIS

Bednarz and Audet (1999) have identified three main reasons that current approaches to teaching GIS in K-12 classrooms have not been effective: teachers inadequately trained to use GIS, a lack of teaching models to guide their pedagogy, and preservice teachers education programs that do not teach GIS in "a meaningful way" (p. 64). Teachers who are adequately trained to use GIS in their classroom endure major frustrations and obstacles in their efforts to successfully integrate technology into their instruction (O'Neill, 1995). Fitzpatrick in communication with Audet and Paris (1997) has estimated that fewer than 20% of GIS software packages are being used in effective GIS teaching. Many teachers are excited about using GIS, but their motivation dissipates when they encounter technical and pedagogical problems. Thus, argues Brownwell (1997), the effectiveness of current approaches recommended for GIS should be questioned, and preservice teachers with time and access to university computer labs should become proficient in both the technical and pedagogical approaches to teaching GIS in the classroom. Bednarz (1999) not only calls upon teacher education programs to more effectively prepare preservice teachers to implement GIS-based curricula, but upon the research community to provide more than anecdotal evidence to support the claims that GIS can enhance students' learning.

This study, in response to Brownwell's (1997) and Bednarz's (1999) appeal for the development of an effective GIS teaching model for K-12 classrooms and for university preservice teachers, develops and researches three GIS teaching models for preservice teacher education programs. The GIS pedagogies are based on three instructional models employed by teachers of the Jasper Woodbury Problem Solving Series published by the

Cognition and Technology Group of Vanderbilt (CTGV). To help students develop effective problem solving skills, the CTGV encourages teachers to use anchored instruction which "provides a way to recreate some of the advantages of apprenticeship training in formal education settings involving groups of students" (CTGV, 1990, p. 6) by creating learning environments that emphasize scaffolding and generative thinking (CTGV, 1992). These instructional approaches are the same ones that many educators have identified as necessary for successfully teaching GIS to learners at all age levels (Bednarz, 1995; Keiper, 1999). Therefore, the goals of the Jasper Woodbury Problem Solving Series and GIS are for students to "learn to become independent thinkers and learners rather than simply become able to perform basic computations and retrieve simple knowledge" and to develop their ability to "identify and define issues and problems on their own rather than simply respond to problems that others have posed" (CTGV, 1990).

The three instructional models CTGV (1990) identified for teaching the Jasper series are: "Basics First, Immediate Feedback Direct Instruction," "Structured Problem Solving," and "The Guided Generation Model." The first model, "Basics First, Immediate Feedback Direct Instruction," focuses on the order in which content and tasks in a curriculum are presented. This model is grounded in a "extreme reductionist view that all components of a skills must be mastered before the components can be assembled into the skill they comprise" (CTGV, 1990). The second model, "Structured Problem Solving," focuses on the importance of learners making errors and struggling with a task. This model is based on the premise "that errorless learning is ideal; at the other is the assumption that important lessons of learning occur only when students make errors or reach impasses and are then helped to correct their initial misconceptions" (CTGV, 1990). The third model, "The Guided Generation Model" is grounded in the role of the teacher in the learning process. This can span the range of "authoritative provider of knowledge to a resource who at times is consulted by the students and at other times can become the student whom others teach" (CTGV, 1990).

In addition to developing and researching GIS instructional models, because GIS use is grounded in a learner's ability to successfully navigate and learn with a spatial perspective (Audet & Paris, 1997), this study will analyze the effect of learners being field dependent or field independent on GIS learning. Field dependence and field independence is an established spatial ability cognitive style that correlates with the ability to successfully perform in a computer-based instructional environment (Riding & Cheema, 1991).

Statement of the Research Questions

This study is designed to answer the following questions based on the development and research of GIS teaching models for university instructors to implement within their preservice teacher education programs:

To what extent will preservice teachers, who are taught with a basics first (BF) model of instruction, be able to perform on a GIS basic skills exam (i.e., a test of procedural knowledge) and problem solve (i.e., a test of GIS cognitive engagement) in a GIS environment immediately after instruction and two weeks later?

To what extent will preservice teachers, who are taught with a structured problem solving (SPS) model of instruction, be able to perform on a GIS basic skills exam (i.e., a test of procedural knowledge) and problem solve (i.e., a test of GIS cognitive engagement) in a GIS environment immediately after instruction and two weeks later?

To what extent will preservice teachers, who are taught with the guided generation (GG) model of instruction, be able to perform on a GIS basic skills exam (i.e., a test of procedural knowledge) and problem solve (i.e., a test of GIS cognitive engagement) in a GIS environment immediately after instruction and two weeks later?

Does field articulation impact learning within the three pedagogical approaches – basics first (BF), structured problem solving (SPS), and guided generation (GG)?

Methods

In order to provide a context for the present study, descriptions of the research methods are organized into several different sections. They include descriptions of the subjects, materials, design, research setting, procedure, data scoring, and statistical analyses.

Subjects

The pool of available subjects in this investigation consisted of 160 volunteer university preservice teachers (hereafter participants) who were enrolled in the post-baccalaureate teaching program at the University of Minnesota. The participants were recruited from seven sections of the EdHD 5007: Technology for Teaching and Learning course.

Materials

The materials for this study consisted of the geographic information system software entitled ArcVoyager, three web-based modules with strict pedagogical guidelines - "Basics First, Immediate Feedback Direct Instruction," "Structured Problem Solving," and "Guided Generation," the Group Embedded Figures Test (GEFT) to measure the participants' field articulation, the project exams – "The Case of the Missing Ship" (ESRI, 1997) and "Magic Dan's Extreme Sea & Ski Resort" (ESRI 1998), and a response confidence survey/ demographic questionnaire.

Instructional Approaches Materials

Three instructional methods were used in this study to identify the best approach for GIS learning and to develop a model to guide future teachers who use GIS in their instruction. Each instructional method was based on suggested instructional approaches to teach the Jasper Woodbury Problem Solving Series from the Cognition and Technology Group at Vanderbilt (CTGV, 1992). The CTGV named their instructional methods "Basics First, Immediate Feedback Direct Instruction," "Structured Problem Solving," and "Guided Generation." The "Basics First" method focused on participants acquiring the basic subskills and subconcepts prior to being presented a complex problem. The "Structured Problem Solving" method focused on participants receiving instruction that minimized errors and reduced confusion and the "Guided Generation" method introduced complex tasks at the same time as the basic subskills and subconcepts. The materials developed for each method of teaching GIS were as follows.

Basics First, Immediate Feedback Direct Instruction Materials

The materials developed for the "Basics First" model were developed for a directed method of instruction where the instructor is the purveyor of knowledge while making sure students acquire the necessary GIS subskills and subconcepts. The "Basics First" GIS model was a web-based module developed with Macromedia Dreamweaver that included text and graphics to illustrate the main GIS subskills and subconcepts. This module was designed to help learners build their basic cognitive foundation in the use of a geographic information system prior to participating in the project exams. All "Basics First" sections were decontextualized to emphasize the basic skills. Therefore, basic GIS skills needed to complete the project exams were covered in this module before they practiced the task themselves and before they independently took the project exam.

Structured Problem Solving

The teaching materials developed for the "Structured Problem Solving" model were developed so participants could minimize their errors without confusion while working only on activities that would hopefully generate the correct result. A worksheet with ten complex practice questions (http://www.geographyeducation.com/gisweb/structuredindex.html) was used that required participants to use basic subskills and subconcepts in parallel with learning the ten sections in the "Basics First" web-based module. In order that participants could minimize their confusion within this module, Quicktime video tutorials (http://www.geographyeducation.com/gisweb/structuredindex.html) were developed. The QuickTime videos included graphics, animation, and narration that provided a web-based tutorial for students to successfully complete the ten complex practice questions. By providing a QuickTime video, students could play, stop, and replay the video, reducing confusion and minimizing errors while completing the practice questions.

The Guided Generation Model

The "Guided Generation" materials were developed to emphasize generative learning, anchored instruction, and scaffolding (CTGV, 1992). The materials in this module consisted of a video news clip (http://www.geographyeducation.com/gisweb/guidedindex.html) that imitated a news report announcing the "Case of The Missing Ship" (ESRI 1998). Within this video, the news anchor provided nine clues that could have been used with a geographic information system (GIS) to find the ship's location. The video provided "anchored" instruction for the GIS learners. In addition to the video news clip, in order to scaffold the participants' learning, a web-based module featuring QuickTime videos was developed to instruct participants on four domains needed to solve the problem of finding the ship. These domains consisted of the biosphere (people, plants, animals), atmosphere (air), lithosphere (rocks), and hydrosphere (water).

Project Exams

The participants' abilities to learn and use GIS were measured by how well they performed on two project exams and two GIS basic skills exams. The project exams measured how well the participants used GIS to identify a given location on a map when given nine clues. The exam questions were set in an authentic situation that the students could relate to in their everyday life. Both project exams have been used extensively in GIS training throughout the nation and have been found to be valid and reliable (Fitzpatrick 2002). Fitzpatrick (2002) noted that the project exams clearly measure how well students learn and use GIS at all age levels while providing a consistent measurement over the last four years.

A GIS basic skills exam was also used to assess the participants' ability to understand basic GIS procedural tasks. The basic skills exam consisted of ten multiple-choice questions (see http://www.geographyeducation.com/gisweb for the exam).

Response Confidence

Kulhavy, Yekovich, and Dyer (1976) found that during an exam, seldom does a test taker know their answer is completely correct or incorrect. In fact, they found that the students create a "hierarchy of confidence" regarding how correct their answers are (p. 522). Therefore, because the participants could possibly guess and receive a high score when taking the project exams, how confident the participants were in their answer was measured by participants ranking themselves on a five point equidistant Likert scale ranging from 1 (low confidence, random guess) to 5 (highest confidence, sure of answer).

Design

The design of this study was a quasi-experimental 4 X 2 X 2 factorial design. The dependent variables included cognitive engagement and procedural knowledge with two levels in each representing the exams immediately after instruction and two weeks later. The four independent variables were four different teaching methods - Basics First, Structured Problem Solving, Guided Generation, and the Control Group.

Setting

The instruction for all GIS methods took place in a Macintosh computer lab. All participants had their own computers. All three web-based modules were burnt on a CD-ROM so access time to text, graphics and videos was not a problem. The instructor had a Macintosh computer connected to a projector that was viewed on an 8 by 8 foot theatre screen for instruction. All modules and videos were available to the participants and were also used for teaching by the instructor on the theatre screen.

Procedures

Participants who volunteered to participate in the study were divided according to the days they were available to have a maximum of 24 participants in the computer lab at one time. The instruction began with each student completing the Witkin's Group Embedded Figures Test (GEFT) to determine his or her field articulation. The GEFT procedure strictly followed the GEFT manual (Witkin et al., 1971) which required a maximum of 20 minutes for the instructor to give the entire exam. Upon completing the GEFT, the students launched Microsoft Internet Explorer and went to a predetermined bookmark where they answered the demographic questions online. These questions were recorded automatically in a database. After the demographic questionnaire, the participants received one of the four instructional methods. Of the 160 participants that were invited to participate in the study, 40 were instructed in the "Basics First" method, 35 were instructed in the "Structured Problem Solving" method, 35 were instructed in the "Guided Generation" method, and 32 received the control group instruction.

After the instruction, the participants completed the first cognitive engagement exam titled "The Case of the Missing Ship" (ESRI 1997). Using the clues from the exam, the teachers wrote the latitude and longitude of their answer and recorded their response confidence. Upon completion of the first project exam, teachers completed the GIS basic skills exam. The teachers' delayed-retention was measured when they reconvened in the same computer lab to take the second project exam titled "Magic Dan's Extreme Ski Shop" (ESRI 1998) two weeks later. The teachers once again identified the location they believed was the correct answer by writing the latitude and longitude and recorded their response confidence. The teachers also completed the second GIS basic skills exam. They were given 90 minutes to complete both exams.

Personal Interviews

Personal interviews were conducted to better understand the participants' experiences using a geographic information system. Five participants were interviewed for each pedagogical level for a total of twenty interviews.

They were asked questions to help the author better understand the benefits and drawbacks of each pedagogical model. The interview questions can be seen at http://www.geographyeducation.com/gisweb).

Data Scoring

A geographic information system is a spatial environment. Therefore, the two project exams, "The Case of the Missing Ship" (ESRI 1997) and "Magic Dan's Extreme Sea & Ski Resort" (ESRI 1998), were scored based on the distance of the participants' answers from the actual answer location. The distance was measured in total degrees latitude and longitude from the correct location. The basic skills tests were graded on the scale of the number of correct out of ten.

Results

This study was designed to determine the effects of three pedagogical approaches for teaching preservice participants GIS and to identify whether or not field articulation has any impact on GIS learning.

Analyses of Participants' GIS Cognitive Engagement

Cognitive engagement (CE) refers to how well the participants solved authentic GIS problems over time. In determining the most effective teaching model, a repeated measures analysis of variance (ANOVA) was computed followed by a Tukey One-Way ANOVA. All analyses were computed at the .05 significance level.

Participants' performances on the CE tests over time were dependent variables with field articulation (FA) and group membership (GM) used as between group factors. This analysis revealed significant main effects for cognitive engagement ($F = 36.075$, $p < .001$) and group membership ($F = 6.048$, $p < .001$). Two-way interactions between cognitive engagement and group membership ($F = 4.476$, $p < .05$) were also found to be significant. No other tests were found to be significant.

The main effect of cognitive engagement over time and the interaction effect of cognitive engagement over time and group membership were significant. Therefore, a Tukey One-Way ANOVA was performed to further analyze mean differences. Cognitive Engagement exam one analyses found no treatment groups significant.

However, when measuring delayed-retention two weeks later in cognitive engagement exam two, the BF and SPS groups performed significantly better than the control group and both BF and SPS performed significantly better than GG.

All three treatment groups performed within nine degrees of each other on the CE exam one. However, on CE exam two, SPS and BF performed significantly better with scores of 36.422 and 55.107 degrees respectively compared to the control group and GG with scores 141.394 and 133.335 degrees respectively. Results were analyzed similarly for the effect of the amount of time a participant took to complete the exams (time on task) based on group membership. Time on task (TT) for cognitive engagement (CE) exams one and two were used as the dependent variables and group membership (GM) and field articulation (FA) were used as between group factors. This analysis revealed a significant main effect for TT ($F = 8.282$, $p < .05$) and GM ($F = 3.846$, $p < .05$). Two-way interactions between TT and GM ($F = 5.893$, $p < .05$) were also found to be significant. No other tests were found to be significant.

The main effect for TT and GM and the interaction effect of TT and GM were significant. Therefore, a Tukey One-Way ANOVA was performed to further analyze mean differences. When analyzing CE exam one, all treatment groups completed exam one significantly faster than the control group. Between group time performances were not significant.

Results for cognitive engagement exam two showed only the GG treatment group performing significantly different compared to the control group - this time investing less time than the control group. Both BF and SPS invested significantly less time than GG.

The cognitive engagement main effect and cognitive engagement and group membership interaction effects were significant. Further analysis using a Tukey one-way ANOVA showed no treatment group performed significantly better. When participants performed their second GIS cognitive engagement exam two weeks later, significant differences were found in the BF and SPS models compared to the control group. Between the SPS and BF pedagogy, participants who received the SPS pedagogy performed best. When analyses were conducted between groups, BF and SPS performed significantly better than the GG group on the second GIS cognitive engagement exam with participants who received the SPS pedagogy once again performing best.

When performance was compared to time on task (TT), all treatment groups took significantly more time than the control group when completing cognitive engagement exam one. No significant differences were found between groups. When completing cognitive engagement exam two, the control group, BF and SPS group members took a significantly longer amount of time than the control group.

Analyses of Participants' GIS Procedural Knowledge

GIS procedural knowledge refers to the ability to understand the basic procedural skills when using ArcView. Procedural knowledge was measured immediately after instruction and two weeks later. The procedural knowledge results were also analyzed using a repeated measures ANOVA. Procedural knowledge (PK) tests one and two were dependent variables with field articulation (FA) and group membership (GM) used as the between group factors. This analysis revealed significant main effects for procedural knowledge ($F=71.985$, $p < .0001$) and group membership ($F=13.971$, $p < .0001$) and a significant interaction effect between procedural knowledge and group membership ($F=5.349$, $p < .05$). No other tests were found to be significant.

The main effect of procedural knowledge and group membership and the interaction effect of procedural knowledge and group membership were significant. Therefore, a Tukey One-Way ANOVA was performed to further analyze mean differences. All treatment groups performed significantly better than the control group. Between group analyses revealed that BF and SPS performed significantly better than GG.

Participants' performances on the second procedural knowledge exam revealed that BF and SPS performed significantly better than the control group. Between group analyses revealed that only BF performed significantly better than GG.

The procedural knowledge and group membership main effects and the interaction effect between procedural knowledge and group membership were significant. Further analysis on procedural knowledge exam one showed all treatment groups performed significantly better than the control group and the BF and SPS groups performed significantly better than GG. Further analysis on procedural knowledge exam two revealed BF and SPS performing significantly better than the control group and only BF performing significantly better than GG on between group analysis.

GIS Performance Qualitative Analyses

Personal interviews were conducted that provided in-depth analyses of all GIS instructional methods. The personal interviews warranted a qualitative approach to data analysis because they helped identify advantages and disadvantages of the GIS instruction by recognizing emerging patterns across group membership.

Data analyses were divided into two categories based on the questions that were posed during the personal interviews: 1) the issues that impacted GIS learning with each pedagogical model and 2) the extent preservice teachers believed they were able to integrate GIS within their future classrooms.

The most common themes found in the interviews broken down by positive and negative responses. A positive response is defined by participant comments regarding the GIS pedagogical model they received during instruction as supportive to learning GIS. A negative response is defined by participant comments regarding the GIS pedagogical model they received during instruction as less than supportive to learning GIS.

Control Group

The common themes on issues that impacted GIS learning within the control group were all negative. The most common theme in the interviews was that participants were "completely lost" and at times "wanted to quit." The participants understood the task, but didn't know how to apply the skills they learned in the "Quick-Start Tutorial" to solving the GIS exam. Holly commented, "I followed the tutorial just fine, but when I had to use what I was supposed to learn in the tutorial in solving a problem with GIS, I had no idea where to start." The second most common theme was the request for more guidance and training. Four of the five participants noted that one class period of learning GIS in this approach was not sufficient. More guidance and training is required if an instructor is going to use self-guided tutorials to have the students teach themselves GIS. Matt said, "I think that GIS would be great in the class, but after this experience, I am very hesitant to try to use this technology."

Basics First

All BF pedagogy themes were positive. The first main theme was that access to an instructor to ask a question was a great benefit in learning GIS. In fact, all participants interviewed commented that they did not use the web-based module, but would rather wait to ask the instructor the question. Holly said, "I would much rather have a live person who I can ask questions than search on the web to find the answer. For me, it is much more efficient." Having access to the instructor led to the second most common theme which was the opportunity to practice the GIS procedural steps until they felt "comfortable." Four of the five participants noted that being able to practice the procedural steps and being able to ask questions was an excellent way to learn. Martha said, "I was never stressed and I understood what I needed to do on the screen to perform the designated task."

Structured Problem Solving

Four of the five common themes found in the interviews with the participants that received the SPS pedagogy were positive. The first positive theme, which all participants mentioned, was the opportunity to watch videos that reinforced learning at any time. Julie said, "I couldn't believe how they helped! After I figured out how to switch between the web browser and ArcView, I had no problem learning the GIS. The videos were well done!" Anthony said, "If it wasn't for the videos, I think I would have quit on the spot. There was no way I was going to be able to learn how to use the program without that assistance."

The second and third themes were also related to the videos. They included the opportunity to stop, rewind, and fast-forward the videos at any time and that the majority of the knowledge needed to perform well on the exams was answered within the web-based module. The opportunity to watch the videos was the most common, however, four of the five participants commented about the opportunity to manipulate the video to find the correct answer. Beau said, "I have to admit that I think I rewound the video at least three times. Granted, it took a bit of time, but it was worth it in the end." Related to this were that the answers were readily found in the modules. Matt said, "It took me a while sometime to find the answer, but I was surprised that everything I needed was either in the text or in the videos."

Lastly, three to the five participants said the authentic practice questions were "excellent." The participants liked having the practice GIS questions to learn ArcView and also learn how to apply the knowledge they had learned. Alan said, "When I did the practice questions I finally could apply the skills that I was learning. The questions were excellent in getting me to think about why I would use the specific skill in the GIS environment. The only drawback was that it took more time that I had wished." Sheryl also said, "It all made sense to me when I started answering the practice questions. I could read and think about my task and then I could find the answer in the videos."

Even though the interview was dominated by positive remarks, the participants stated they would have liked to have had immediate feedback from an instructor during their learning experience. Cassie said, "The videos and the practice questions definitely helped me, but it would have been nice to ask an instructor questions at times."

Guided Generation

Guided generation participants had a very different experience in their GIS learning. The only positive theme was the QuickTime video used for setting up the task to be completed. All participants thought it was an "excellent" way to "motivate" the learner and to "set the stage" for GIS learning. Chrissy said, "The video was excellent. I completely understood what we were supposed to do." Bob said, "I had never seen anything like [the video]. I think it could be used in more than just learning GIS."

All other common themes were negative regarding the GG pedagogy. All participants said they felt either "lost" or "frustrated." They all commented that they understood what they were supposed to do, but they didn't know where to start. Even after the participants started to understand their task, four of them said that it took too much time to learn one skill. Joe said, "It seemed as if I spent fifteen minutes just to learn how to add one layer." Once a skill was learned, the participants said they didn't know how to "apply the skill." Joe further commented, "Once I did learn how to import a layer, I really didn't know what to do next. It seemed as if I was spending most of my time playing and really not getting anywhere."

The last questions of the interviews and one question on the demographic questionnaire pertained to how likely the participants would be to integrate GIS into their future classroom.

Control Group

Fifteen percent of the control group responded "maybe " when asked if they feel they could integrate GIS within their future classroom. This statistic was supported in the interviews when all participants interviewed stated additional tutorials would be needed to learn GIS effectively. Four of the five stated they would need much more time to learn ArcView before they would consider integrating GIS within their classroom. Marlene said, "I really was frustrated when only going through the tutorial without any other instruction. I felt like I was missing the entire point of doing the exercise." Four of the five participants also said they needed suggestions on effective integration. Matt stated, “I actually think I would try to integrate GIS in my classroom, but I really need some ideas on effective integration and different types of lessons.”

Basics First

The BF group of participants felt very comfortable with GIS and 82% of them stated they would “definitely” integrate GIS within their future classroom. Roni said, “I really felt like I learned the concepts and use of GIS pretty well. My next big step is to practice and think about how I will use it in my class.” All participants interviewed said they would like a “little more practice,” but could definitely see the application of GIS technology. All participants commented that they relied heavily on the instructor and therefore, would really like some additional integration ideas.

Structured Problem Solving

Much like the BF group, 90% of the SPS participants said they would “definitely” integrate GIS within their future classroom. The participants stated that having access to the web-based modules for “further learning” and as a “refresher” would be excellent. Four of them asked if they could use the web-based modules with their future students. Jackie stated, “I definitely will try to integrate GIS in my future classroom. I would really like my students to have access to videos like we did. Would that be possible?” Three of the participants also said they would like integration ideas. Marlene said, “I would really like to see what other participantss have done with GIS. Some sample lessons or even videos like we had about GIS, but showing participants teaching would be nice.”

Guided Generation

Only 40% of the GG participants felt they would “maybe” integrate GIS in their future classroom. All participants interviewed said they would need effective integration ideas for their classroom and more experience. Beth stated, “Not to be negative, but I really don’t see myself integrating a technology like this unless I have much more practice and experience. I need more structure and definitely more help!” Mark said, “I would like to use technology like this, but I really would need assistance in learning it better. I can’t imagine using it in my classroom when I have no idea of knowing what my students should be doing with it.”

Personal interviews found participants who were in the BF and SPS treatment groups had an overall much better GIS learning experience than those in the control and GG groups. The BF group reported that access to the instructor was most beneficial while the SPS treatment group noted that access to the QuickTime videos proved most valuable. All participants who received instruction in the control and GG groups were very negative about the instruction they received stating they were “lost” during their learning experience and needed much more assistance.

When asked about the future integration of GIS in their classrooms, the BF and SPS treatment groups were most positive and optimistic. The participants saw the relevance and need for GIS integration and were willing to try to integrate GIS within their future classroom. Many participants noted they would also appreciate the assistance from the web-based modules when they are teaching their students. participants in the control and GG groups were not willing to try to integrate GIS unless they would receive more opportunities to learn GIS so they could see the relevance of the technology.

Field Articulation and Response Confidence

Field articulation had no effect on participants performance on either exam. In regards to response confidence, significant Pearson correlations showed correlations between response confidence and participant performance on all exams. Therefore, as response confidence increased, so did performance showing participants were not guessing at their answers.

Discussions and Recommendations

GIS Performance Summary

This study found participants who completed the first cognitive engagement exam did not perform significantly different depending on the GIS model of instruction they received. However, when participants returned two weeks later to complete the second cognitive engagement exam, participants in the BF and SPS treatment groups performed significantly better than the participants in the control group and in the GG treatment group. The mean scores were markedly different with the BF group scoring 86.2868 degrees and the SPS group scoring 79.5863 degrees significantly closer than the control group to the correct answer. Likewise, the BF group scored 78.2281 degrees and the SPS group scored 71.5276 degrees significantly closer to the correct answer than the GG treatment group.

Participant performance on the first GIS procedural knowledge exam revealed participants in the BF, SPS, and GG treatment groups performing significantly better than the control group, while the BF and SPS treatment groups performed significantly better than the GG treatment group. The second GIS procedural knowledge exam taken two week later revealed BF and SPS treatment groups performed significantly better than the control group and BF treatment group performed significantly better than the GG treatment group.

The question that needs to be answered is why did the differences occur in the cognitive engagement and procedural knowledge exams? A closer look as to why they preformed the way they did was found in the personal interviews.

Implications for Designing Learning Environments

Based on the data from this study, the following consideration should be taken when developing GIS instruction for preservice teachers. They are 1) instructors of GIS may have a tremendous influence on GIS learning using the "Basics First" pedagogical model, 2) GIS instruction that is not accompanied by an instructor within the room should have practice questions that set the GIS task within an authentic situation, 3) access to QuickTime videos for GIS skill understanding and review significantly enhances GIS learning, 4) GIS learners need instruction and direction in their learning, and 5) understanding the procedural knowledge of a GIS influences learning.

The "Basics First" (BF) treatment group performed extremely well on all exams. They noted that access to the instructor was most important in their GIS learning. They would rather wait to ask the instructor than looking on the web-based module for the answer. Therefore, the quality of the GIS instructor was very important when learning GIS with this model. If instructors with different GIS backgrounds and understanding use the BF pedagogy, one must ask the question, "Will the GIS learners perform at such a high level?"

The "Structured Problem Solving" (SPS) treatment group also performed significantly well with access only to the "structured practice questions" and QuickTime videos. Therefore, if one were going teach GIS online or would not be able to offer assistance at a level that is required in the BF treatment group, the SPS approach would be most beneficial. The success of the GIS learning environment following the SPS model relies heavily on the development of the QuickTime videos. All participants interviewed stressed how important these were for their learning and how the ability to stop, fast-forward, and rewind the video had a tremendous impact on their learning. The second most important feature related to the SPS model are the "structured practice questions." The participants noted how beneficial it was for them to practice the GIS skills with "direct application." The participants knew why they were doing the specific GIS skill. Therefore, practice questions where students are able to see the direct application of the question to real life can be very beneficial to GIS learning.

The "Guided Generation" treatment group felt that they understood what they were supposed to do after they watched the authentic video, but didn't "know where to start." They stated that they needed to know how to apply the GIS skills to solving the task at hand. Therefore, a constructivist approach that provides no instructor guidance with GIS learning was not found to be effective and used with caution.

Lastly, procedural knowledge and GIS performance significantly correlated on all exams. Therefore, when designing a GIS learning environment, GIS basic procedural skills should be taught and reinforced for quality future GIS performance. Participants within the GG treatment group received no instruction on procedural knowledge and performed poorly. Thus, even though setting up the environment with an authentic video may seem important, an understanding of GIS basic skills should be taught first.

References

Audet, R. H., & Paris, J. (1997). GIS Implementation Model for Schools: Assessing the Critical Concerns. Journal of Geography, 96, 293-300.

Bednarz, S. W. (1995). Reaching New Standards: GIS and K-12 Geography. Retrieved April 10, 2001, from the World Wide Web: http://www.odyseey.maine.edu/gisweb/spatdb/gislis95/gi95006.html

Bednarz, S. W., & Audet, R. H. (1999). The Status of GIS Technology in Teacher Preparation Programs. Journal of Geography, 98(2), 60-67.

Brownwell, K. (1997). Technology in teacher education: Where are we and where do we go from here? Journal of Technology and Teacher Education, 5, 117-138.

CTGV. (1990). Anchored instruction and its relationship to situated cognition. Educational Researcher, 19(6), 2-10.

CTGV. (1992). The Jasper Experiment: An Exploration of Issues in Learning and Instructional Design. Educational Technology, Research and Development, 40(1), 65-80.

Environmental Systems Research Institute, I. E. (1998). White Paper: GIS in K-12 Education. ESRI Press.

ESRI. (1997). Case of the Missing Ship. Retrieved February 5, 2001, from the World Wide Web: http://www.esri.com/k-12

Fitzpatrick, C. (1990). Computers in geography instruction. Journal of Geography, 89, 148-149.

Fitzpatrick, C. (2002). Personal Communication. In A. Doering (Ed.). St. Paul.

Fredrick, B., & Fuller, K. (1997). What we see and what they see: Slide tests in geograpy. Journal of Geography, 97, 63-71.

Keiper, T. (1999). GIS for Elementary Students: An Inquiry Into a New Approach to Learning Geography. Journal of Geography, 98, 47-59.

National Geography Standards Project. (1994). Geography for Life: National Geography Standards 1994. Washington DC: National Geographic Society.

Riding, R., & Cheema, I. (1991). Cognitive Styles--An Overview and Integration. Educational Psychology: An International Journal of Experimental Educational Psychology, 11(3-4), 193-215.

Science, S. P. f. t. S. (2000). SPSS Reference Guide (Version 10.0). Chicago, IL: SPSS, Inc.

Sui, D. (1995). A pedagogics framework to link GIS to the intellectual core of geography. Journal of Geography, 94, 578-579.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. (1971). A Manual for the embedded figures test. Palo Alto: Consulting Psychologists Press, Inc.

Meeting State Mandates for Inservice Technology Integration Training

Mary B. Shoffner and Laurie B. Dias

Georgia State University

This paper details one university's approach to meeting state mandates for technology training for in-service teachers, and the results of a continuous, feedback-driven project to evaluate for technology integration through a educator electronic portfolio development process and field-based observations. Portfolios are assessed for national and state technology standards. Educators are also observed in their schools for the application standards in their classrooms, offices, and counseling centers. Assessment and evaluation results are discussed.

Introduction

Federal, state, and local agencies are investing billions of dollars to equip schools with the technology that may well be the key to improving the learning experience of our nation's youth. Despite these gargantuan investments, only 20 percent of the 2.5 million teachers currently working in public schools feel comfortable using these technologies in the classroom (U.S. Department of Education, 1999; Technology Counts, 1997). As reeducating the existing teaching force to take full advantage of these technology tools will require expensive professional development over many years, much of the focus in recent years has been on ensuring the technology competency of new teachers. Initiatives such as the Preparing Tomorrow's Teachers to Use Technology as well as the adoption of NCATE 2000 standards, which require teacher education programs to address technology preparedness, have gone a long way to prepare the estimated 2.2 million new teachers needed in the next decade (Milken Exchange on Education Technology, 1999).

The focus is expanding, however, to address inservice teachers. Current literature indicates an increasing trend towards educational accountability, and in particular, teacher accountability. The No Child Left Behind Act of 2001 (Public Law 107-110) reinforces states' policies on improving education by calling for increased accountability and improved teacher quality. This act also supports staff development for teachers and administrators in the area of technology integration training and leadership development for technology selection and support. States receiving technology funds must spend 25 percent on training (Skinner, 2002). Some states have moved to requiring inservice preparation in technology integration as a requirement for teaching certificate renewal. Currently only four states require teachers to participate in technology staff development for certificate renewal in 2002: Connecticut, North Carolina, South Carolina, and Virginia (Blair, 2002). Others are moving in this direction.

Georgia is one of those states with a plan in place to mandate in-service teacher technology training. While the state of Georgia had originally passed a law that all certified teachers would be required to document their technology competency for certificate renewal in 2001, the deadline was delayed until 2006 due to insufficient resources available to train the estimated 111,000 Georgia educators (Georgia Professional Standards Commission, 2001).

This paper details one university's approach to meeting state mandates for technology training for inservice teachers. The following sections will review current professional literature on teacher accountability, technology skills for certification, and evaluation for teaching competencies, provide background on education mandates in the state of Georgia, provide an overview of project development scope and significance at Georgia State University to meet state mandates, and review assessment and evaluation data to date on the inservice teacher technology competency as well as developing issues in project continuance.

Review of Literature

National Trend for Teacher Accountability

The national trend toward educational accountability continues. Two decades have past since the National Commission on Excellence in Education declared us a "nation at risk" due to the "rising tide of mediocrity" in our educational foundations (1983). In 1987, the Carnegie Task Force created the National Board for Professional Teaching Standards (NBPTS) in an effort to increase teacher quality and reward those who demonstrate excellence in teaching by awarding National Board Certification (National Board for Professional Teaching Standards, n.d.). At the same time, many professional educational organizations such as the National Council of Teachers of Mathematics

(NCTM) and American Association for the Advancement of Science (AAAS) were writing standards documents, creating challenging curriculum and calling for "state of the art teaching" (Zemelman, Daniels & Hyde, 1998, p. X). Continuing in the same vain, President Clinton and the 103rd Congress passed the Goals 2000: Education Act of America (1994). In this legislation, President Clinton called for effective uses of technology in teaching and learning that promote opportunities for students to meet the National Education Goals. Among other things, his presidential plans called for teachers to become technology literate. Paralleling these accountability and reform efforts, the International Society for Technology in Education (ISTE) began developing technology standards for students and teachers (National Educational Technology Standards for Teachers, 2002). Released in 2000, the third edition of the National Educational Technology Standards for Teachers (NETS-T) outlined six standards areas with performance indicators for applying technology in educational settings. Today, President Bush's No Child Left Behind Act of 2001 (Public Law 107-110) reinforces state's policies on improving education by calling for increased accountability and improved teacher quality. This act also supports staff development for teachers and administrators in the area of technology integration training and leadership development for technology selection and support. States receiving federal technology funds must spend 25 percent on training (Skinner, 2002).

Technology Skills for Certification

Since the development of the NETS-T standards, Colleges of Education, state and local education agencies as well as accrediting bodies such as the National Accreditation for Teacher Education (NCATE) have begun requiring educators to demonstrate mastery of technology integration. Currently, 31 states and the District of Columbia have adopted, adapted, aligned or referenced the NETS for teachers in their state department of education documents which include certification and licensure requirements (Use of NETS by State).

In 1997, NCATE concluded that a majority of teacher education programs were not doing what needed to be done in terms of preparing teachers to teach in the 21st century classrooms. NCATE recommended that its accreditation body recognize technology education for teachers as central to the teacher preparation process. As a result, NCATE raised the bar. The newest NCATE unit standards now require teacher candidates to be able to "appropriately and effectively integrate technology and information literacy in instruction to support student learning" (2000, p. 8). Presently 26 states and the District of Columbia require technology training or coursework for initial teacher licensure and 7 states require an assessment of technology competence before granting initial certification (Blair, 2002). With the newest NCATE standards in place, more states will begin to make similar requirements of their college graduates.

Currently only 4 states require teachers to participate in technology staff development for certificate renewal in 2002: Connecticut, North Carolina, South Carolina, and Virginia (Blair, 2002). Others are moving in this direction. For example, this fall Texas' State Board for Educator Certification (SBEC) approved educator certification standards in Technology Applications for their beginning teachers (n.d.). Beginning fall 2003 Educators seeking initial licensing are required to pass a Pedagogy and Professional Responsibilities test embedded with the state's new technology standards. The SBEC recommends that all educators should strive to meet State Board of Educator Certification standards required for all beginning educators. In addition, they have created a Master Teacher Technology Certificate program to provide select teachers with additional technology training in order to assist their colleagues and students with technology integration. In October 2003 teacher certification applicants in Illinois will take a new Assessment of Professional Teaching which includes a section on core Technology Standards (Illinois State Board of Education, n.d.). Although veteran teachers will maintain their current endorsements, the Illinois State Board of Education states that the core Technology Standards will be used to guide the professional development of teachers and administrators. In Georgia, in-service teachers and administrators are required to complete either the Georgia Framework for Integrating Technology in the Student-Centered classroom (InTech) staff development program or a state approved technology integration course prior to renewing their teaching certificate. Portfolio assessments are used to document mastery of state technology standards. All educators are expected to meet this requirement beginning in 2006.

Evaluation for Technology Competencies

Assessments are central to educational reform and accountability. As a favored strategy by lawmakers and government agencies, their intended purpose is to "promote higher standards of teaching, more powerful learning, and more credible forms of public accountability" (Hargreaves, Earl & Schmidt, 2002, p. 70). When it comes to evaluating technology skills, three types of assessments are common: skills-based self-assessments, electronic portfolios, and observation instruments. Alternative to pencil-and-paper tests, these performance assessments are intended to motivate teachers to take more responsibility for their own learning, to utilize complex problem-solving skills, and to embed learning in authentic activities which promote a synthesis of information and skills (Herman, 1998; Hargreaves, et. al., 2002).

Technology skill-based self-assessment surveys seek to measure a teacher's "level of skill, literacy, integration and attitude towards technology and learning" (Anderson, 2000, Formal Assessments section, para. 1). National surveys have been conducted by several researchers in an attempt to determine characteristics of exemplary technology users, belief, practices and types of computer use by teacher leaders and patterns of technology integration (Hadley & Sheingold, 93; Becker, 94; Riel & Becker, 2000). State agencies, school districts and local schools have created or modified existing surveys. These tend to be either short rubric-based or Likert scale instruments. Assessments include those such as the Levels of Technology Implementation (LoTi) scale (Moersch, 1995) and the Mankato Survey of Professional Technology Use, Ability and Accessibility (Mankato Public Schools, 1997). The purpose of these instruments is for staff self-evaluation and decision-making about technology staff development.

Electronic portfolios are becoming a common means of validating both pre-service and in-service teacher performance (Lyons, 1999; Kariuki & Turner, 2001; Wright, Stallworth, & Ray, 2002). These alternative assessments provide learners opportunities to reflect on their practice, evaluate their own learning and progress towards clearly defined goals (Corbett-Perez & Dorman, 1999). Electronic portfolios not only encourage teachers to demonstrate pedagogical competencies but also foster continued growth in their technology skills. The results of such efforts may directly impact students. Teachers who create electronic portfolios are more likely to integrate technology in their own classrooms (McKinney, 1998).

Observation of technology integration competencies is another means to evaluate the level to which a teacher can meet standards. Researchers conduct qualitative observations to examine teachers' beliefs about technology and technology integration practices (Ertmer, Addison, Lane, Ross & Woods, 1999; Dias, 2000; Pierson, 2001). Collecting data from classroom observations of technology use is imperative, since the effectiveness of teaching practice is enmeshed in the myriad details of maintaining student engagement. As summarized by Painter (2001), "Successful integration of technology requires not only knowledge of the technology and its potential use but also the skill to plan and execute a good lesson (of which the technology is only a part)" (p. 23). Few observation instruments have been developed and decimated that target teaching with technology.

Background: State of Georgia Mandates

The state of Georgia has had several state initiatives to increase student use of technology and likewise to increase teacher technology competency. These initiatives include the use of lottery funds to fund technology initiatives in the schools, state funding for technology training centers, and a state legislation, House Bill 1187, which increased funding for technology specialist positions in schools. (Technology Counts, 2001). H.B. 1187 also mandated pre-service and in-service technology competency as of June 1, 2001. These initiatives are not without limits, however. Details about each of these initiatives as well as infrastructure limitations that limit Georgia's means of meeting these mandates are detailed below.

The Georgia Lottery was created in November 1992 by the people of Georgia to enhance education funding (Georgia Lottery Corporation, 2002). Lottery proceeds fund a variety of educational initiatives, including tuition grants, scholarships, and loans to undergraduate students and teachers who seek advance degrees in critical areas of need; voluntary prekindergarten programs; and technology grants to train teachers in the use and application of advanced technology and capital outlay projects for educational facilities (hardware, software, networking, teacher training centers, surveillance cameras and other safety hardware) (Georgia Lottery Corporation, 2002). Since 1992, the lottery has contributed more than $5 billion to education in Georgia. Of this, more than 1.8 billion as been appropriated to capital outlay projects and technology grants for schools. Lottery funds are meant to supplement, not supplant, traditional educational funding. In fiscal year 1998, Georgia funded $55.5 million in technology and capital outlay projects, $52.9 million of which came from lottery funds (Technology Counts, 1999). Estimated technology funding for fiscal year 2001 was $65 million (Technology Counts, 2001). A portion of state technology funding goes to the operation of thirteen technology training centers. The main program offered at these centers, InTech, is a staff development program for educators that focuses on integrating technology into the curriculum and classroom instruction.

Early in 1999, Georgia Governor Roy Barnes formed an Education Reform Study Commission to look at ways to improve Georgia's schools. Governor Barnes used the results of the commission's study to produce the A Plus

Education Reform Act of 2000 (2002). Out of the act came technology-related initiatives that impact practicing educators. First, the act funded one technology specialist position for every 1,100 students. Previously, one technology specialist position was funded for every four schools (Technology Counts, 2001). Second, the act mandated in-service educator technology integration competency:

Legal Reference: Code Section 20-2-200; Subsection (b)(2)

(b)(2) Before granting a renewable [teaching] certificate to an applicant, the commission is authorized to require the applicant to demonstrate either satisfactory proficiency on a test of computer skill competency or successful completion of the phase one InTech training model at a state educational technology center or by a State Board of Education approved redelivery team shall be acceptable for certificate renewal purposes.

The A+ Education Reform Act in the state of Georgia requires that all certified educators in Georgia demonstrate competence in the application of instructional technology as outlined in the Georgia State Technology Standards for Teachers. The Special Georgia Technology Requirement is grounded in the premise that all educators must become competent in the use of technology to attain high levels of student achievement. To this end, the law stipulates that the state funded technology training program, InTech, which is offered at the thirteen state funded technology training centers, be the defacto method for educators to achieve technology competency for recertification. The mandate was to go into effect for certificate renewals as of June 1, 2001.

However, the state soon realized the implications of the law and the reliance on state technology training centers. The law, as written, indicated that within a period of five years, the thirteen state technology training centers would need to deliver the 50-hour InTech program to over 110,000 educators. This far exceeded the capacity of the state technology training centers. To alleviate this overburdening of state resources, that state enacted a delay in the application of the law to June 1, 2006. Also, the legislature charged the Georgia Professional Standards Commission (PSC), the agency that manages educator certification, with two tasks: to develop a plan for alternative pathways for educators to meet the state requirement, and to formally approve and monitor these alternative pathways developed by state and other local agencies, school districts, private schools, and colleges and universities. Therefore, multiple agencies share in the responsibility for ensuring that all educators are competent in integrating instructional technology.

State Requirements and Program Development

The Georgia Professional Standards Commission (PSC) set forth several stipulations that must be included in any proposal submitted for a course or professional development program to be considered as an approved alternative pathway to meet the state technology requirement. First, any course or program developed and proposed must address multiple audiences, including those in instructional, support, service, and administrative roles, as well as educators with special learning and assessment needs. Second, any application for PSC approval must include a matrix demonstrating how the course or program maps and correlates with state technology standards. Third, the PSC mandated three format stipulations: programs offering professional development and assessment must also offer educators the opportunity to "test-out" of the requirement; approved programs must make use of an electronic portfolio for assessment purposes; and approved programs must include an on-site, field-based observation of each applicant. The course/program application packet can be downloaded from the PSC at: http://www.gapsc.com/TeacherEducation/Documents/Tech_App.pdf.

Course in place: IT 7360 Technology for Educators

At Georgia State University (GSU), a resource-based learning environment was developed in fall 1998 to serve as the basis of an elective course in technology integration methods for graduate education students. The course, IT 7360, Technology for Educators and its related resource laden WWW site, incorporates a problem-centered, activity-based approach where the computer applications are anchored in authentic and familiar contexts in which teaching and learning occurs (Cognition and Technology Group at Vanderbilt, 1991; Vygotsky, 1978). This approach is based on the view of an open learning environment in which learners have direct input on the direction of the course based on their needs (Hannafin, 1999; Hannafin, Hall, Land, & Hill, 1994). In navigating through the environment and tackling challenges, it is proposed that educator-students will also develop self-directed learning skills, which will serve them well as they professionally develop as educators. Along with confidence in using the technology, self-directed learning skills have been identified as a characteristic of successful technology-using teachers (Shoffner, 1996). The RBLE can be accessed at http://msit.gsu.edu/IT/Teachers.

In addition to introducing and reinforcing technology integration skills, the course reviews teaching and planning methods for the technology–enhanced learning environment. Educator-students review instructional objectives, national, state, and local curriculum standards, lesson planning, evaluation, and assessment. In the Technology for Educators course at GSU, the technology is immersed in learning about what being a educator entails – briefly, planning, learning theory, instructional strategies, classroom management, and assessment. Throughout the course, educator-students demonstrate their technology integration skills in a variety of activities which focus simultaneously on both what they can do with the technology, personally, and their ability to plan for their students to meet curriculum requirements while making use of a variety of technologies. The course makes use of multiple methods of assessment, including Technology Integration Planning and Skills samples, a paper-based portfolio, rich with student and educator technology artifacts, and a series of reflection papers on teaching with technology.

Audiences Served

While the course at GSU, like most other technology integration courses taught at the university-level, focused on what the classroom, Georgia's H.B. 1187 specifically called for the all certified educators to meet the state technology standards. In the call for proposals for programs to meet the Special Georgia Technology Requirement, pathways for variety school- and district-level educators had to be included. Specifically, any program approved by the Professional Standards Commission must provide suitable professional development and assessment for those in instructional and instructional support positions (classroom teachers, lead teachers, school library media specialists, teacher support specialists, and guidance counselors), as well as those in administrative or leadership positions (principals, assistant principals, district administration, as well as the often overlooked specialized certification fields such as school nutrition directors and school psychologists). A final requirement indicated that all approved programs must provide accommodations for the professional development and assessment of those educators with special needs, as defined by the Americans with Disabilities Act.

To determine if the course at GSU met the needs of both leadership and leadership populations, course objectives and assessments were mapped against the various Georgia technology standards. The mapping process and resulting adaptations are described in the following section. It was determined that the existing course would meet the special needs population requirements, as all programs and courses offered at GSU must provide accessibility and reasonable accommodations for persons with disabilities through the Office of Disability Services.

Documentation: Alignment with Standards

IT 7360, Technology for Educators, was designed to meet the earlier versions of the International Society for Technology in Education (ISTE) standards last distributed in 1998, and updated to match the 21 standards in five overarching categories of the National Technology Standards for Teachers. With H.B. 1187 and the ensuing charge of the PSC, Georgia Technology Standards for Educators were developed and were included with the application materials to be downloaded from the PSC web site. Georgia State Technology Standards for All Teachers can be downloaded from the PSC at http://www.gapsc.com/TeacherEducation/Documents/TechStandards.pdf.

Each program seeking approval from the PSC to offer state technology training was required to document that each and every Georgia Technology Standard for Educators, Professional Development Objective, and Performance Indicators was met. State and National standards were compared for parity. As the Georgia State Technology Standards for All Teachers were based on the NETS-T, parity was established. The application packet included a matrix to be completed. The matrix contained six columns, three of which were contained the Georgia Technology Standards for Educators, Georgia Technology Professional Development Objectives, and Georgia Performance Descriptors for teachers (instructional), service personnel, and administrators (leadership). Next, state technology standards were mapped against course objectives, sub-objectives, performance indicators, and assessment instruments. It was determined that all state performance indicators that addressed technology integration and planning skills for those in instructional positions were met in the course assignments and the culminating project, the portfolio, of the existing course. Equivalent course assignments and projects were created for those in administrative positions to meet the technology integration and planning skills performance indicators of the Georgia State Technology Standards for Administrators. It was also determined that all state technology application and management performance indicators could be assessed in the required field-based observation of the educator.

Rubrics were used to document each educator's performance. In addition to rubrics already in place to assess technology integration and planning skills, observation rubrics were created to assess application and management skills for those in instructional positions (teachers and media specialists). A second set of rubrics were developed to measure technology integration, planning, leadership, and dissemination skills for those in local school and district administrative positions. Technology integration and planning rubrics are available for viewing on the course website at http://msit.gsu.edu/IT/Teachers/Assignments/3210/Samples/Rubrics/rubricmain.html.

Project Development Requirements

The PSC mandated three format stipulations that must be included in any proposal submitted for a course or professional development program to be considered as an approved alternative pathway to meet the state technology requirement: programs offering professional development and assessment must also offer educators the opportunity to "test-out" of the requirement; approved programs must make use of an electronic portfolio for assessment purposes; and approved programs must include an on-site, field-based observation of each applicant.

Educators who had developed technology integration knowledge and skills must have the option of "testing-out" of any approved program. For IT 7360 and the related on-line resource based learning environment, meeting the required test-out criteria was not difficult. Course developers had always intended for the course to someday be delivered at a distance. The course was designed so, if needed, educators may progress through instruction on particular software skills and applications in an individualized, self-directed manner. The on-line learning environment for IT 7360 contains all necessary course materials for educators to learning and master skills, including software help sheets (tutorial directions) and recommended readings. Previous experience with course test-out options made the program developers cautious, however, resulting in a GSU-specified screening process to ensure test-out participant skills for success, as well as a timeline for the application and completion of the test-out option each semester. Educators electing to participate in the test-out option are still required to make application to the university and pay tuition. Educators who successfully complete the test-out option receive three graduate credits.

A second PSC stipulation was for the inclusion of an electronic portfolio. To meet this requirement, GSU converted the culminating paper-based portfolio to a web-based format. This change precipitated a change in course content, as instructional time in developing websites (as opposed to single webpages) was added to the course.

A final PSC stipulation was that all candidates must complete an on-site observation that demonstrates their abilities to integrate technology in accordance with their job responsibilities. This stipulation goes beyond the assessment requirements of the state technology professional development program, InTech, which has no observation requirement. Two observation rubrics were developed to measure achievement of performance based Georgia Technology Standards for both instructional and support roles as well as for individuals with leadership certificates. The content validity of the observation assessment instruments were checked through the inspection of items and sample performance descriptors by experts in the area student teaching as recommended in psychometric texts (see for example Gay, 1992; Isaac & Michael, 1981; Kerlinger, 1992). Experts were asked to check for overall content and accuracy. Based on feedback from these experts, specific changes in content and wording were made to the instruments.

Assessment and Evaluation

Assessment

Not all students who enroll in the GSU course use it to meet the Special Georgia Technology Requirement, as some have already met the requirement through the state InTech program, or are exempt due to National Board Certification. In the spring 2002 semester, of those who indicated they would use the IT 7360 course to meet the state requirement, 16 educators earned a grade of "B" or better in all technology integration and planning skills performance indicators (100 %). Field-based observations took place in a variety of instructional settings: elementary, middle, secondary, staff development, higher education, and public libraries were used as environments. Large group, small-group, individual, classroom, and laboratory instructional configurations were used. Technology resources included as little as one computer in a classroom, and as many as 38 computers in a laboratory setting, including many permutations in between. Content taught included mathematics, social studies, science, language arts, writing, reading, pre-reading, remedial, ESOL, computer science, and teacher staff development. Technology tools included spreadsheets, databases, graphics, writing, concept-mapping, word processing, desktop publishing, desktop presentation, internet research, creation of web pages, and use of weblogs for journaling, The purpose for educator technology integration in many cases was student productivity, but many educators also cited student motivation, the need to meet multiple learning styles, and enrichment. Fall 2002 semester observations are currently ongoing, but to date demonstrate the richness of topics and applications present in the spring semester. An additional 31 educators are participating this fall semester. To date, the educators represent a total of 16 county/school systems, and 55 different schools, both public and private.

Evaluation

During this first year as a pathway to meeting the Special Georgia Technology Requirement, several issues have surfaced in the strategies, management, and delivery of the IT 7360 course. These issues generally fall into one of two course requirements: the e-portfolio, and the field-based observation.

Issues that have arisen with the e-portfolio can be grouped into the areas of access and skills. Regarding access, educators still do not regularly have access to webspace at their place of employment, and must use the webspace provided to all GSU students or a free webspace such as Geocities. One participant even used a "weblog" site. University student webspace has been moved more than once in the past year, and teaching the file transfer process continues to take a great deal of instructional time.

This lack of regular access has also led to skills issues. Educators have little difficulty creating a single webpage, but struggle with design and file structure knowledge when asked to create an entire website, as they must to meet the e-portfolio requirement. To alleviate the design struggles, instructors created a template for educator-students to use in developing their e-portfolio. Educator file structure knowledge was not as easily solved. Strategies used to date include having educator-students first map their own e-portfolio website based on the requirements (objectives) using Inspiration®, and then creating templates as a class, modeling the linkage structure (instead of simply supplying the templates for use). After developing the personal templates, educator-students are also provided with the instructor created templates. The process of developing their own templates assists learners in developing file structure knowledge allows them to relax and focus on their content. A recent skill issue has been relative linkages used in recently released web development software upgrades making web page editing difficult. Instructional strategies to address relative linkages knowledge are currently under development.

Evaluation results of the on-site observation requirement are largely of a management nature. GSU, located in downtown Atlanta, is centrally located in the most populated area of the state. The university regularly draws teacher-educators from as distant as a 100-mile radius of the city. The scheduling, management, record keeping, and travel to and from on-site observations have turned into a time-consuming and expensive operation that has placed a strain on GSU resources. Initially, conducting on-site evaluations was not considered as part of faculty teaching load. The distances covered to conduct on-site observations has made the training of evaluators to ensure inter-rater reliability difficult, resulting in only two trained evaluators to date, further straining GSU resources.

With increasing enrollments, however, management issues in scheduling and conducting on-site observations are being addressed. In fall 2002 semester, one faculty course load was awarded for every 20 on-site observations scheduled. Furthermore, it is anticipated that two additional evaluators will be trained prior to spring 2003 semester. As more educators use the GSU course to meet the technology requirement, more observations will be scheduled, and location groupings of observations may be possible, thus decreasing travel expenses.

Conclusions

The national trend toward educational accountability will undoubtedly continue. It is anticipated that more states will follow the lead of Georgia, Connecticut, North Carolina, South Carolina, and Virginia, and will mandate educator technology integration professional development and put competency gateways into place. The curriculum mapping versus standards methods as well as the strategies for meeting state mandates in this paper will hopefully assist and encourage other university programs in being proactive to meeting this large and important in-service teacher professional development need.

References

A plus education reform act of 2000. (2000). [On-line]. Available: http://ganet.org/services/leg/ShowBillPre.cgi?year=1999&filename=1999/HB1187

Anderson, M. (2000). Assessing teacher technology skills. Multimedia schools 7(6), 25-27.

Becker, H.J. (1994). How exemplary computer-using teachers differ from other teachers: implications for realizing the use of computers in schools. Journal of Research on Computing in Education 26(3), 291-321.

Blair, J. (2002). Technology counts 2002: The virtual teaching life [Electronic version]. Education Week 21(35), 31-24. [Online]. Available: http://www.edweek.org/sreports/tc02/article.cfm?slug=35virrtual.h21. Accessed November 8, 2002.

Cognition and Technology Group at Vanderbilt. (1991). Technology and the design of generative learning environments. Educational Technology, 31(5), 34-40.

Corbett-Perez, S. & Dorman, S. (1999). Electronic portfolios enhance health instruction. Journal of School Health 69(6), 247-249.

Dias, L. B. (2000). Best practices of technology integrating teachers: Pictures of practice from four elementary classrooms. Unpublished Dissertation, Georgia State University, Atlanta.

Ertmer, P., Addison, P., Lane, M., Ross, E. & Woods, D. (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. Journal of Research on Computing in Education 32(1), 54-72.

Gay, L.R. (1992). Educational research: Competencies for analysis and application (4th ed.). New York: Merrill. Georgia Lottery Corporation (2002). History of lotteries. [Online]. Available at: http://www.galottery.com/lottery/lotteryhist.html. Accessed November 12, 2002.

Georgia Professional Standards Commission, Division for Educator Workforce Research and Development (2001). The Georgia teaching force: A report of the supply, demand, and utilization of pre-kindergarten – twelfth grade teachers in Georgia public schools. [Online]. Available: http://www.gapsc.com/Workforce/Data_Research.asp. Accessed November 12, 2002.

Goals 2000: Educate America act of 1994, H.R.1804, 103rd Cong. 2nd Session (1994). Retrieved November 11, 2002 from http://www.ed.gov/legislation/GOALS2000/TheAct/

Hadley, M., & Sheingold, K. (1993). Commonalities and distinctive patterns in teachers' integration of computers. American Journal of Education 101(3), 261-315.

Hannafin, M.J. (1999, February). Learning in open-ended environments: Tools and technologies for the next millennium. Paper presented at the 1999 annual meeting of the Association for Educational Communications and Technology, Houston, TX.

Hannafin, M.J., Hall, C., Land, S., & Hill, J. (1994). Learning in open-ended environments: Assumptions, methods, and implications. Educational Technology, 34(10), 48-55.

Hargraves, A., Earl, L. & Schmidt, M. (2002). Perspectives on alternative assessment reform. American Educational Research Journal 39(1), 69-95.

Hill, J.R. (1999). Teaching technology: Implementing a problem-centered, activity-based approach. Journal of Research on Computing in Education, 31(3), 261-279.

Herman, J. (1998). The state of performance assessments. The School Administrator Web Edition. Retrieved November 11, 2002 from http://www.aasa.org/publications/sa/1998_12/herman.htm

Illinois State Board of Education. (n.d.). Illinois professional education standards frequently asked questions. Retrieved November 11, 2002 from http://www.isbe.net/profprep/CASCDvr/faq.pdf

International Society for Technology in Education. (2000). National education standards for teachers. Eugene, OR: ISTE.

International Society for Technology in Education. (2002). Use of NETS by state. Retrieved November 11, 2002 from http://cnets.iste.org/pdf/States_using_NETS_10_09_02.pdf

Isaac, S. & Michael, W.B. (1981). Handbook in research and evaluation (2nd ed.). San Diego, CA: EdiTS Publishers.

Kariuki, M. & Turner, S. (2001). Creating electronic portfolios using laptops: a learning experience for preservice teachers, elementary school pupils, and elementary school teachers. Journal of Technology and Teacher Education 9(4), 567-584.

Kerlinger, F.N. (1992). Foundations of behavioral research (3rd ed.). New York: Harcourt Brace.

Lyons, N. (1999). How portfolio can shape emerging practice. Educational Leadership, 56(8), 63-65.

Mankato Public Schools. (1997). Mankato survey of professional technology use, ability and accessibility. Retrieved November 11, 2002 from http://www.isd77.k12.mn.us/resources/surveydatabase.html

McKinney, M. (1998). Preservice teachers' electronic portfolios: Integrating technology, self-assessment, and reflection. Teacher Education Quarterly, 25, 85-103.

Milken Family Foundation (1999). Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education. Santa Monica, CA: Author.

A Nation at Risk: A Report to the Nation and Secretary of the United States Department on Education (1983). Retrieved November 11, 2002 from http://www.ed.gov/pubs/NatAtRisk/title.html

No Child Left Behind Act of 2001, Pub. L. No. 107-110, 115 Stat. 1425 (2002).
National Board of Professional Teaching Standards. (n.d.). History & facts. In About NBPTS. Retrieved November 11, 2002 from http://www.nbpts.org/
National Association for Accreditation of Teacher Education. (2000). NCATE 2000 unit standards. Washington, D.C.: NCATE.
Pierson, M. (2001). Technology integration practice as a function of pedagogical expertise. Journal of Research on Computing in Education 33(4), 413-429.
Riel, M. & Becker, H. (2000, April 26). The beliefs, practices and computer use of teacher leaders. Paper presented at the American Education and Research Association, New Orleans.
Shoffner, M.B. (1996, February). Teachers and technology: What makes a technology adopter? Paper presented at the 1996 Annual Meeting of the Association for Educational Communications and Technology, Indianapolis, IN.
Skinner, R. (2002). Technology counts 2002: Tracking tech trends [Electronic version]. Education Week 21(35), 53-56.
Technology Counts [Special issue] (1997, November 10). Education Week, 17(11). [Online]. Available: http://www.edweek.org/sreports/tc/tchome97.htm. Accessed May 12, 1999.
Technology Counts 1998 [Special issue] (1998, October.). Education Week on the Web [Online]. Available: http://www.edweek.org/sreports/tc98/states/ga.htm. Accessed November 12, 2002.
Texas Education Agency (2002). Technology applications education standards. Retrieved November 11, 2002 from http://www.tea.state.tx.us/technology/ta/ed_standards.html
U.S. Department of Education (1999). Preparing tomorrow's teachers to use technology. [Online] Available: http://www.ed.gov/teachtech/. Accessed May 12, 1999.
Vygotsky, L. (1978). Mind in society. Cambridge, MA: Harvard University
Wright, V. & Stallworth, J. (2002). Challenges of electronic portfolios: student perceptions and experiences. Journal of Technology and Teacher Education 10(20), 49-61.
Zemelman, S., Daniels, H. & Hyde A. (1998). Best practice: new standards for teaching and learning in America's schools (2nd ed.). Portsmouth, NH: Heinemann.

Augmenting Classroom Instruction with WebCT

Ron Payne

Oklahoma State University

Less than ten years ago, if you mentioned the word "classroom" to any person on the street, you were apt to receive some form of subject recognition. To most of us, a classroom basically involved the actions of a teacher or some hardware that could be suspended, attached, or rolled into the room. If there were connections to the world outside the classroom, they usually involved some form of television, such as Channel One, close-circuit video, or some local station. Most of the other items usually associated with the classroom, like the chalkboard or the overhead projector, were largely considered standard for any general schoolroom and, in fact, a part of the general definition. The point is when we spoke of learning or the act of teaching in connection with a classroom, we rarely had to define the tools that had become associated with the norm. (Ko, Rossen, 2001)

However, in those same ten years, we have begun to undergo a tremendous change. Whether the change is to be considered revolutionary remains to be seen; but we actually have a chance to be a part of what could be one of the greatest changes to the act of teaching in 2,000 years! To be sure, at one time or another, we thought the overhead projector, the television medium, and even the motion picture would change education dramatically. To some extent, they probably had some good effects, yet overall, the definition of and the act of teaching remained fairly constant. Students still sit in rows with the teacher at the front of the room. To use any new devices, we often had to endure scheduling conflicts, a considerable amount of expense, and some effort to work through the associated "entertainment" value. Often, by the time we had obtained the items, using them properly had to slip somewhat. Moreover, when the big day arrived that we were to use the media, there was no assurance that there would not be a fire drill or a mass absence for some type of event!

Now, however, there is a tool available that requires no scheduling, little in the way of funds, especially when compared to setting up a video studio, and the tool is already perceived as a productivity tool more than one of entertainment. It is the computer, of course, but even more than that, it is the special software now available for the teacher. The software, or course tool, was designed by a teacher and is often used for distance education. But mostly, its real value is in the way it can support classroom instruction. And depending upon the involvement with such details a teacher wants to be engaged, (s)he can change the design, colors, or any other design elements, and (s)he can add instructional elements or take away instructional elements as needed. The teacher can administer a test or survey, show a movie, provide for an online discussion, use class e-mail, conduct an online chat or maintain a virtual office hour, and/or provide an audio effect to support realism or add narration when needed. But, even more, the course tool technology gives us a tremendous opportunity to change the very premise of what we define as classroom instruction. In no small way, it helps to make the possibilities of a constructivist's environment a reality.

Though the literature has suggested it for years, we are quickly approaching the time when we really are going to change our basic method of instruction from essentially teacher-centered activities to those directed by the learner. (Murphy, Cathcart, Kodali, 1997) And we teachers are beginning to see ourselves as "learning facilitators" instead of the traditional "know-it-all."

By using course tools, such as WebCT, we can even have more time to devote to answering students' questions, providing uniquely individual instruction, and or making available additional tutorials for students having difficulties or wanting to go deeper into the course content. (Shih and Cifuentes, 2001) In fact, with a little practice, we can turn any classroom into a haven for personalized instruction as envisioned by James Keefe and John Jenkins(2002).

In a very real sense, we can add the major concept of personalization to the traditional classroom: students setting their own pace of learning, learning materials based upon learning styles. With a tool like WebCT, we can begin our conversion to the future now. We can make course content available when our students are ready for it. We can selectively release content based upon test scores, students' names, or just dates.

In addition, a tool like WebCT can help us help our students gain academic confidence. Far too often, we have had students who suffered because they did not trust their efforts to produce "what the instructor wants." As we attempt to provide an environment that supports our students' attempts to construct knowledge, our job should be to help our students learn how to learn for those times when they must successfully solve their own problems. If we do, they will be able to engage in what could be a wonderful world where technology will help them attain the "best" learning experience that they define for themselves. (Adler and Rae, 2002) In fact, some suggest that we should help students learn to set their own achievement goals and help them maintain their work habits by letting them see their progress. (Salpeter 2002) With tools like WebCT, we can show them what they are accomplishing and provide the extra experiences that once was available only "outside" the classroom and, therefore, rarely. The students can select the extra experiences and content they want while still being on hand for the core of the course.

What about the importance of collaboration? Several authors suggest that we have spent far too much time making education a competitive enterprise. We need to make learning more of a team effort. (Heinich, Moldenda, Russell, and Smaldion, 2002) (Newby, Stepich, Lehman, and Russell, 2000) (Jenkins, J. and Keefe, J., 2002a) In WebCT, we can make teams easily. Students can exchange document and spreadsheet files, Web pages, and audio and video files. The instructor can randomly generate teams or assign students to teams. When the teams are generated, special discussion boards are set up for only the team members (and the instructor). Students can share ideas, suggest work strategies, and assign each other deadlines. They can begin to take some responsibility for their own learning. For many students, class stops being something to endure or merely to be a place to exhibit a passive-resistance to learning and become instead a place of active learning!

In addition to providing online discussions for groups, WebCT provides for online discussions for the whole class. Interestingly, students' additions to discussions tend to be well thought out, not the "off the cuff" comments we may hear in the classroom. In addition, online discussions can be an effective means for disallowing certain diversity issues from adversely affecting a learning opportunity. Since the teacher can configure the discussions to be anonymous, students do not know whose contributions they read. Also, students discussing an issue online can be amazed to find that their thoughts or opinions are the same as those held by someone with a different societal background or ethnicity. In essence, the negative effects produced by stereotyping can successfully be combated by this technique, helping the school achieve one of the goals of ethnic diversity. (Banks, et al, 2001, p. 200)

For a believer of the constructivist methodology, we can view the use of Web-enhanced classrooms as a very real attempt to gain the extra dialogues between our students and the content from which they are to construct their knowledge. We see three modes of dialogue and communication: 1) a dialogue between an instructor and a student; 2) the dialogue between and among students (learning from each other); and 3) a dialogue between the student and the instructional materials and resources. (Boettcher and Cartwright, 1997) And it seems that this method is very effective. Students do tend to learn more effectively when they interact with and process information than when they just hear about it. (Hoffman 2001) Indeed, we seem to have a wonderful opportunity to move beyond the learning of "inert" facts to generating better mental models (Dede 1995) supporting their construction of knowledge and problem solving strategies. This may sound like a lot and it is. But with a tool like WebCT, so much of the course operation is standardized and even easy that the teacher is left free to concentrate upon important pedagogical issues. Students do not have to take a course on taking a course. The course tool tends to be intuitive. Like the faculty, due to the inherent standardized look and "feel," students can devote their attention to the course content and the online experience. (Baker, 2001)

And, for the utilitarian purpose of producing effective citizens for our world of tomorrow, we should use the technologies now available to us to help our students get used to working with them. They are already entertained by it. Now, let's show them how to work effectively with them. Or, as one author suggested, "Given today's increasingly technological world, educational institutions must produce students who are able to function comfortably in this world." (Levine 2002, p.18)

But how? We may need a real example to see how some of the instructional "wishes" and "hopes" can be employed successfully. A quick survey of the constructivist's literature can provide several concrete suggestions for interpreting theory into the "classroom." An interesting case is provided by Honebein (1996), who suggests seven goals for the design of constructivist learning environments. His list of the seven goals builds upon the work of Cunningham, Duffy, and Knuth (1993). Honebein's goals follow:

1. Provide experience with knowledge construction process.
2. Provide experience in multiple perspectives.
3. Embed learning in realistic and relevant contexts.
4. Encourage ownership and voice in the learning process.
5. Embed learning in social experience.
6. Encourage the use of multiple modes of representation.
7. Encourage self-awareness of the knowledge construction process. (11-12)

When faced with the "trouble" of translating the seven goals into action, one is reminded of Wilson's (1996) plea for teacher to remain "vigilant to ensure that an environment includes proper support and guidance and rich resources and tools." (5) It is in applying the goals that one does more than pay lip service to her/his beliefs about learning and teaching and takes action to help students attain the desired learning. An example of one instructor's attempts to apply the seven goals using WebCT to augment classroom instruction follows.

1. Provide experience with the knowledge construction process. Following a presentation about the Internet and some of its educational uses, the students were given live instruction about HTML. Their tool during this session was Notepad, a small text editing package that is a resident of Windows operating systems. The students created three pages that linked to each other and included differing font colors and at least one picture. (Some students placed more than one picture.) During the next class session, the students were introduced to FrontPage. After a couple of sessions of instruction and practice with the software, they were assigned the task of creating their own Website. The purpose of the site was to introduce themselves, tell about their interests, display their pictures (they had taken digital images of each other earlier in the session), and provide links to their favorite Websites. By using the tool of their choice, no one selected Notepad, they met and solved the various challenges of producing a site.

2. Provide experience in and appreciation for multiple perspectives. After the students uploaded their Web pages to the protected course site, they could view each other's pages. They checked the links and looked at how others met and solved production problems that they had experienced in their own production. In addition, they noted the creativity displayed by each Web page and in some cases, worked to figure out how certain features had been accomplished.

3. Embed learning in realistic and relevant contexts. Believing that every educator needs to "know their own mind" or view of typical educational issues in the event they are ever called upon to present their views to members of the community, the students are asked to write a position paper on one of four issues facing education. The issues are set forth as follows:

Homework? Some people suggest children have too much, do they? For additional information, you might begin here.
Socializing with friends? Reports are school performance falls as time spent with friends increases? For additional information, consider this information.
Extracurricular activities? Are sports too important? Check the additional information.
Television? Is TV viewing a problem for students? For additional information, see this!
Part-time jobs? Do students work too much and too long? For additional information, see Gannon University's study hints page.

In addition, the students are told to produce a PowerPoint presentation that they can use to present their position. Though they are asked to present their position, they are cautioned that, as potential educators, they should provide an "informed" opinion citing the sources provided as links and an additional one of their own. The authentic activity for this aspect of the course is for them to determine their own stand.

4. Encourage ownership and voice in the learning process. During the second week of the course, after all the introductory exercises and learning to use the course Website are satisfied, the students are asked to provide a list of ten learning objectives they hold for themselves during their time in the course. Those objectives are combined, provided with appropriate links to course materials that will further them on their way to achieving the objectives, and posted in a prominent place in the course Website.

5. Embed learning in social experience. Later in the course, the students are introduced to the concept and steps involved in performing a WebQuest. They are told by way of introduction that the WebQuest will help them move from Web Surfers to Web Searchers. They will learn to search with a purpose, not aimlessly wander through cyber space. To perform the WebQuest, they are divided into four research teams. They are then told to physically move to one of four locations in the room whereby they take part in a short team-building exercise. Then, they are introduced to the challenge requiring the WebQuest. Since most of these students will probably be in charge of their school's Website by virtue of their having this course on their transcript, they are charged with the responsibility to perform as a team to determine five major rules that determine an exceptional educational Website. Then, they are assigned the task of finding five educational Websites that display each of their rules and they are to find five educational Websites that fail each of the five "tests." They are provided a site that lists all or most of the

educational sites in Oklahoma that they are to study. Finally, they are given the task of reporting the findings of their research via a group Website inside the course Website. In the beginning of the three-day exercise, the instructor moves from group to group to handle any special problems, answer non-routine questions, or to provide appropriate guidance. By the second and third day, the instructor "fades" away and allows the groups to function as independent teams that assigns tasks for each member and sets appropriate deadlines. After the completion of the quest, the students engage in a special essay "examination" during which they reflect and write about their experiences, recount their activities, and, hence, their learning.

6. Encourage the use of multiple modes of representation. In several cases through the time during which various pieces of relevant software or certain activities are presented, the students are presented at least two modes of gaining information. First, the traditional voice, picture, "doing" type of instruction is presented during class. On the course Website, there are additional "presentations" that augment the in-class work. The presentations may be a simple Web tutorial, as in the case of learning FrontPage. To enrich the in-class presentation of Boolean logic for Web research, a couple of Viewlets© are presented to help the students quickly "cement" their new search power.

7. Encourage self-awareness of the knowledge construction process. The discussion tool is ideal for the metacognitive effort. In responding the questions about the topic of study posted by the instructor, students are asked to respond to both the instructor's questions and to the questions and/or comments of at least five of their classmates. In addition, when the instructor finds a need to add a comment, he has found a unique way of further enriching the discussion tool by linking to a video inside the message. He says something similar to, " . . . for a report dealing with MIT's work on artificial intelligence, click here." When the student clicks the link marked "here," a short video plays showing the work of several MIT researchers as they "teach" machines to respond as humans. Predictably, the video brings about additional discussions about humanists versus machines and, then, often leaps into what the students can expect in the future!

In conclusion, WebCT can assist the constructivist build a meaningful environment for students. In so doing, the practicing teacher risks taking her/his classroom out of the "safe" zone of centuries-old tradition and leaping deep into the future. A future that holds some promise for those who believe in personalized instruction where each student builds or constructs their learning to suit their particular style and needs. What a wonderful time to be a teacher!

References

Adler, C., Rae, S. (2002). Personalized learning environments: the future of e-learning is learner-centric. E-Learning (3, 1) 22-24.

Baker, J. (2001). Enhancing online faculty productivity with WebCT. Syllabus (15, 3) 24-27.

Boettcher, J., Cartwright, G. (1997). Designing and supporting courses on the web. http://contract.kent.edu/changes/articles/sepoct97.html .

Baker, J. (2002). Enhancing online faculty productivity with WebCT. Syllabus (15, 3) 24-27.

Banks, J., Cookson, P., Gay, G., Hawley, W., Irvine, J., Nieto, S., Schofield, J., and Stephan, W. (2001) Diversity within unity: essential principles for teaching and learning in a multicultural society. Phi Delta Kappan. (83, 3) 196-201.

Cunningham, D., Duffy, T. and Knuth, R. (1993). Textbook of the future. In C. McKnight (Ed.). Hypertext: a psychological perspective. London: Ellis Horwood Publishing.

Dede, C. (1995). The transformation of distance education to distributed learning. Available online http://www.hbg.psu.edu/bsed/intro/docs/distlearn/ .

Heinich, R., Molenda, M., Russell, J., Smaldino, S. (2002). Instructional media and technologies for learning. 7th Edition. Merrill/Prentice-Hall: Upper Saddle River, NJ.

Hoffman, R. (2001). Technology's impact on the faculty: a perspective. The Technology Source. May/June 2001. Available online at http://ts.mivu.org/default.asp?show=article&id=853 .

Honebein P.C. (1996). Seven goals for the design of constructivist learning environments. In B.G. Wilson, (Ed) Constructivist learning environments case studies in instructional design. Englewood Cliffs, NJ: Educational Technology Publications. pp11-24.

Jenkins, J., Keefe, J. (2002a) Two schools: two approaches to personalized learning. Phi Delta Kappa (83, 6) 449-456.

Keefe, J., Jenkins, J. (2002). Personalized instruction. Phi Delta Kappan (83, 6) 440-448.

Ko, S. and Rossen, S. (2001). Teaching online: a practical guide. Boston, MA: Houghton Mifflin Company.

Levine, L. (2002). Using technology to enhance the classroom environment. T.H.E. Journal (29, 6) 16-18.

Murphy, K., Cathcart, S., Kodali, S. (1997). Integrating distance education technologies in a graduate course. TechTrends (42, 1) 24-28.

Newby, T., Stepich, D., Lehman, J. Russell, J. (2000). Instructional technology for teaching and learning: designing instruction, integrating computers, and using media. Merrill/Prentice-Hall: Upper Saddle River, NJ.

Salpeter, J. (2002). Accountability: meeting the challenge with technology. Technology & Learning (22, 6) 20-30.

Shih, Y-C, Cifuentes, L. (2001). One tale of why and how to teach and learn online internationally. TechTrends (45, 6) 8-13.

Using and Evaluating Online Course Discussions

Dorothy P. Fuller

Black Hills State University

Abstract

This paper explores how faculty from a small university in the northern plains use electronic discussion to support their online courses in various disciplines, how they evaluate student participation, and how they prepare their students to successfully use discussion to interact with the course content and with other students. Qualitative analysis of the results indicates that while faculty use electronic discussion in a variety of ways, the applications tend to fall in four focus areas: course content, collaboration and community building, development of higher order thinking skills, and course management. Results also indicate that faculty find their greatest satisfaction with electronic discussion stems from the increased levels of content interaction and the use of higher order thinking skills.

Introduction

As more and more learning institutions begin using the Internet to deliver courses, instructors work to develop better ways to bring students together, to help them make connection with others in the course and to enhance their learning. Asynchronous electronic discussion has become an increasingly popular tool for these purposes. Electronic course management tools such as WebCT and Blackboard provide threaded discussion groups that can be tailored for the specific demands of each course through the development of specific course related topics and the design of both large and small group discussion opportunities. In spite of the proliferation of online discussion tools, some instructors are hesitant to require the use of online discussions, either because they don't have a clear picture of the various ways that electronic discussions can benefit a course, or they are uncertain about how to effectively manage or evaluate the use of a tool that can potentially consume a large amount of student and teacher time and energy. Yet those who have begun using electronic discussions in their online courses have found that they provide structure for the course (Lieblein, 2000), build awareness of the ideas and contributions of other participants (MacKnight, 2000) and encourage student collaboration through information sharing and peer support (Sherry, 2000). Advocates point out that online discussion has the reflective characteristic of written communication (Northrup, 2001), and thus encourages reflective contributions to ongoing topics of discussion (MacKnight, 2000) and enhances the development of higher order thinking skills through a combination of human and content interactions (Rose, 2002; Wilson, 2002).

Online discussion is frequently used similarly to face-to-face discussions in classrooms to encourage students to dig into the course content and develop understanding. Strategies such as open and small group discussions of case studies, debate teams, mock trials and jigsaws can be quite effective in online environments (MacKnight, 2000). Palloff and Pratt (1999) provide striking examples of how electronic discussion has been used to foster collaboration among students separated by distance and time. Some instructors provide structured questions to guide students' written responses to the group. Such structured questions often require the application of higher order thinking skills such as analysis and evaluation principles and their applications (Liaw & Huang, 2000). And sometimes online discussion becomes a tool for course management as it is used to document regularity and frequency of attendance by students in the course (Palloff & Pratt, 2001).

As many ways as exist for incorporating discussion in online courses, just as many are available for evaluating participant contributions to those discussions. Most instructors who use discussion as a part of their courses do assign some level of participation points, but the elements they select in determining the assignment of those points vary widely. Some use rubrics or checklists, others provide their students with specific elements that must be addressed in order to gain credit in the discussion, and still others follow a pattern often seen in traditional classrooms, assigning points based on an overall impression of the quality of participation (McKinnon, 2000). Bean (1998) reported that face-to-face professors frequently rely on their impressions to determine class participation grades and may use an overall sense of student participation as a "fudge factor" when computing final grades. The professor's general impression of the frequency and thoughtfulness of a student's participation in ongoing class discussions could spell the difference between one letter grade or another in the course. Regardless of how discussion points are determined, research indicates that grading discussion participation encourages steady contributions (Lieblein, 2000) and encourages student collaboration (Hathorn & Ingram, 2002).

However, online discussion has one distinguishing characteristic that sets it apart from face-to-face discussion. Although, just as in a classroom discussion, the participants consider and respond to ideas and thoughts of others around a specific topic, the online discussion achieves substance as a written format. Threaded discussion postings provide the instructor with a durable record of the entire course discussion and end the necessity of relying on memory and general impressions to determine the frequency and quality of each participant's contributions. In classroom discussions, students who use active body language and a few well chosen words may lend the impression of substantive participation. The written record of online discussion removes nonverbal static and clearly separates the simple "I agree" from the contribution that provides factually supported agreement, critical reflection, or a penetrating question that deepens the discussion or moves it in a new direction. These are the elements that Palloff and Pratt (2001) refer to as substantive contributions.

Online discussion affords new opportunities for reflective participation and collaboration as well as new levels of learner accountability. The pressure of being constantly visible while being physically separated from the rest of the class and the requirement for active learner involvement throughout the course may seem strange and threatening to students who have been comfortably successful in more passive traditional classroom environments. Instructors who wish to use the advantages of electronic discussions successfully must design enough structure into their discussion assignments to provide a safe learning opportunity for their students. Online professors should consider modeling the use of critical questioning and self reflection in the discussion (MacKnight, 2000). Berge and Muilenburg (2000) recommend that faculty develop guiding questions that evoke the use of higher order thinking skills. McNabb (2002) encourages designing discussion assignments that focus on specific goals, provide structure and boundaries, and encourage the use of probing and self-reflective questioning. She also suggests providing access to materials and resources that help students prepare for substantive discussion participation.

How, then, do faculty successfully pull everything together? How do they use discussion in their online courses across various disciplines? What do they want discussion to accomplish in their courses? How do they prepare their students to use discussions effectively? And how do they evaluate the results?

Method

Nineteen faculty representing three colleges in a small northern plains university were interviewed for the study. All currently teach online courses and have between one and seven years experience developing and teaching online courses. Of those nineteen, only five reported not using discussions in their courses. The remaining fourteen faculty were interviewed using the following questions:

- What do you want the use of electronic discussion to accomplish in your course?
- Do you assign points for discussion? If so, what percentage of the course grade do they represent?
- What factors do you consider when evaluating discussion?
- Do you use a rubric or a checklist for evaluation? If not what do you use?
- Do you provide specific instructions to students for conducting electronic class discussions?
- How satisfied are you that online discussion is meeting your stated goals for the course?

The faculty were also asked to provide copies of any student instructions and rubrics that they used and to provide examples of discussion postings that represented both excellent and below par student performance.

College	Use Discussion	Do Not Use Discussion
Arts & Sciences	3	1
Business & Technology	6	4
Education	5	0

Table 1: Faculty using electronic discussion, by college.

Results

Information from the interviews on the uses of electronic discussions was analyzed, coded and clustered into four general areas: Course content, higher order thinking skills, collaboration and community building, and course management.

Course content included such elements as understanding of principles, application of principles, accuracy, completeness, and supported by examples.

- Higher order thinking skills included evaluation of theories and principles, analysis of cases, problem solving, and moving the discussion to levels above statement of facts and application.
- Collaboration included reading/listening to others, responding to other students' ideas, sharing resources, politeness, and regularly engaging in ongoing discussions.
- Course management included attendance, homework submissions, and quantity of postings.

Goals

Not surprising, interaction with course content was the most frequently cited goal by online professors in all represented disciplines. Professors wanted students to use electronic discussion to demonstrate their understanding of the content and to apply the principles they learned to real world situations and problems.

This was followed closely by goals involving the development and maintenance of strong online communities. Many of the professors spoke of helping students make connections to others in the course in order to reduce the distance and isolation that seems to stimulate high attrition rates in many online courses. Business faculty in particular were interested in developing electronic collaborations that simulated the electronic workgroups many corporations now use regularly.

Especially for those faculty teaching upper level and graduate level courses, the demand for evidence of higher order thinking skills such as analysis, synthesis and evaluation was important, but overall the terms most frequently used to describe desired discussion content included understanding, summarizing, supporting with details, and applying principles. All of these terms relate to thinking skills at the lower end of Bloom's taxonomy.

Faculty within each college used electronic discussions to track student online attendance and participation, but those in business and technology courses make the most use of this feature. Likewise, this group of faculty was most likely to use the discussion element as a means for collecting homework.

College	Course Content	Higher Order Thinking Skills	Collaboration	Course Management
Arts & Sciences	100%	33%	67%	33%
Business & Tech.	50%	33%	83%	67%
Education	80%	60%	80%	40%

Table 2: Goals for electronic discussion, by college

Evaluation

Most faculty felt strongly that assigned points for discussion participation was essential. One instructor stated, "I've tried it both ways, and I get much better participation when I assign enough points to make a difference." His points equated to 10% of the final course grade.

College	Faculty Assigning Points	Faculty Not Assigning Points	Percentage Range
Arts & Sciences	2	1	8% - 20%
Business & Tech.	5	1	3% - 10%
Education	4	1	7% - 30%

Table 3: Assigned percentage points for discussion, by college

There was a wider disparity in how faculty evaluated student discussions. Only education faculty used formal rubrics for evaluating discussion. Remaining faculty used either informal checklists or a general impression of quality of participation. Those that reported using general impressions of quality and quantity also reported that they used discussion as a "fudge factor" when assigning final grades, giving the edge to students with consistent performance levels in both quantity and quality.

College	Rubric	Informal Checklist	General Impressions
Arts & Sciences	0	67%	33%
Business & Tech.	0	67%	33%
Education	80%	20%	0

Table 4: Methods of evaluating discussion participation, by college

Faculty reported a variety of factors that they took into consideration when determining the quality of a discussion posting. No single element was on every list, but the most frequently used term was "substantive." When pressed to further define substantive, faculty provided examples such as completeness, accuracy, supported by facts and examples, reflective analysis, applied to specific circumstances, and adding something new to the discussion, or moving the discussion forward. This tends to coincide with the description of substantive postings developed by Palloff and Pratt (2001): "A substantive post responds to the question in a way that clearly supports a position, begins a new topic or somehow adds to the discussion by critically reflecting on what is being discussed or moving the discussion in a new direction" (pp. 79-80). Other elements frequently sited were demonstrated understanding, use of outside resources to expand discussion, and responds to and builds upon others' ideas.

Faculty had a much easier time agreeing on the elements of a below par submission: off subject, unsupported "I agree" postings, rephrasing of other submissions with nothing new added, and rudeness. All faculty agreed that such submissions received no credit for participation, and three instructors stated that they responded to such postings by private correspondence with the author and provided guidance for more effective postings.

Instructing Students

Considerable disparity existed in the methods that faculty use to prepare their students for successfully using electronic discussions. Some faculty provided general instructions that included how to used the system for posting discussions and general rules of netiquette. Others provided specific instructions directly related to the requirements of an assignment. These instructions were more likely to provide examples of acceptable and unacceptable responses and to itemize specific elements (e.g., supporting data, examples, real-world applications) expected in a posting. Some faculty provided both general and specific instructions. Only two faculty reported modeling discussion postings within the ongoing class discussion. There were also faculty who reported providing no instructions, general or specific, to their students.

College	No Instructions	General Instructions	Specific Instructions	Modeling
Arts & Sciences	0	100%	67%	0
Business & Tech	50%	0	50%	0
Education	20%	60%	80%	40%

Table 5: Faculty providing student instruction for electronic discussion participation, by college

Satisfaction

Faculty were asked to report their level of satisfaction (high, medium or low) in relation to how well electronic discussion were meeting their established course goals. When reporting levels of satisfaction, faculty comments tended to link their level of satisfaction with electronic discussion with the quality content interaction by their students and to the degree in which students used higher level thinking skill in their class discussions. Several faculty qualified their answers with statements such as, "Perhaps I set my expectations too high." And one faculty member reported a high level of satisfaction with online discussion and then qualified that by stating, "But I've changed my expectations from last year." However, none of the faculty reported any interest and foregoing discussion in any future classes. The highest levels of satisfaction were reported by the instructors who incorporated models of desired behaviors in their ongoing class discussions.

College	Low	Medium	High
Arts & Sciences	33%	33%	33%
Business & Tech.	33%	33%	33%
Education	0	20%	80%

Table 6: Levels of faculty satisfaction with electronic course discussions, by college

Conclusion

Electronic discussion is a common element in the online courses taught by the participants of this study, and for the most part it seems to be effective in providing a means for students to interact with the instructor, with other participants and with the course content. By virtue of the written format of electronic discussion, students interaction with the content may be more reflective and may invoke greater use of higher order thinking skills. This proposition is supported by higher levels of satisfaction reported by faculty who also named course content interaction and development of higher order thinking skills as goals for using discussion. The written format of online discussion certainly provides faculty with more concrete evidence for evaluating both the quantity and quality of discussion participation, and this in turn, may be encouraging faculty to use more specific criteria for evaluating student participation, moving away from impressionistic evaluation techniques. Regardless of the factors used to evaluate discussion participation, the results of this study adds further support to research showing the effectiveness in using assigned point values for discussion participation in order to encourage regular student participation and collaboration. Electronic discussion also seems to be an ideal way of providing students with realistic models of electronic working groups currently used in businesses around the world. The small population of this study limits conclusions regarding the relationship between faculty satisfaction with discussion and the level of instruction on effective participation that they provide to students. This could be an area where faculty mentoring could increase the satisfaction of all.

Reference List

Bean, J. C. (1998, Summer). Grading classroom participation. *New Directions in Teaching and Learning*, 74, 33-40.

Berge, Z. L. (2000). Designing discussion questions for online adult learning. *Educational Technology*, 40(5), 53-56.

Bloom, B. S. (1956). Taxonomy of educational objectives handbook 1: The cognitive domain. New York: David McKay.

Hathorn, L. G. & Ingram, A. L. (2002). Online collaboration: Making it work. *Educational Technology,* 42(1), 33-40.

Lieblein, E. (2000). Critical factors for successful delivery of online programs. *Internet and Higher Education*, 3(3), 161-74.

Liaw, S. & Huang, H. (2000). Enhancing interactivity in Web-based instruction: A review of the literature. *Educational Technology,* 40(3), 41-45.

MacKnight, C. B. (2000). Teaching critical thinking through online discussions. *Educause Quarterly,* 23(4), 38-41.

McKinnon, G. R. (2000). The dilemma of evaluating electronic discussion groups. *Journal of Research on Computing in Education,* 33(2), 125-131.

McNabb, M. (2002). In search of strategic designs for mediating e-learning. Retrieved September 30, 2002, from University of Kansas PT3 VisionQuest site: http://www.pt3.org/VQ/htm/mcnabb.html

Northrup, P. (2001). A framework for designing interactivity into Web-based instruction. *Educational Technology,* 40(2), 31-39.

Palloff, R. M. & Pratt, K. (1999). *Building Learning Communities in Cyberspace: Effective Strategies for the Online Classroom.* San Francisco: Jossey-Bass.

Palloff, R. M. & Pratt, K. (2001*). Lessons from the Cyberspace Classroom: The Realities of Online Teaching*. San Francisco: Jossey-Bass.

Rose, R. (2002). E-learning communities and cultures. Retrieved September 30, 2002, from University of Kansas PT3 VisionQuest site: http://www.pt3.org/VQ/html/rose.html

Salmon, G. (2000). E-Moderating: The Key to Teaching and Learning Online. London: Kogan Page.

Sherry, L. (2000). The nature and purpose of online discourse: A brief synthesis of current research as related to the WEB Project. *International Journal of Educational Telecommunications,* 6(1), 19-51.

Electronic Technologies in High School Mathematics Classrooms

Aytac Simsek

Syracuse University

Abstract

This paper presents the results of a qualitative study investigating the use of electronic technologies, such as computers and graphic calculators, in 10th grade geometry courses in a small, rural high school in New York. This study examines how math teachers understand the use of electronic technologies in the classroom to support teaching and to improve students' conceptual understanding of mathematics. A discussion for the implementation of effective and supportive teaching by using technology in the classroom is provided.

Introduction

Electronic technologies, such as computer and graphic calculators, can provide teachers and students in High School Mathematics with the tools to develop a better understanding of mathematics. Electronic educational technologies are essential tools for teaching, learning, and doing mathematics (NCTM, 2000). Learning with technology enables students to build more meaningful personal interpretations, representations of ideas and simulating meaningful real-world problems (Jonassen, 1995). Research indicates that these electronic technologies are especially useful in developing the higher-order skills of critical thinking, analysis, and scientific inquiry (Roschelle, et al., 2000). Using technology tools helps students focus on decision-making, reflection, reasoning, and problem solving (NCTM, 2000).

Learning mathematics with understanding is essential to enable students to use what they know, and to improve their conceptual understanding (Bransford, et al., 1999). Technology tools help students develop pictures of abstract concepts in their mind. Students' ownership of abstract mathematical ideas can be fostered through technology because technology use prompts the transfer and applications of mathematical ideas into concrete experiences (NCTM, 2000). However, research on the effects of using technology has generally emphasized that "technology is not a panacea" (Kramarski, 2001, p.77). Jonassen (2000) argues that "students do not learn from technology, but technologies can support meaning making by students" (p. 8). Then, Jonassen (2000) emphasizes that students learn with technologies when technology supports knowledge construction, explorations, learning by doing, learning by conversing, and learning by reflecting. Clark, Hosticka, and Huddlestun (1999) emphasize that technology tools are powerful in the right hands, but tools can cause great harm when misused such as teaching lower-order thinking skills involving drill and practice. Therefore, fostering learning with technology depends on how technology is used and how technology is integrated into classrooms.

An investigation of how electronic technologies should be integrated into high school mathematics classrooms may provide the essential information for decisions about the required conditions for successful implementation of technology. A qualitative research study in high school mathematics classrooms may inform how mathematics teachers should use technology to support teaching and to improve students' understandings. Therefore, this research study examined how math teachers understand the use of electronic technologies in the classroom to support teaching and to improve students' conceptual understanding of mathematics. A discussion for the implementation of effective and supportive teaching by using technology in the classroom is provided.

Research Purpose

This research study considered the role of electronic technologies to support teaching and to improve students' conceptual understanding of mathematics. The goal of this study was to document the distinguishing features of electronic technologies, the process of their integration into the current curriculum and its impact on mathematic education in a small, rural high school in New York. The purpose of this research was to discuss the results of this qualitative study investigating the use of electronic technologies in 10th grade geometry courses in which students and teachers have been using computer and graphic calculators.

Method

Data were collected through participant observations in four different classroom and interviews with four mathematics teachers. Moreover, this study is a part of ongoing investigation on how electronic technologies such as computers graphic calculators, and projectors are integrated into their math teaching practices. This ongoing study consists of participant observations, document analysis, and interviews with participant math teachers.

Research Questions

Based on information collected from initial meetings with teachers and classroom observations it was assessed that electronic technologies, e.g., computers and graphic calculators had been integrated into mathematics classroom.

Thus, the focusing research question was: how do math teachers use electronic technologies to support their teaching and to improve students' conceptual understanding of mathematics in high schools?

The data were collected to assess:

- the kinds of materials and equipment being used,
- teaching and learning perspectives on technology use,
- mathematical concepts being presented,
- teachers' skills to use the technologies effectively,
- implications of the current curriculum, and
- math teachers' perspectives on using electronic technologies to enhance teaching and learning.

Analyze

Field notes from classroom observations and data from document sources were coded and analyzed for categories. Interviews were transcribed, coded and analyzed. Development of the coding system was evolved through rereading the transcripts, and field notes.

All of the classrooms have enough graphic calculators, and enough textbooks for all students; and these textbooks support use of the graphing calculators. All of the classrooms had one projector, one computer and one Internet connection. The school has two computer labs with access to Internet connections.

Results from Observations

During the lessons, teachers used transparencies, PowerPoint presentations, and graphic calculators instead of drawing all things on the blackboard. Students brainstormed about the concepts or questions by reading and discussing instead of only writing all things. When using overhead projector teacher could see students' face easily, and asked questions by pointed on slides. This helps to keep students interest and improve communication. Teachers could save time during the lesson since they did not spent time by writing all problem statements and drawing complex shapes to the blackboard, and then waiting students to write down their notebooks. While teachers showed presentations and explained steps for solutions. Teachers guided to students their active learning process by solving questions together with students when using graphic calculators, by engaging students into lesson with question-answer method, group activities and class discussions.

One experienced teacher used Geometry Sketchpad with the computer on teacher table and reflected the computer's monitor through projector. The teacher played with Geometry Sketchpad to draw parallel lines and explain the different kind of lines. Since there was only one computer in the classroom students did not have a chance to study with computers during the lesson. Teachers believe students can explore concepts, have a better understanding of real life problems if they learn by doing instead of listening teacher. Students can see three-dimensional shapes by using graphic calculators and Geometry Sketchpad. If teachers and students use computer labs students have a chance of playing with Geometry Sketchpad. Thus, technology can add another dimension to the learning environment by doing more things then doing by pencil, and paper.

Teachers and students used graphic calculators and a computer during lesson to drill and practice, solve problems, draw graphs, and discuss on the solutions.

Results from Interviews

Technology definitions of teachers included calculators such as the Texas Instrument TI-82, computers, overheads, and software e.g. Geometry Sketchpad. Teachers could use the computer as a teaching device with the PowerPoint presentations, the web-based reading, and a grading book.

Teachers stated that using technology during 82-minute periods lesson helped to keep students' interest. Some problems that teachers face were that time consuming for

- preparing of technology before class,
- practicing new software and web sites,
- attending inservice technology workshops,
- learning teaching tips,
- completing the determined topics for each semester, and
- using computer labs during the lesson

Teachers stated a lack of preservice training (especially for older teachers) and a lack of inservice training caused difficulties in using technology in the classroom. Teachers with fewer years of experience felt more comfortable than novice teachers during adaptation of using technology.

Some teachers had a fear of facing a problem with computer server, programs, or overheads in the classroom. They wanted to have technical support for immediate feedback and training to improve their skills to use technological tools easily and effectively. They needed time for preparing of technology before class, for practicing new software and web sites, and for learning teaching tips when using technology in the classroom.

The other important problem teachers' state is the decisions about which technology, for what, and when should be integrated into curriculum. For example, they think that students are being introduced the calculators a little too early, and students come in high school with such weak basic arithmetic operations' skills.

Discussions

Teachers in this study believed using electronic technologies allowed students to improve their understanding of the concepts and ideas behind mathematical thinking. However, the results of this study emphasized the need for teacher training on how to use these technologies effectively and realistic teaching tips to integrate technology into teaching practices.

Teachers had concerns about time given to complete the determined topics for each semester, so none of the teachers used computer labs during the lesson. The math curriculum should be revised to let the teachers to have enough time to integrate technology into their teaching. Teachers should

- develop technology materials or curriculum;
- practice with new resources and change their teaching methods;
- assess on what does work, and what does not work;
- be analytical for decisions on what technology can be used for instruction and learning and how to use the technology;
- match technology integration strategies with course needs;
- have technical support for immediate feedback; and
- improve their skills to use technology.

Jonassen (1995) states learning in classroom should emphasize seven qualities of meaningful learning: active, constructive, collaborative, intentional, conversational, conceptualized, and reflective. Integrating computer technologies should include these seven qualities of learning to promote higher-order thinking, creative thinking and thus meaningful learning. Educators, teachers, and teacher education programs should try to understand these seven qualities and apply them during their efforts for technology integration into their teaching practices.

Roblyer and Edwards (2000) states that elements of a rationale using technology in the classrooms are motivation, unique instructional capabilities, support for new instructional approaches, increased teacher productivity, and required skills for an information age. There are many benefits in using computers in our math classes (Sfard, & Leron, 1996). But, Wentworht (2002) states that mathematics teachers should rethink on their teaching practices when integrating technology into their classroom. Bitner and Bitner (2002) developed eight areas of consideration that is important to allow teachers to successfully integrate technology into the curriculum: fear of change, training in basics, personal use, teaching models, learning based, climate, motivation, and support. Skillful and motivated teachers can take advantages of technology in the learning process of their students.

Using technology in the classroom effectively requires that teachers make good decision about which technology will best meet learning objectives and why. Therefore, professional development programs should prepare inservice teachers to use technology in the classroom effectively.

The emphasis on integrating technology into the curriculum requires that K-10 mathematics teachers become experienced of instructional technology in the management of the classroom, in developing teaching/learning strategies, and for the delivery of classroom instruction. Teachers must be comfortable with their skill to use computer software, hardware, Internet, and graphic calculators and to develop new learning strategies according to new technologies.

Recommendations for Future Research

This study was a first step in investigating on how electronic technologies such as computers and graphic calculators, and projectors are integrated into their math teaching practices. Recommendation for ongoing and future researches include:

- conduct the study in different high schools near New York to compare and contrast the results;
- conduct the study in different grades in mathematics classrooms to distinguish the results of different grades in terms of technology integration; and
- conduct the study in science classroom to compare and contract the influence of the technology integration into two different subjects.

References

Bitner, N. & Bitner, J. (2002). Integrating technolgy into the classroom: Eight keys to success. Journal of Technology and Teacher Education, 10(1), 95-100.

Bransford, J. D., Brown, A.L., & Cocking, R. R. (1999). How people learn: Brain, mind,

experience, and school. Washington, D.C.: National Academy Press.

Clark, K., Hosticka, A., & Huddlestun, D. (1999). Computers in the mathematics/science classroom: Help or hindrance. International Conference on Mathematics / Science Education and Technology, 1, 78-83.

Jonassen, D. (1995). Supporting communities of learners with technology: A vision for integrating technology with Learning in schools. Educational Technology, July- August, 60-63.

Jonassen, D. (2000). Computers as mindtools for schools: Engaging critical thinking. New Jersey, NY: Prentice Hall.

Kramarski, B. & Zeichner, O. (2001). Using technology to enhance mathematical reasoning: Effects of feedback and self-regulation learning. Educational Media International, 38(2/3), 77-82.

National Council of Teachers of Mathematics (NCTM). (2000). Principles and standards for school Mathematics. Reston, VA: National Council of Teachers of Mathematics.

Roblyer, M. D., & Edwards, J. (2000). Integrating Educational Technology into Teaching. NY: Macmillan Publishing Co.

Roschelle, J., Pea, R., Hoadley, C., Gordin, D., & Means, B. (2000). Changing how and what children learn in school with collaborative cognitive technologies. The Future of Children, 10(2), 76–101.

Sfard, A. & Leron, U. (1996). Just give me a computer and I will move the earth: Programming as a catalyst of a cultural revolution in the mathematics classroom.

International Journal of Computers for Mathematical Learning, 1(2), 189-195.

Wentworht, N. M. (2002). Mathematics as a factor in technolgy and curriculum integration. Journal of Computers in Science and Mathematics Education, 372-377.

Designing a learning objects-based learning system: Lessons learned

Mary Kay Alegre

Kevin Clark

George Mason University

This paper focuses on lessons learned when the action learning approach was applied to the design and development of an online learning system using reusable content objects for a large-scale government agency. The theoretical model of instructional systems design (ISD) and action learning theory were combined to give students a framework for facing the day-to-day project management realities of:

- effectively working as a team to solve the instructional design challenge;
- managing client needs and expectations; and
- designing an online learning system that utilizes reusable content objects.

Despite the project's complexity, the team completed a prototype of three courses and the structure of a course learning system. The project team was comprised of graduate students in an instructional technology program and they instructor. The instructor acted as the project manager of the project while the students completed much of the instructional design work. The students were all a part of a full-time instructional technology masters program. The program has students working on client-supported design projects for two semesters.

Action Learning and The ISD model

The action learning theory was particularly appropriate for this project because we had the components needed to implement the project: a committed group of team members, and an authentic task. Action learning aims to confront the increasing demands of environmental change and job complexity in the workplace through promoting a team-based learning process (Bannan-Ritland, 2001). Teams solve the problem, and the process works to generate new perspectives and capitalizes on team resources. And, similar to the ADDIE model, action learning utilizes a systematic process to address various types of problems at the macro and micro levels.

Documented in this paper are the processes and results of applying action learning theory to the instructional systems design process:

1. Analysis – performance analysis, needs assessment, and role modeling;
2. Design - development of essential use cases, content and task modeling, wireframing;
3. Development – prototyping.

Implementation and Evaluation were beyond the scope of this project, but it is worth noting that each phase of the process involved some form of formative evaluation, and revision.

The Client

The client for this project, a large government agency, wanted to improve the delivery of its current paper-based distance-learning courses by converting them to an online format. The client chose this course of action partly because of a mandate and partly because of a desire to decrease the amount of travel time and resources previously required to train employees.

How Reusable Content Objects Fit Into the Project Design

The client envisioned the use of a reusable learning objects system for this project. Learning objects, later termed, reusable content objects are described in more detail in the Design Phase. The concept of reusable content objects refers to the notion that objects such as text, graphics, video, audio, etc. can be reused in different areas of the learning system without reproducing the same object over and over (Wiley, 2000). Much has been written about the conceptual implementation of reusable content objects, but not much emphasis has been placed on designing and developing these systems within the instructional systems design framework.

The project team had to consider existing specifications and standards for learning objects including durability, interoperability, accessibility, reusability, affordability, and manageability in making a decision on whether to use this technology for this particular project. The team also explored the benefits of using content objects, because of their potential for reusability, generativity, adaptability, and scalability.

Project Phases

Analysis

Step One: The Performance Analysis and Day-to-Day Project Realities

The team began by conducting a brief performance analysis (PA), which is the "partnering with clients and customers to help them define and achieve their goals. It involves reaching out for several perspectives on a problem or opportunity, determining any and all drivers toward or barriers to successful performance, and proposing a solution system based on what is learned, not on what is typically done" (Rossett, 1999).

The team sought out perspectives from the client, Subject Matter Experts (SMEs), and staff members. The team also analyzed non-human sources of data including reports, the current course content, and the current format and system of instruction. The team used these resources to develop a project vision describing the problem and opportunities, and to generate a list of drivers and barriers that would assist or hinder the team in achieving the vision. The project vision and underlying challenge was to "develop an online learning system for users which provided access to current, critical knowledge through an enhanced instructional environment." Drivers were resources both technical (hardware and software) and human (SME's, staff, and the team's instructors, and advisors). Barriers identified were possible insufficient access to people: (learners, SMEs, and others) and to resources and information needed for a thorough needs assessment. The resulting document was presented to the client for discussion and approval before beginning the next step in the process.

During the first month, while the team completed the Performance Analysis, the eventual scope of the project began to unfold. A series of meetings with the client revealed the possible impact of agency politics on the project scope. The client felt that it was important to include agencies with similar responsibilities and concerns in the effort to develop the online learning system. In light of this, our client began securing the interest of another agency in the project and subsequently began to consider inclusion of their content in the courses that were going to be converted. For the team, this raised questions about the scope of the project, the timeline for deliverables, and who the client was and would become. By the second month, our client was still unsure of the content and the courses to by prototyped. Because of this, the team scaled back the deliverables slated for completion by the end of the first semester. We would not fully enter the design phase; rather focus on doing a thorough needs assessment and analyzing system functionality.

Step Two: The Needs Assessment and Day-to-Day Project Realities

Upon completion of the performance analysis, the team began a thorough needs analysis process. This included surveying learners, SMEs, client staff members and course instructors, reviewing course materials and student course evaluations, as well as other sources of data. The team developed a strategy for gathering data, and developed instruments that would be most effective for gathering data to illuminate possible relationships between the performance problem and those most affected by the solution – the learner, and secondly, other system users (Rothwell & Kazanas, 1992).

Because of strong indications that a second agency and its learners would be included in this project, the team included them in its needs analysis. The findings of the needs analysis yielded the following design considerations:

1. An enhanced learning environment – including the addition of interactivity within the course and among learners and instructor; more appealing content and shorter courses; and the addition of case studies at various levels of complexity and interactivity;
2. Current information – which describes the need to design the courses in such a way that they are easy to update with new information and develop the courses in a modular format; and
3. Immediate access to information – describing a system designed for portability and printability, accessible anytime from anywhere.

In meetings with the client during the needs analysis, the team discovered that the client was in the process of developing a web site and structure for handling course management functions, including student login, registration functions, and course management capabilities. All of it was to be backed by a database. With this finding, the scope of the project changed. The team no longer needed to develop an entire learning system from login to course completion, rather only needed to focus on course functionality and converting three courses to an online format.

This finding also had implications for reusable content objects. Because the client was building a course management system with a database infrastructure, the feasibility of designing the courses using a reusable content objects database significantly increased because the technology was already in place. The team more thoroughly researched reusable content objects during this phase, and along with the client, made decisions related to their design.

Design

Step Three: Development of Personas

While each team member finalized his/her section of the Needs Assessment Document, sub-teams developed role models or personas for those who would be using the system. The method of creating personas is simple but extremely powerful – "make up pretend users and design for them" (Cooper, 1999). Personas have goals, characteristics and personalities and can even have a name. These characteristics are based on research and personify a particular class of user. Once personas are created, design decisions are based less on design team hunches or opinions, or what "all users' might want and need, and are based more on a particular user that represents a single category of user. The team built one persona for each of the different categories of users: learners, instructors, course administrators, and, learner supervisors.

Step Four: Development of Essential Use Cases

For the four personas, the team developed essential use cases. Use cases provide a way to build system functionality based on a usage-centered design approach that responds to user needs. It is a model that focuses attention on user intentions and simplified system responses (Constantine & Lockwood, 2001). To create the essential use cases, the team developed well-defined user tasks and matched them with system responses. These tasks were pulled from the Needs Assessment Document. Each case was described in abstract and in technology-free terms to allow for alternative design solutions during the next step of the process when team members determined system functionality and built wireframes.

Step Five: Determining System Functionality and Building Wireframes

The team, along with its programmer, worked very closely with the client to build a system compatible with the system being built to administer and house the courses. With results from the Needs Assessment, as well as knowledge of user intentions and goals, the team was able to identify those system functions necessary to satisfy user needs. Some of these functions were already available on the client's system, the others would need to be added. Once these functions were determined, they became the basis for course navigation. With functions identified, and content developed and ready for placement in the course, the team began building wireframes. Wireframes are visual representations of each of the system functions. When used together with a navigation map, they show both how the interface is laid out, in its most simple and general terms, and how the system will be navigated based on user interactions (Constantine & Lockwood, 2001). The wireframes and course navigation maps along with the course content were provided to the team programmer who built a database structure using web-based applications such as ASP and Cold Fusion.

Step Six: Reusable Content Objects and System Design

Before chunking the content, and while the team decided on system functionality, and system navigation, and built course wireframes, we continued to research learning object systems, and the feasibility of using learning objects, or reusable content objects as the foundation of our course structure. Discussions continued with the client about if and how to approach the creation of reusable content objects. We needed to consider conforming to official standards called the Sharable Content Object Model or SCORM. SCORM is a "set of specifications for developing, packaging and delivering high-quality education and training materials whenever and wherever they are needed" (SCORM, 2001). SCORM comes from a U.S. Government's initiative in Advanced Distributed Learning (ADL).

The team learned that a full-fledged learning objects system that complies with these standards would probably be beyond the scope and budget of this project. The client proposed a different approach so that content could be reused among and between courses. The decision was made to develop course and system specific tags, based on the tags indicated in the standards. This solution would be cost-effective and allow for future growth and compliance if desired. This level of tagging, however, could not be completed in the short time that remained in the second semester, so alternate plans were made to simply chunk content according to topic, using naming conventions to identify the content's placement in the course. Each chunk was added to the database and would serve as the foundation for a reusable content object system.

Development

Step Seven: Prototyping

During the development phase, the system, its functions, and content got a "look". The user interface was created with the help of a graphic designer. The team's programmer added the graphics to the database, and built the infrastructure for and populated an active, high-fidelity prototype (Constantine & Lockwood, 2001). An active, high-fidelity prototype is one that functions to the extent necessary to show how the real system will work, and one that closely resembles the user interface.

Conclusion

The prototype, along with a description of all phases of the instructional design process, was presented to the client upon completion of the second semester. The team summarized its experience of working as a team and putting action learning theory into practice to solve the ISD problem. The team successfully fulfilled its vision of building three course prototypes that were interactive, appealing, portable and printable, and easy to update. The courses, now in a web format, will provide students of land and realty management an enhanced learning environment. This environment was created only after conducting a thorough needs assessment, and through the team's understanding of and commitment to usage-centered design, and planning in great detail the course functionality based on user needs. The prototypes will need to be tested, and will go through several iterations before they become the new method of training for emerging managers of the two government agencies.

Lessons Learned

As a result of working on this project there were a few lessons that we learned:

- Establish the database structure with the assistance of a database engineer prior to beginning design on the essential aspects of the system. Because the database system and the online learning system were viewed as two different systems, issues of compatibility were overlooked. This proved to be a tremendous challenge when the time came to integrate the two "systems" into one large-scale online learning system with a database infrastructure.
- In addition to determining the database structure, you should also fully investigate the details involved in implementing the technology. In this case, the client wanted to implement a cutting edge technology such as learning objects. Because of the lack of time and resources, neither the client or designers were able do dedicate the time required to fully investigate all of the implications involved in designing for a learning objects-based system.
- Have client and team work closely together on the design and development; communication is key. The client and the design team should work very close together so that each is aware of the others needs, vision, and resources. This will eliminate the possible of duplication of efforts as well as the need for drastic and sudden changes in project goals.
- Create prototypes to test out ideas and approaches. In order to help the client and designers gain a clearer understanding of what is to be achieved, prototypes enable both parties to put their ideas in context; giving abstract ideas more details.

Many of the lessons learned boiled down to basic common sense and sticking to the Instructional Design Process. The caveat is that when you are attempting to introduce or utilize new technologies is especially imperative that the processes are followed and that no steps are skipped or ended prematurely. Working with a new technology does not afford you the opportunity to make changes on the fly unless the designers and the client are extremely aware of the technology's capabilities and constraints.

References

Bannan-Ritland, B. (in press). Teaching instructional design: An action learning approach. Performance and Improvement Quarterly.

Constantine, L. L. & Lockwood, L. A. D. (2001). Structure and style in use cases for user-interface design [Electronic version]. In M. van Harmelen (Ed.), Object modeling and user interface design. Reading, PA: Addison-Wesley.

Constantine, L.L. & Lockwood, L. A. D. (1999). Software for use: A practical guide to the models and methods of usage-centered design. New York, NY: Addison-Wesley.

Cooper, Alan (1999). The inmates are running the asylum. Indianapolis, IN: Sams Publishing.

Fuccella, J. & Pizzolato, J. (1999). A divided approach to web site design: Separating content and visuals for rapid results. Retrieved on November 18, 2001 from http://www-106.ibm.com/developerworks/library/wireframe/wireframe.html.

Katzenbach, J. R. & Smith, D. K. (1993). The wisdom of teams. New York, NY: Harper Collins.

Rossett, A. (1999). First things fast: A handbook for performance analysis. San Francisco, CA: Jossey Bass/Pfeiffer.

Rothwell, W. J. & Kazanas, H. C. (1992). Assessing relevant characteristics of learners. In Mastering the instructional design process (pp. 67-82). San Francisco: Jossey-Bass.

Wiley, D., II. (2000). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In D. Wiley II (Ed.), The instructional use of learning objects (pp.1-17) [Electronic Version]. Retrieved on February 12, 2002 from http://reusability.org/read/chapters/wiley.doc.

Design of Faculty Development Workshops: Attempting to Practice What We Preach

Gayle V. Davidson-Shivers, University of South Alabama,

John Salazar, University of Tennessee, &

Karen M. Hamilton, University of South Alabama

Abstract

The purpose of the presentation is to provide recommendations for designing and implementing faculty development programs on technology integration. The recommendations are based on instructional strategies as related to faculty development in higher education. Research data will show that the strategies were comprised of two components or factors. Lastly, the results demonstrated which instructional factor that had the most effect on teaching impact and workshop satisfaction.

Introduction

Today's university faculty face many problems from decreased funding and resources to increased diversity in student populations that make it difficult to maintain the traditional faculty roles (Davidson-Shivers, 2002; Morrison, 1996, Miller, 1995). The traditional workload of higher education faculty at four-year institutions has been based on teaching, research, and service. There is a tendency within universities using the Carnegie system that the higher the level of university, the stronger the emphasis is on research (Davidson-Shivers). Even with two-year colleges, faculty are encouraged to conduct research in addition to their primary focus on teaching (Tsunoda, 1992)

According to Rutherford and Grana (1995), faculty roles in teaching are shifting from knowledge gatekeepers to knowledge facilitators. This change in roles is based on a trend toward active and less authority-dependent learners and students' access to information through technology. In addition, faculty are undergoing change due to the availability of technology for classroom use (Johnstone & Krath, 1996; Young, 1997). Even though this change is eminent and some faculty have made the transition, there are still many who have not (Armstrong, 1996).

This resistance to change may be due to a variety of factors: 1) faculty may lack the skills to use technology appropriately; 2) lack of institutional support (Horgan, 1998) and new roles of the professor are not rewarded (Armstrong). New roles currently being suggested are those of course developer and facilitator, rather than instructor. According to Horgan, incentives such as promotion and tenure are still based on traditional roles. Finally, faculty development efforts may not be well received because they are not well designed.

The traditional faculty development, such as workshops, of the 1970s and 1980s were viewed least effective (Maxwell & Kazlauskas, 1992) and that they may have been misdirected (Blackburn, Boberg, O'Connell, & Pellino, 1980). In their review of literature, Davidson and Rasmussen (1994) found few ID models specifically developed for faculty development. Although not all models are appropriate for every situation or setting, some underlying ID principles do transcend disciplinary boundaries. However, these ID principles serve as guides in our faculty development efforts.

Analysis Phase.

Our faculty development efforts began with the analysis phase. Because of a short timeframe for planning, the goal of the workshops was based on the desire of the university's administration to upgrade faculty's use of technology tools in teaching. Being faculty members at that same institution, we knew the environmental settings and the faculty. We had also served on the University's Committee on Teaching , developed faculty seminars in the past, and created and coordinated the Educational Technology Poster session involving faculty from across the university. Based on our prior knowledge and experience, we began developing the workshops on PowerPoint™. We set the maximum of 20 participants per workshop.

Concurrent Design and Development Phase.

During the concurrent design and development phase, we planned and developed the instruction in an integrated manner. We met several times to plan our workshop as follows:

1. identify the sequence from simple features to more complex ones. Provide simple definitions, overview of procedures, and establish the tone of the workshop.
2. create the advertisements and establish a faculty registration system that encouraged faculty to bring their own teaching materials. The logistics of breaks and lunch were also delineated.
3. prepare the instructional strategies, emphasizing demonstration and hands-on application. Included would be the development of several PowerPoint™ presentations and handout materials.
4. Select and purchase additional support materials of books and videos.
5. Divide the instructor tasks for developing our PowerPoint™ presentations, handouts, etc. and conducting the demonstrations.
6. determine the location, obtain administration approval and purchase PowerPoint™ for the computer lab to meet licensing requirements.

Evaluation Planning.

Evaluation Planning began simultaneously with concurrent design. We planned for a simple survey on the effectiveness of the instruction. We reviewed and revised our materials by conducting trial runs prior to the initial workshop.

Implementation Phase.

For Implementation phase, we considered the roles of facilitator as well as the participants. The workshop allowed for a high-gain of information by providing job aids, hands-on exercises, and personalized feedback. In addition, we created a relaxed atmosphere by establishing dialogue between instructor and participants and among faculty participants early on and using humor appropriately during the workshop. The type of materials used and the style of the various PowerPoint slide presentations added variety. Finally, we added variety by changing which instructor would demonstrate and which would provide assistance and feedback throughout the day.

This research is a result of surveys completed and analyzed after the conclusion of the workshops. The objective of the analyses was to investigate which instructional strategies that influenced the participants' overall workshop satisfaction as well as their professional development.

Methods

As previously discussed, three components of the design and development phase included: identifying the appropriate sequencing for the workshop, planning instructional strategies, hands-on applications, providing support materials, and delineating instructor responsibilities for presenting content and software demonstration. The survey instrument was created in order to evaluate the effectiveness of the instructional strategies, the impact of the workshop on the participant's teaching development and skills, and overall satisfaction with the workshop.

Participants

All participants were asked to complete the survey at the end of each workshop. Within three years, six introductory and four advanced workshops were offered to university faculty. Eighty-nine faculty members participated in the introductory workshops, while 46 participated in the advanced. One hundred thirty-five faculty members participated in the workshops over the three-year period. The introductory workshops contained a range in participants from 11 to 19. The advanced had a range from seven to 15. All workshops were sponsored by the university and conducted in the campus computer lab.

Measurement Items

The 20-question survey instrument was specifically designed to evaluate feedback on: technical frustrations, handouts, video presentation, textbook, order of topics, hands-on activities, instructor's estimate of participant knowledge, pace of workshop, constructive feedback, and organization. Ten items were developed to investigate the participant's reaction to the workshop's instructional strategies. Two questions were developed to seek feedback on the workshop's effect on how the participant will function professionally and its impact on teaching. Lastly, two questions were developed to assess participant satisfaction and willingness to recommend the workshop.

Fourteen of the 20 questions utilized a five-point Likert scale. Two of the fourteen questions did not have weighted values assigned to the Likert response scale (instructor's estimate or participant knowledge and pace of workshop). Those items were not utilized for the analyses. Six open-ended questions were added to collect specific feedback on the structure of the workshop and instructor style. The open-ended items were also not included in the analyses. Participants were asked to circle the letter response (i.e. a, b, c, d, or e) that best reflected their opinions to each statement. For example, question one stated:

In general, this workshop:

(a)	(b)	(c)	(d)	(e)
could have a major effect on how I will function professionally				had little or no effect

The (a) response was considered favorable, (c) was considered neutral, and the (e) response was unfavorable. All responses were recoded numerically and assigned weighted values appropriate for discrete statistical analyses: a = 1, b = 2, c = 3, d = 4, and e = 5.

Statistical Design

Statistical Program for Social Sciences 9.0 (SPSS Inc., 1999) was used to analyze the data. Factor analysis was conducted to investigate validity of the instrument and Cronbach's alpha was used to test for reliability. Multiple regression was utilized to investigate the influence of the instructional strategies on two dependent variables: teaching impact and workshop satisfaction.

Results

Due to two items not having weighted values assigned to the Likert response scale, only eight items investigating the reaction to the instructional strategies were analyzed. The items were subjected to factor analysis and rotated using a Verimax rotation. Factor analysis was used to reduce the number of variables required to describe or explain the items comprising the instructional strategies construct. Additionally, it was conducted to assess the construct's psychometric properties (Rosenthal & Rosnow, 1991). Consequently, two factors were rotated using the Verimax procedure. Table 1 shows the instructional strategies investigated, the two interpretable factors, and the factor loadings. Factor one accounted for 40.4% of the item variance, and Factor two accounted for 6.7% of the item variance. The item assessing the response to the hands-on activities did not load on either factor.

Table 1:
Factor Analysis for Instructional Strategies

Item	Factor 1	Factor 2
Factor 1		
Workshop organization	.90	
Handouts were helpful	.83	
Order of topics	.74	
Benefiting from technical frustrations	.56	
Textbook was helpful	.51	
Workshop was designed for constructive feedback	.45	
Factor 2		
Helpfulness of video		.62

The factor analysis clearly indicated two salient constructs when investigating the participants' response to the instructional strategies. Factor one appears to relate to some components of the concurrent design and development phase as well as the implementation phase: identifying the appropriate sequencing for the workshop, planning instructional strategies and support materials, and delineating instructor responsibilities for presenting content and software demonstration. The researchers referred to factor one as Instructional Strategies. While factor two does relate to the benefit of support materials, it is a type of support material in a non-print format that was different from the other materials provided during the workshops. The researchers referred to this factor as Video Support.

Cronbach's alpha was used to test the internal-consistency reliability for factor one. The closer the reliability coefficient (Cronbach's alpha) is to +1.00, the more reliable the dimension. The closer the reliability coefficient is to 0, the less reliable the dimension, (Crowl, 1996). Reliability coefficients of approximately .85 or higher may be considered dependable psychological tests, whereas in experiment research, instruments with much lower reliability coefficients may be accepted as satisfactory (Rosenthal & Rosnow). According to Ary et al. (1996), if measurement results are to be used for making a decision about a group or experimental research purposes, a lower reliability coefficient (in the range of .50 and .60) might be acceptable. The results of the reliability analysis yielded an alpha coefficient of .83 for factor one. Therefore, the first factor appears to be valid and reliable. Factor two was comprised of only one item with a considerably high loading. However, due to the one item loading it was not subjected to reliability testing.

The factor analysis on the items assessing participant satisfaction and willingness to recommend the workshop also resulted in one factor being extracted. The items accounted for 64.2% of the variance and the factor loadings were .82. The reliability results indicated an alpha coefficient of .78 for the factor lending support for validity and reliability. This factor was referred to as Workshop Satisfaction. As previously mentioned the responses were recoded numerically and assigned weighted values appropriate for discrete statistical analyses: a = 1, b = 2, c = 3, d = 4, and e = 5. Therefore, after recoding the lettered responses 1 = favorable, 3 = neutral, and 5 = unfavorable. Table 2 indicates the scale distribution for the four factors.

The items that were developed to investigate for the workshop's effect on how the participant will function professionally and contribution to skill development were also subjected to factor analysis. One factor was extracted and both items accounted for 52.5% of the variance and the factor loadings were .72. The results of the reliability analysis yielded an alpha coefficient of .68 for the factor. Therefore, the factor also appears to be valid and reliable. The researchers referred to this factor as Impact on Teaching.

Table 2:
Factor Scale Distribution

Construct	**N**	**Mean**	**SD**
Instructional Strategies	74	1.48	.50
Video Support	84	1.67	.76
Workshop Satisfaction	82	1.27	.49
Impact on Teaching	84	1.66	.59

Two constructs were extrapolated from factor analyzing the instructional strategies: Instructional Strategies and Video Support. Two regression analyses were then used to explore which instructional strategies influenced the dependent variables: (1) Workshop Satisfaction and (2) Impact on Teaching. The Pearson correlation in the first regression indicated that Instructional Strategies correlated with Workshop Satisfaction (r =. 790, n = 71, $p<.01$) as well as the Video Support (r = .287, n = 71, $p<.01$). The results of the regression (Table 3) indicate the Instructional Strategy factor explained almost 64% of the variance in Workshop Satisfaction.

Table 3:
Regression Analysis for the Workshop Satisfaction Factor

Variable	R^2	B	SE	Beta	T	Sig.
Constant		.133	.120		1.101	.275
Instructional Strategies	.638	.864	.085	.856	10.217	.000
Video Support		.009	.059	-.134	-1.604	.113

Note: Dependent variable = Workshop satisfaction

Indicated in the second regression was the Pearson correlation that revealed that both the instructional strategies($r = .589$, $n = 72$, $p<.01$) and video support ($r = .384$, $n = 72$, $p<.01$) correlated with Impact on Teaching. Specifically, the regression indicated that the factors explained 36% of the variance on the Impact on Teaching dependent variable, and that the Instructional Strategies factor significantly predicted Impact on Teaching. Table 4 depicts the results of the first regression.

Table 4:
Regression Analysis for the Impact on Teaching Factor

Variable	R^2	B	SE	Beta	T	Sig.
Constant		.480	.196		2.445	.017
Instructional Strategies	.360	.651	.136	.526	4.790	.000
Video Support		.114	.095	.131	1.196	.236

Note: Dependent variable = Impact on teaching

Discussion of Results

The results of our analysis clearly indicate that the workshops were successful. The impact of instructional strategies, planned and employed, produced a strong satisfaction rating for the workshops. Using our faculty development workshop model represents the notion that providing appropriate instructional strategies for what faculty need and enjoy can result in positive ratings.

These PowerPoint workshops were organized around a relaxed atmosphere whereby instruction was chunked into instructor-led demonstration, hands-on activities for the participants, and discussion amongst participants and between participant and instructor. Most faculty workshops are instructors talking at participants, which is different from demonstrations, with little active involvement of participants. However, these participants were given the opportunity to work on their own materials throughout the workshop. What also may have been significant about the organization of these workshops was that faculty were encouraged to bring their own teaching materials, which brought relevance to the instruction. Additionally, we also realized that we there was a need to develop or supply concrete instructional support materials that would facilitate faculty in learning the steps involved in producing a slide show. Hence, we created short demonstrations of how to build PowerPoint in a step-by-step manner. Each demonstration was followed by opportunities for practice. Finally, sequencing of the instructional activities from demonstrating steps to practicing the steps as well as switching instructors for various chunks of the instruction provided variety. Finally, the majority of the support material was print based that allowed participants to reread information on steps demonstrated as they worked on their slide presentations.

The Video Support may have been singled out as the other factor for Workshop Satisfaction due to its novelty effect. With the video, we chose to show only those portions of the video that explained certain aspects of PowerPoint, such as Pack and Go, in a very efficient manner. Limiting the amount of what was viewed at any given time also perhaps helped faculty maintain interest. Hence, keeping the use of this passive type of learning to a minimum. Likewise, using video may have added variety to what faculty traditionally are provided; most faculty workshops rely heavily on instructor presentations supported by print-based materials.

Instructional strategies also explained Impact on Teaching but to a lesser degree than Workshop Satisfaction. It is not surprising that it indicated a less strong explanation since we were asking the participants to speculate on how the effect of the workshop would project onto their future teaching. However, in planning the workshop, we realized that in order for these participants to continue to use what they had learned about PowerPoint, they would need support material that could serve as reference materials for use at a later date. Our handouts as well as the book served that function.

Summary

Higher education faculty realize that there is a need for change due to pressures from outside and within their institutions. While some faculty may be reluctant to change, others willingly take advantage of opportunities for professional development when offered. However, they are only willing to do so when, and if, faculty development efforts are focused on improving their knowledge and skills and when these development activities are effective. Our initial data suggests that our ID planning and implementation guidelines provide an avenue for developing programs that enhance faculty teaching and instructional skills. Further exploration on the use of our ID guidelines needs to be expanded to other areas of faculty development as well as to other higher education institutions.

References

Andrews, D. H. & Goodson, L.A. (1980). A comparative analysis of models of instructional design. *Journal of Instructional Development, 3*(4), 2-16.

Armstrong, G. (1996, May). One approach to motivating faculty to use multimedia. *T.H.E. Journal, 23,* 69-71.

Ary, D., Jacobs, L. C., & Razavieh, A. (1996). *Introduction to research in education*. Orlando, FL: Harcourt Brace and Co.

Blackburn, R.T., Boberg, A., O'Connell, C., & Pellino, G. (1980, June). *Project for faculty development program evaluation: Final report.* Ann Arbor, MI: University of Michigan, Center for the Study of Higher Education.

Candiotti, A., & Clarke, N. (1998, January). Combining universal access with faculty development and academic facilities. *Communications of the ACM, 41*(1), 36-41.

Carnegie Foundation. (2000). *Carnegie Classification 2000: Background and Plans*. http://www.carnegiefoundation.org/OurWork/Classification/cc.2000.htm 15 February, 1999.

Crowl, T. K. (1996). *Fundamentals of educational research (2nd Ed.)*. Madison, WI: Brown and Benchmark Publishers.

Davidson, G.V. & Rasmussen, K.L. (1994, April). Needs assessment for faculty development. Paper presented at the Annual Meeting of the American Education Research Association, New Orleans, LA.

Davidson-Shivers, G.V. (2002). Instructional technology in higher education. In Reiser, R.A. & Dempsey, J.V. *Trends and Issues in Instructional Design and Technology.* Columbus, OH: Prentice-Hall, Inc.

Davidson-Shivers, G.V. & Rasmussen, K.L. (1999, June). WBID: An web-based instructional design model. Paper presented at the Ed-Media 1999 of the Association for the Advancement of Computing in Education, Seattle, WA.

Gustafson, K.L. & Branch, R. M. (1997, May). *Survey of Instructional Design Models.* Syracuse, NY: ERIC Clearinghouse of Information & Technology.

Horgan, B. (1998). Faculty, instruction and information technology. *The Technology Source.* Also found at website: http://www.asia.microsoft.com/educaton/hed/articles/facsep98.htm

Johnstone, S. M. & Krauth, B. (1996, March/April). Some principles of good practice for the virtual university. *Change*, 38-41.

Maxwell, W. E., & Kazlauskas, E. J. (1992). Which faculty development methods really work in community colleges? A review of the research. *Community/Junior College Quarterly, 16*(1), 351-360.

Morrison, J.L. (1996). Anticipating the Future. *On The Horizon. 4*(3), 2-3. Also found at website: http://horizon.unc.edu/horizon/online/html/4/3/editor.asp

Rutherford, L. H., & Grana, S. J. (1995, September). Retrofitting academe: Adapting faculty attitudes and practices to technology. *T.H.E. Journal*, 82-86.

Rosenthal, R., & Rosnow, R. L. (1991*). Essentials of behavioral research: methods and data analysis.* New York, NY: McGraw Hill, Inc.

Statistical Program for Social Sciences, Version 9.0 (1999).

Tsunoda, J. S. (1992, Fall). Expertise and values: How relevant is preservice training? New Directions for Community College, 79, 11-20.

CAMS: Automating Data Collection to Ensure Program Quality

Marcie J. Bober

Brock Allen

San Diego State University

Abstract

When fully developed, San Diego State University's Continuous Assessment and Monitoring System (CAMS) will allow faculty in the College of Education to conduct a broad range of self-assessment activities. The system is not meant to measure competency but it can interface with pertinent college and/or university systems that track such information. CAMS has the potential to be the vehicle by which the College of Education can periodically but continuously determine that its seven departments (among them, the School of Teacher Education, Special Education, and Educational Technology) are NCATE-compliant, on-course, stringent, market-responsive, in compliance with all state laws and regulations, and motivational.

CAMS: An Introduction

Accountability is the watchword for educators today. In the K-12 environment, accountability is reflected in the public's clamor for improvement indicators that range from gains on student achievement tests and college entrance exams, to fewer instances of both petty and serious schoolyard crime, to reductions in absenteeism and transiency. At the college or university level, accountability indicators include graduation rates and time to graduation; program enrollment choices and perceptions of program quality; access to and use of support services; and employer "satisfaction" with the "product" – graduates.

Accountability increases the information demands placed upon our educational system. Regardless of size or student demographics and no matter how organized, our schools depend on integrated information systems to manage their data loads and to respond to the community's desire for immediate access to detailed information about school life (e.g., student performance, the costs of running extracurricular clubs and activities, a school's readiness for incidents of violence). Unfortunately, empirical evidence relative to the implementation and effects of such systems is fairly lean. There's little to suggest that accountability systems of any type factor into policy making tied to accreditation mandates, or evoke change in overall data management, program operations, organizational structure, or personnel practices (hiring, deployment) (Bober, 2001).

Accountability is central to the day-to-day functioning of San Diego State University's College of Education, which has a strong focus on urban education, technology, and preparation of practitioners for work with diverse populations. Its unique characteristics showcase the ways in which accountability issues come into play:

- Each year, between 700 and 800 teacher candidates graduate from the COE's several teacher preparation programs. *That figure represents ~7% of the CSU total*.
- COE students may earn a variety of master's degrees and professional certificates – from rehabilitation counseling to literacy.
- Currently, ~80 COE students are enrolled in one of two joint doctoral programs.
- The COE employs ~100 tenure or tenure-track faculty, and ~100 part-time or full-time lecturers.
- Faculty are active grant writers; total yearly awards (grants and contracts) exceed $15 million, on average.

The SDSU/COE recognizes the need to continuously capture informative data that allows for both strategic and tactical decision-making. The Continuous Assessment and Mentoring System (CAMS) is an innovative tool for doing just that. Structurally, CAMS is a set of web-deployed (and cumulative) surveys that capture perceptual data from students at no less than four strategic points during their academic careers: at the time they complete prerequisite courses; about midway through their program of study; when they enroll in their capstone experience; and about one-year post-graduation. But the system is more than a mere collection of respondent opinions, reactions, and beliefs. At its core are several relational databases populated by a host of program-specific data, including objectives for each of the courses students must or may elect to take <u>and</u> the ways in which objectives build across course strands.[1] As important is that CAMS, when fully deployed, will be able to access data available on other college or university-level computer systems.

In the end, then, CAMS can contribute to the COE's vitality and relevance. The system will generate student profiles that portend program quality. Sophisticated searching and sorting routines will allow faculty to provide advising services tailored to student interests and needs, ensure that course strands maintain their integrity, and modify internship/field experiences based on workplace demands. Perceptual and program-level data will be combined in ways that allow for a host of tactical and strategic decisions: creating new courses or revising existing ones; personalizing academic advising; and adjusting faculty and staff resource allocations.

Of course, anonymity and confidentiality will be protected at all costs. Integrated into the system will be dynamic security features to ensure that only authorized users view sensitive data, package information, and generate reports. Once fully operational, CAMS will allow the COE to be responsive and accountable to its many constituents.

CAMS: Verifying the Need by Exploring Institutional Processes

There's extensive support in the literature for a CAMS-style system. Institutions of higher education are under increasing pressure to demonstrate *value*: to students, to faculty, to administrators, and to the larger community. In 1998, the National Center for Public Policy and Higher Education used established benchmarking procedures (see: http://www.qut.edu.au/law/benchmarking/overview.html) to produce a state-by-state report card (published in 2000) that compared post-secondary institutions across several dimensions – among them, preparation, participation, affordability, completion, benefits, and learning. Though faculty assumptions drove at least some of the data analysis, results appear to confirm longstanding concerns about the accuracy of institutional assessment practices, actual availability of data, and the ways in which systematically collected data inform funding and other core decisions (see: http://measuringup2000.highereducation.org/highlights2.htm).

Increased competition for funds tends to propel accountability – whether the effort is mandated or voluntary.

- *Voluntary accountability* is evidenced by the Malcolm Baldrige National Quality Award (Acaro, 1995), which promotes self-assessment and organizational excellence. The educational strand forces academic leaders to take a broad-based look at program quality. Recipients are judged to have achieved distinction in leadership, strategic planning, customer and market focus, information and analysis, human resource focus, process management, and results.

- *Mandated accountability* is evidenced by accreditation, a sanctioned evaluative process for measuring institutional (or program) strengths and weaknesses. Accreditation is a monetary gatekeeper of sorts, with nonaccredited institutions largely excluded from traditional funding streams. The purpose of accreditation is well articulated by the Commission on Higher Education – a unit of the Middle States Association of Colleges and Schools.

  - Accreditation is the educational community's means of self-regulation through quality assurance and improvement. The accrediting process is intended to strengthen and sustain the quality and integrity of higher education, making it worthy of public confidence and minimizing the scope or exercise of external control. (http://msache.org/poevpre.html)

Mandated accountability is also reflected in state laws and regulations. Fully integrated into the newly revised California Master Plan for Education, for example, are regulatory procedures for ensuring that students are academically prepared for the workforce; are enrolled in programs that are fiscally responsible; have equitable access to resources they need to be successful (academic, social, logistical); and are taught by competent faculty intent on growing the knowledge bases of their respective disciplines. Here, CAMS can serve as a preemptive mechanism to ensure both compliance and value added.

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[1] In the Educational Technology program, for example, strands fall out as follows: instructional design (two courses); inquiry and multimedia development (four courses); research (three courses); and organizational leadership (two courses).

And CAMS directly responds to the revised standards and criteria promoted by the National Council for Accreditation of Teacher Education (NCATE), the accrediting body for SDSU/COE. As the heart of the "new" NCATE is a clear focus on *performance-based* outcomes. Programs must be able to demonstrate that a) their graduates have the skills and knowledge needed to educate all learners and b) faculty and staff participate in continuous self-assessment for improvement based on accurate and dependable data. The agency's newly revised Unit Standard 2 specifically targets assessment systems and program evaluation (see: http://www.ncate.org/standard/m_stds.htm). The idea is to demonstrate integrated processes that:

- mirror the conceptual frameworks defined by professional and state standards.
- collect data through diverse methods that are systematic and fair … and which continually cross-check for data validity.
- provide comprehensive information about program quality, operations, and student performance.
- enable the unit to conduct meaningful assessment that leads to credible (and data-based) improvement in whatever areas fall below acceptable levels.

CAMS: Verifying the Need by Exploring the Research Base

A comprehensive accountability system must necessarily be both *data* and *information* driven. *Data*, according to Ramer and Snowden (1994), are collections of facts and figures, while *information* suggests answers to questions provided by a person or agency as a service to others. In essence, then, CAMS is a data-driven system that provides easy access to timely information that has relevance and purpose, with the intention of empowering its users. It's integrative by its very nature.

Telem's (1996) depiction of the K-12 setting has broad applicability to the post-secondary (college/university) environment. He suggests that most schools are bureaucratically, professionally, and politically complex organizations, characterized by a "loosely coupled nature" (p. 87). Staff members, though interdependent, do not exhibit strong interpersonal ties. Moreover, the school's subsystems and the functions within them are fairly insulated from one another. Leadership is diffused rather than concentrated; there is high respect for professional autonomy (Telem, 1999; Telem & Avidov, 1994).

Introduction of a student-focused accountability system such as CAMS has the potential to impact a variety of instructional and administrative roles and responsibilities. In essence, thoughtfully-planned implementation may contribute to stronger educational leadership, to an environment that encourages self-improvement, and to School renewal.

Positive change in roles and relationships is one of several outcomes associated with system implementation. When well-deployed, the data are integrative, timely, reliable, and easily-accessed … and can significantly impact interrelations among the several functionaries that comprise a college administration: staff, adjunct faculty/lecturers, tenure-track faculty, tenured faculty, program chairs and coordinators, and a Dean. Results drawn from Telem's year-long study of an 800-student high school have implications for the SDSU/COE:

- Issues that were only occasionally or randomly dealt with before accountability system implementation were regularly addressed "according to predefined mandatory regulations including mandatory timetables" (p. 203).
- Vertical and hierarchical interrelation patterns among administrative functionaries "tightened up" (i.e., relationships became stronger, interaction was more frequent, and individuals became less autonomous) following system introduction.
- Horizontal interrelations among faculty also "tightened up" – reflecting themselves in higher competition tempered by more intensive cooperation, teamwork, and joint planning.
- The system, even when just partially assimilated into daily school life, created patterns of interaction reflective of the business environment.

A CAMS-like accountability system is, in fact, a social enterprise. A bevy of social consequences must be considered during system planning and as the product is deployed. Student perceptions of it – from relevance to academic planning to impact on academic progress – can affect the quality of the data collected. The system is doomed to failure if students feel that their input favors or disadvantages them in some way – grades, selection for special/unique opportunities, selection for internships or assistantships, registration priority. As a result, they may opt not to respond, or provide information that falls into three distinct categories: *socially correct*, *politically correct*, or *error-prone*. The research is rife with descriptions of unanticipated effects that warrant caution among savvy system “operators”: the sense of being over-surveyed; expectations (often, unrealistic) regarding use of results; concern with privacy and data security; concern about (and confusion over) anonymity and confidentiality (Abbott, Wulff, Nyquist, Ropp, & Hess, 1990; Anton, Dilla, & Fultz, 1997).

But system integrity also depends on engaging *faculty*. The MSACHE framework earlier referenced advocates total faculty involvement at all stages of system development: design, prototyping, testing, full deployment, ongoing maintenance. Faculty commitment is predicated on several assurances:

- That the system’s purpose is improved teaching and learning – not loss of academic autonomy.
- That system activities are not burdensome in terms of workload.
- That comprehensive training and ongoing support are available.

CAMS: Research Issues/Methods and Analytical Techniques

CAMS is a comprehensive project, designed to affect the ways in which all core constituent groups (students, faculty, administrators, staff) think about accountability and data-driven decision-making. Clearly, the research/evaluation design must be robust, systematic, and responsive to both interim and impact outcomes and a mix of data collection and data analysis strategies. Undergirding this effort, then, is a four-level management-oriented approach known as CIPP (Stufflebeam, 2000), structured to help high-level program staff make good decisions when presented with viable alternatives (Worthen, Sanders, & Fitzpatrick, 1997). CIPP’s flexibility accommodates both formative (improvement-oriented) and summative (judgmental) assessment; as a noncumulative model, it allows for one “class,” group, or level of decisions to be made independently of others – which is likely the case here. CIPP attends well to the different areas of complex decision-making inherent to this project’s intent: ***Context*** (which informs planning decisions); ***Input*** (which informs structuring decisions); ***Process*** (which informs implementing decisions); and ***Product*** (which informs recycling decisions). Integrated into the CIPP framework will be tenets of the Concerns Based Adoption Model (CBAM), an approach that attends to participants’ responsiveness to change and innovation (Rogers, 1985).

CAMS development follows a four-phase process. Phrase 1 is *ongoing needs assessment*, which calls for completion of the following tasks.

- Validating the clusters of questions that currently characterize each of the current surveys.
- Validating the survey items themselves (and the usefulness of the data they’ll generate).
- Determining ways to rephrase questions that are meant to serve a cumulative function.
- Determining ways to triangulate data, thus generating reports that truly address tactical or strategic goals.
- Determining database and report layout and format – to ensure data accuracy isn’t compromised by aesthetics.
- Determining ways to couch directions to reduce confusion on the part of survey-takers and report producers
- Seeking strategies for “institutionalizing” the process into the fabric of the department and college.
- Seeking alternative strategies for ensuring data integrity – and anonymity and confidentiality.
- Identify viable vendors (to reduce the need for “reinventing” programming tasks/processes

Phase 2 is largely devoted to *product design and pre-rollout*. Major tasks include:

- Completing technical specifications, including how different technologies (and college-or university-wide systems) will seamlessly interface.
- Developing a marketing strategy (for faculty and students).
- Preparing strategies for acting on results (tactically or strategically).
- Formalizing the evaluation process.

Phase 3 is where *development* and *formal rollout* occur:

- Building each of the four surveys (including features and functions that allow for advanced searching and report generation).
- Developing and launching product orientation activities.
- Establishing protocols for reporting and resolving technical problems (navigation, etc.).
- Designing and prototyping an ongoing maintenance program (that addresses both the system and the ‘content’ at its heart).
- Developing update procedures (changes in course objectives, changes in courses themselves).

- Conducting a small pilot test, and revising product elements based on results
- Finalizing a process for ramp-up (tailoring the system to match Department-specific needs).

Finally, Phase 4 centers on marketing and dissemination, as well as monitoring system use.

It is premature at this time to devise a complete research strategy, but clearly, research and evaluation activities occur throughout all four phrases – in accordance with the CIPP framework previously detailed.

Hypothetically speaking, however, a dynamic, process-oriented system that promotes high-level and multifaceted decision-making should impact both "functioning" and culture in significant ways. Gross impact can be measured *quantitatively* by comparing the SDSU/COE to other SDSU colleges or schools that are demographically and culturally/socially similar. Among the program data of value to collect are application, enrollment, graduation, and time-to-completion statistics; general student characteristics; class loads; and community placements. *Quantitative data* can also be collected via survey to measure attitudes/perceptions across a range of intensity scales. And, of course, system performance must be monitored (error types and frequency, nature and frequency of security breaches, technical team response time). The types of quantitative data envisioned call for both descriptive and inferential (primarily, nonparametric) tests of significance.

Qualitative data may be gathered through semi-structured interviews or focus groups, and classroom observations may also be appropriate. Constant comparison, a well-respected technique for analyzing open-ended data drawn from multiple sources (Yin, 1994), will allow critical themes to emerge. Case studies or vignettes of several different types (exploratory, critical instance, program implementation, or cumulative) offer opportunities to focus on contextual comparisons across sites (Yin).

Other mixed-methods processes are also wise to include. *Content analyses* may focus on course syllabi, selection of questions for inclusion on each semester's comprehensive exam, midterm and final exams, and project types (individual or team). *Action plans* may allow for time series-style studies targeting data management, synthesis, packaging, and distribution.

As a research endeavor, then, CAMS encourages school personnel (administrators, faculty, *and* students) to actively explore how tracking and reporting the nuances of "school business" can impact – perhaps even alter – the school environment in substantive ways. Such investigative goals are premised on several assumptions:

- That a technology-based accountability system can help school personnel perform their assigned duties.
- That communication within a school and externally with others is a primary function of a technology-based accountability system.
- That data generated via the system are used in the context of multilevel decision-making.
- That accountability systems differ in terms of type, functionality, and scope (Visscher, 1994).
- That a successful accountability system must be customized to meet local needs.

Understanding, from an evaluative perspective, how a sophisticated accountability system influences school operations, culture, and community relations allows us to identify areas for program revision/improvement.

CAMS: Importance of Findings to Research and Practice

There's little value in instituting an accountability system if results (progress; system strengths and weaknesses; lessons learned) aren't broadly disseminated. CAMS deployment begs for information sharing – at conferences, via peer-reviewed and practitioner-oriented journals, through demonstrations (online and traditionally facilitated). This project can build communities of practices focused on optimizing student performance and program responsiveness by showcasing:

- the types of COE management activities or functions that system output can inform.
- the ways in which the system impacts decision-making processes, as well as administrative and instructional roles and responsibilities.
- how the system impacts communications.
- how the system contributes to changed perceptions of information needs – specifically, from student-specific to comprehensive (e.g., departmental, college, or university-wide).
- how automation affects the productivity of department and college personnel.
- what educational benefits result from system implementation (e.g., positive changes in how instructional programs are planned, delivered, and assessed for effectiveness).
- how the system affects instructor and/or administrator self-reflection.

- the challenges associated with system implementation, including creation of a shared vision and accommodation of cultural differences among constituencies.
- the effects of differential access to data among system users.
- how the system affects the way information is packaged and disseminated.

So much is at stake … not the least of which is our graduates' readiness for a fast-paced, technological world and team-based, highly-competitive work environments that call for incisive decision-making and problem-solving skills). In that light, then, such a research agenda cannot be ignored.

References

Abott, R. D., Wulff, D. H., Nyquist, J. D., Ropp, V. A., & Hess, C. W. (1990). Satisfaction with processes of collecting student opinions about instruction: The student perspective. *Journal of Educational Psychology, 82*(2), 201-206.

Acaro, J. S. (1995). *The Baldrige Award for education: How to measure and document quality improvement.* New York: St. Lucie Press.

Anton, C. M., Dilla, B. L., & Fultz, M. L. (1997, May 18-21). *Assessing student attitudes: Computer versus pencil.* Paper presented at the Annual Forum of the Association for Institutional Research, Orlando, FL. (ERIC Document Reproduction Service No. ED 410 866)

Bober, M. J. (2001). School information systems and their impact on school operations and culture. *Journal of Research on Computing in Education, 33*(4). Available online at: http://www.iste.org/jrte/33/5/bober.html

Ramer, M. H., & Snowden, M. (1994). Using a management information system effectively for contract education programs. *New Directions for Community Colleges, 85,* 35–46.

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: Free Press.

Stufflebeam, D. L. (2000). The CIPP model for evaluation. In D. L. Stufflebeam, G. F. Madaus, & T Kellaghan, T. (Eds.). *Evaluation models: Viewpoints on educational and human services evaluation* (2nd ed.). Boston: Kluwer Academic Publishers.

Telem, M. (1996). MIS implementation in schools: A systems socio-technical framework. *Computers & Education, 27*(2), 85–93.

Telem, M. (1999). A case study of the impact of school administration computerization on the department head's role. *Journal of Research on Computing in Education, 31*(4), 385–401.

Telem, M., & Avidov, O. (1994). Management information system (MIS) impact on the loosely coupled nature of a high school: A case study. Planning and Changing, 25(3/4), 192–205.

Worthen, B. R., Sanders, J. R., & Fitzpatrick, J. L. (1997). *Program evaluation: Alternative approaches and practical guidelines* (2nd ed.). New York: Longman.

Visscher, A. J. (1994). A fundamental methodology for designing management information systems for schools. Journal of Research on Computing in Education, 27(2), 231–249.

Yin, R. K. (1994). *Case study research: Design and methods* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Instructional Technologies in Developing Countries: A Contextual Analysis Approach

Sonia Arias
Education Development Center, Inc.

Kevin A. Clark
George Mason University

Abstract

This paper describes the problems encountered when working with instructional technologies in developing countries. These problems include socio-cultural and environmental factors such as lack of human capacity and poor infrastructure. The authors argue that the traditional instructional analysis phase of the instructional design process is not designed to catch this type of challenge and can therefore lead to failed instructional technology interventions in developing countries. The authors argue for a broader, context-based definition and deployment of the analysis phase. The authors describe the Tessmer and Richey (1997) context-based analysis model and propose specific areas of adaptation to the model. The authors argue that the adapted Tessmer and Richey context-based model presented in this paper can better anticipate the challenges likely to be found in developing country contexts and therefore better prevent failed IT interventions from occurring in developing countries.

Introduction

Countries throughout the developing world are struggling to bring their populations out of poverty. For the past several decades international development efforts have focused largely on economic, infrastructure, and social reform policies. However, with the advent of the Internet and its profound impact on society, commerce, and education, development practitioners are compelled to examine the role of information communication technologies (ICTs) on development. Just as ICTs have catapulted industrialized countries into the Information Age, many countries in Africa, Asia, and Latin America are anticipating that ICTs can leapfrog several stages of development and thus bring wealth and improved social benefits in governance, health, and education.

In the area of education and training, developing countries are faced with monumental problems. World population growth is such that by 2025 about 100 million children worldwide will be without schooling (Crede & Mansell, 1998). The implications of this on the demand of teacher training for example is equally monumental. Ministries of education throughout the southern hemisphere are increasingly looking at the scalability of ICT-based distance learning options to meet this challenge. Additionally, governments are justifying the implementation of instructional technology initiatives within primary and secondary schools on the basis that:

a) Developing economies need populations skilled in information technologies;
b) All citizens need to be able to take advantage of technological developments as they become available;
c) Technology can enhance existing curricula;
d) Technology can make curricula more relevant and redefine the teachers' roles; and
e) The Internet allows students and education practitioners to communicate with others (Perraton, 2000).

However, designing, developing, and implementing instructional technology initiatives in a developing country is by no means a simple endeavor. Issues of poor connectivity, lack of human capacity, scarcity of appropriate content, and ever diminishing budgets are dealt with on a regular basis.

In spite of this, education practitioners in developing countries are moving forward and implementing instructional technology initiatives in order to improve access to education, to increase the quality of education, or to implement educational reform (Perraton, 2000). These initiatives often take the form of incorporating computers into elementary and secondary schools, or developing synchronous and asynchronous distance learning systems for secondary, tertiary, and other adult training environments.

There is an increased application of instructional technology in developing countries, but because of the increasingly scarce supporting resources it is imperative that effective and meaningful instructional systems design (ISD) principles continue be included in the design of new technology-based learning environments. However, "every effort should be made to avoid simple replication of the ICT-based learning processes used in industrialized countries." (Crede & Mansell, 1998). Indeed, when applying instructional systems design to an instructional technology initiative in a developing country it is important to keep in mind that the design process never takes place in a vacuum. In fact, the instructional design process often occurs within a highly volatile socio-economic, cultural and political *context*. Some researchers state that failure to analyze the broad context surrounding the instructional event will inevitably lead to countless failed instructional design initiatives in developing countries (Romiszowski, 1981, 1989; Weston 1989).

Tessmer and Richey (1997) underscore the importance of analyzing context in the instructional design process by developing a context-based analysis model. In essence, this model calls for a broader definition of the analysis phase and a concomitant inclusion of factors not included in the traditional analysis phase. These additional factors include learner, environmental, and organizational factors that have an impact before, during, and after the instructional event.

This paper contributes to the existing body of literature (Romiszowski, 1981,1989; Weston 1989; Tessmer & Harris, 1992) by presenting an adaptation of Tessmer and Richey's (1997) context-based analysis model. This adaptation is necessary because the increased level of instructional technology initiatives taking place in developing countries requires that instructional designers be appropriately prepared to work with the unique challenges found in developing country environments. Tessmer and Richey's model, though it broadens the analysis phase, is still insufficient for a developing country context. Thus, the adapted model presented in this paper calls for the front-end analysis phase of the design process to go beyond the traditional instructional needs assessment approach and to broaden Tessmer and Richey's analysis of the socio-cultural, environmental, and organizational factors surrounding the instructional problem. It is hoped that this adapted model, when applied, will increase the success rate of instructional technology initiatives in developing countries.

First, the authors will outline some of the ways in which instructional technologies are being deployed in developing countries. Second, the commonly known challenges of instructional technology initiatives in developing countries will also be outlined. Third, based on the challenges described, the Tessmer and Richey model (1997) model will be adapted to include contextual factors specific to developing countries.

Instructional Technologies in Developing Countries

> Instructional technologies in varying forms of delivery and formats such as radio, television, personal computers, the internet, print, cassettes, and CD-ROMs are being deployed throughout the developing world in an effort to meet the critical educational problems of numbers, resources, and quality at all levels.

In the area of distance learning for example, radio has been in use at the primary education level in Australia since the 1950's. In the 1970's, interactive radio instruction was launched in Nicaragua in order to teach mathematics to isolated children living in rural areas (Mayo, 1999). At the secondary level, Mexico's Telesecundaria program has been providing televised instruction to seventh, eighth, and ninth grade children who cannot get to conventional schools because of their remote living conditions. This successful program has been in operation for over thirty years (Calderoni, 1998). At the tertiary level, China in 1990, reported that its television universities had enrolled 1.83 million students. In the area of teacher training, Zimbabwe and Tanzania have deployed instructional technologies in the form of radio, and print to improve the quality of teachers' performance in the classroom (Perraton, 2000). Finally, the use of computers in schools has been argued for and tested in several developing countries. Chile's *Enlaces* Network was launched in 1993 to ". . . provide teachers and students with new and improved instructional content and methods, increased information resources for research and analysis, and improved communications for collaboration and dissemination of ideas (p.5, Potashnik, 1996).

These examples underscore the fact that the developing world has indeed turned to instructional technology, whether it is for distance learning, training, or for the classroom. This has an impact on instructional design since all of these educational applications of technology are explicitly or implicitly being designed using the instructional systems design process. The following section describes the types of challenges often encountered when implementing instructional technology initiatives in developing countries. However, these are challenges that the traditional analysis phase of the instructional systems design process is not necessarily designed to solve.

The Challenges of Implementing Instructional Technology in Developing Countries

Instructional technology initiatives in developing countries can take on several forms. Because English is the predominant language in the technology arena, projects may consist of creating language-specific, culturally appropriate content to be distributed via the Web or CD-ROM. Other interventions might include improving the quality of classroom instruction, providing vocational or technical training, or teaching English. The challenges of implementing instructional technology interventions of this type in developing countries span the social, cultural, environmental, and institutional contexts. An illustrative list of these challenges follows.

Socio-cultural and Human Capacity Factors

Incipient Culture of Participation: A culture of participation, information sharing, and open discussion should not be assumed to exist in all developing nations. This implies that a "community of practice" for example, may need to be based on a very thorough analysis of the degree to which users are actually willing to share information on a routine basis. Additionally, institutional change will most often involve a 'top-down' process and thus commitment to change or adopting new procedures may present some challenges.

Centralized Decision-Making*:* Designers will find that many decisions are made by a potentially unstable, central authority that may or may not take into account the needs and desires of local constituents. The implications of this are that instructional designers will need to go out of their way to ensure that users have the opportunity to provide input and feedback into the design process.

Resources for Learning and Support: If the instructional technology being designed requires users to undergo a learning curve, motivation, release time, and compensation must be addressed during the design phase. Failure to do so may lead to a design or implementation strategy that is not appropriate for users.

Lack of Budget Planning: It is possible that institutional capacity will have limited budget planning capabilities. This contextual factor could have a negative impact on the implementation of new technology if maintenance, support, and upgrades are not included in the budget.

Scarcity of Qualified Personnel: Qualified staff required to maintain the new instructional technology may not be available. This implies that the design process for developing country contexts needs to consider the amount of human capacity available for maintenance or ensure that the design incorporates a very simple maintenance structure.

Infrastructure Factors

Unreliable Power and Telecommunications Grids: Users in developing countries may only have access to the internet through low bandwidth connections. Designers should therefore aim to design systems that accommodate low bandwidth limitations by using fewer graphics and media.

Hardware, Software, Maintenance and Support: It is possible that computer hardware and equipment will need to be imported in order to support the new system. When this is the case, it will be necessary to budget for high import duties and ensure that appropriate maintenance, support, and upgrades can be secured locally or with the overseas vendor. Failure to take this into account in the analysis phase could lead to the design of unsustainable systems.

Adequate Facilities: The climate in many developing countries is extremely hot and humid. System design needs to ensure that adequate cooling, ventilation, and dust control will be available.

A close examination of these challenges leads one to conclude that many of them are by no means strictly instructional in nature and one cannot assume that they will be accounted for in the traditional analysis phase of the instructional system design process. And yet these challenges have the potential to positively or negatively impact instruction as well as instructional technology initiatives in general. In other words, depending on local contexts and circumstances, social, cultural, environmental, and institutional factors can make or break instructional technology initiatives in developing countries. It is therefore imperative that the instructional design process be much broader, and employ a context-based analysis approach when designing instructional technologies for developing countries.

A Context-Based Analysis Approach

Instructional systems design can be defined as the application of systems theory, information theory, and cognitive psychology to the process of designing effective and efficient instruction. Smith and Ragan (1999) define instructional design as the ". . . systematic and reflective process of translating principles of learning and instruction into plans of instructional materials, activities, information sources, and evaluation" (p. 2). This process of design usually consists of five key components: Analysis, Design, Development, Implementation, and Evaluation. The ensuing acronym, "ADDIE", is often used to describe this approach to instructional design and is thus commonly referred to as the ADDIE model. The analysis phase concentrates on examining three basic components: the instructional context, the prospective learners, and the learning task. Weston (1989) points to the key importance of a 'front-end' analysis for developing country instructional technology interventions. However, as already mentioned, this type of analysis is not designed to analyze the broader context.

Tessmer and Richey (1997) define context as a "multilevel body of factors in which learning and performance are embedded." The contextual analysis is a model that investigates the influence of context on three aspects of learning; orienting, instructional, and transfer. The orienting context occurs before the learning event and deals with factors that influence student motivation and cognitive preparation. The instructional context focuses on factors that are present during the learning event such as the physical, social, and symbolic resources. The transfer context deals with the environment where the learning is applied after the learning event. For each of these temporal contexts; orienting, instructional, and transfer, there are three embed contextual levels. These levels include the learner, environment, and the organization. These contextual levels may contain several factors such as learner profile, social support, or incentives. Table 1 summarizes Tessmer and Richey's (1997) context-based analysis model. This model is a great start, but does not include many of the factors and issues that learners and instructional designers in developing countries deal with on a daily basis.

Table 1: Context-based analysis model (Tessmer and Richey, 1997)

	Orienting	**Instructional**	**Transfer**
Learner Factors	Learner profile Goal Setting Perceived utility Perceived accountability	Learner role perception Learner task perception	Utility percept. Perceived resource Transfer coping strategy Experiential background
Immediate Environment Factors	Social Support	Sensory conditions Seating Instructor role perception Learning schedule Content culture	Transfer opportunity Social support Situational cues
Organizational Factors	Incentives Learning culture	Rewards & values Learning supports Teaching supports	Transfer culture Incentives

In an effort to apply the contextual analysis model to learning situations in developing countries, the original Tessmer and Richey (1997) model has been expanded to included additional environmental and organizational factors in the orienting context. The additional immediate environment factors are motivation, release time, compensation, participation culture, availability of electricity, and appropriate facilities. All of these factors relate to supporting the learner prior to the learning event. Learners must be motivated, be given the time as well as the compensation to participate in the learning event. Additionally, the culture of participation needs to be taken into consideration. Are people likely to participate or is it against their cultural or social norms? Lastly, the availability of basic resources like electricity and facilities should not be overlooked.

The following organizational factors were added to the orienting context. These additional factors included: centralized decision making, budget planning capacity, and human capacity building. In many developing countries, learning systems and instructional technology interventions can not be created or implemented without involvement or approval from other organizations. Having a centralized decision making process can hamper the process of obtaining by-in and cooperation from all involved parties. The notion of budget planning and human capacity building are both related to the ability of the developing nation to create the necessary resources for budgeting, support, and maintenance. In addition to the learning event, organizations may also need to assist people in the acquisition of technical, accounting, and managerial skills.

This expanded context model focuses on specific issues that may be related to the design, development, and implementation of instructional technology interventions in developing countries.

Table 2: Adapted Context-based analysis model; based on Tessmer and Richey (1997) model

	Orienting	**Instructional**	**Transfer**
Learner Factors	Learner profile Goal Setting Perceived utility Perceived accountability	Learner role perception Learner task perception	Utility percept. Perceived resource Transfer coping strategy Experiential background
Immediate Environment Factors	Social Support *Motivation* Release time Compensation Participation culture Availability of electricity Appropriate facilities	Sensory conditions Seating Instructor role perception Learning schedule Content culture	Transfer opportunity Social support Situational cues
Organizational Factors	Incentives Learning culture Centralized decision making Budget planning capacity Human capacity building	Rewards & values Learning supports Teaching supports	Transfer culture Incentives

Conclusions

This paper has presented an adapted context-based analysis approach for implementing instructional technology in developing countries by calling for the front-end analysis phase of the design process to go beyond the traditional instructional needs assessment approach and having it include an analysis of the socio-cultural, environmental, and institutional factors surrounding the instructional problem. Given that there is an increased application of instructional technology in developing countries and limited human capacity to appropriately design instructional technology interventions, it is imperative that instructional designers working in developing countries take into account the contextual factors outlined in the adapted Tessmer and Richey (1997) model. This adapted context-based analysis model for instructional design if appropriately applied, may increase the probability of successful instructional technology initiatives in developing countries. Although this context-based model was expanded to include factors related to developing countries, the factors described in this paper exist in developed country settings as well. The authors would therefore encourage the use of this expanded model in settings that can include but are not limited to certain rural and urban areas in industrialized countries as well.

References

Calderoni, J. (1998). *Telesecundaria: Using TV to Bring Education to Rural Mexico*. (Available from The Education and Technology Team, HDNED, The World Bank, 1818 H Street, NW, Washington DC 20433). URL: http://www.worldbank.org/html/extdr/educ/edu_tech/edutech.htm

Crede, A., & Mansell, R. (1998). Knowledge Societies in a Nutshell: Information Technology for Sustainable Development. Ottawa: International Development Research Center.

Mayo, J. 1999. *Radio's Role in Education and Development: Introduction and Overview*. In Interactive Radio Instruction: Impact, Sustainability, and Future Directions in (A. Dock & J. Helwig, Eds.). (Available from The Education and Technology Team, HDNED, The World Bank, 1818 H Street, NW, Washington DC 20433).

Perraton, H. (2000a). Open and Distance Learning in the Developing World. London: Routledge.

Perraton, H. (2000b). Choosing Technologies for Education. *Journal of Educational Media, (25)*1, 31-38.

Potashnik, M. (1996). Chile's *Learning Network*. (Available from The Education and Technology Team, HDNED, The World Bank, 1818 H Street, NW, Washington DC 20433).

Romiszowski, A. J. (1989). Troubleshooting in Educational Technology or, Why Projects Fail. *Programmed Learning & Educational Technology, 18*(3), 168-89.

Romiszowski, A. J. (1989). Avoiding Failure through Better Project Planning and Analysis: Case Studies of Avoidable Failures in Instructional Systems Design and Development Projects. *Educational & Training Technology International, 26*(2), 95-112.

Smith, P. L., & Ragan, T. J. (1999). Instructional Design (2nd Ed.). New York: Wiley.

Tessmer, M., & Harris, D. (1992). Analyzing the Instructional Setting: Environmental Analysis. London: Kogan Page.

Tessmer, M., & Richey, R.C. (1997). The Role of Context in Learning and Instructional Design. *Educational Technology Research & Development, (45)*2, 1042-1629.

Weston, C. B. (1989). Critical Factors for Educational Technology Interventions in Developing Countries. *Educational & Training Technology International, 26*(2), 122-28.

Wright, C., R. (1997). Educational Technology Consulting in Developing Countries. *TechTrends, 42*(1), 35-40.

Managing Online Mega Classes

Tena F. McQueen

Robert A. Fleck, Jr.

Columbus State University

Background

Columbus State University (CSU) is a unit of the University System of Georgia and offers graduate and undergraduate degrees to over 6000 students. Many CSU students work full- or part-time and come to CSU with a great range of computer competencies. One of CU's institutional values is computer literacy.

During a self-assessment it was determined that some students had found a curriculum path that allowed them to avoid or postpone courses with computer content until their senior year, thus defeating the concept of using computer skills in other courses. It was therefore decided to require a literacy course of all entering freshman. All entering freshmen would be automatically enrolled in the new literacy course and strongly counseled against dropping the course. It was estimated that in excess of 800 students would be enrolled.

Faculty Issues

With the anticipated enrollment of 800 students in computer literacy classes, where normally there were 150 enrolled, faculty resources would be stretched. Since it was expected that students enrolled in the literacy course would not decrease the number of hours in other classes, there was little opportunity to shift resources or teaching assignments. Developing creative solutions for this increased credit hour production became essential.

Asynchronous Courses

The authors had experience in developing solutions to the changing needs of the student population. One solution was the use of a CD-ROM tutorial package. The authors had also developed a complete Internet course for delivering computer skills.

Results from these initial asynchronous courses showed a high degree of success and acceptance by students and administration. The courses offered reduced seat time, required fewer physical facilities, and met the needs of commuter students. These courses were not without their flaws and in retrospect resource savings to students and the institution were at the expense of instructor time.

Proposed Solution

The institution decided that a combination of CD-ROM and WebCT materials would be used to deliver course content. Management of the course would be vested in one instructor responsible for designing content and assigning grades. Teaching and student assistants would support this individual. Students were required to purchase the CD and were given written directions on how to access online course materials. As with all great plans, some problems only appear during implementation.

Student Misconceptions

Online course content is often viewed as less rigorous, less time consuming, and therefore, more "manageable." Our experience indicates that students underestimate their off-campus hardware/software resources and often ignore minimum computer requirements essential for success. Misjudging their ability to manage time, set goals, and to navigate Web-based material was another impediment.

Institutional Misconceptions

One misconception is that online courses give faculty more free time. Some think that less class contact time requires less effort and underrate the complexity of delivering a course online. They may therefore argue that hundreds of students be permitted to enroll in such courses.

Infrastructure Considerations

Since this course was required of all entering freshmen, a mechanism was developed for automatically enrolling students during registration. University Enrollment Services developed procedures, policies and fee structure for this class. A computer lab facility was staffed and available six days a week to assist students. Anticipating the ebb and flow of student computer lab use became one of the serious management challenges.

Instructional Technology Services ordered equipment which would permit creating large numbers of CD-ROMs and printing labels for each.

Coordination with the Registrar's Office was a key element in notifying students of course requirements and logistics. Information appeared in the printed Schedule Booklet, in the online version on the University's Web site and announced at each Freshman Orientation Session.

The university's center for Computer Information and Networking Services prepared for increased student activity in the university's open lab by hiring and training additional student assistants. A "Help" line was established to answer student questions via phone, e-mail, or face-to-face. The Help Line addressed network matters such as logon and password problems, but most often could not provide assistance with Web, course-content problems.

Instructor Considerations

While many instructors can develop the materials needed for an asynchronous course, utilizing materials developed by publishers or software companies is more efficient. Finding Web-based materials that match course goals and objectives is the challenge. If there is a short period of time between developing the asynchronous course and delivery, requisite time to develop course materials becomes a key factor.

Publishing as much course information as possible to a public Web site allows unobstructed access. This can be an important consideration for students just learning to navigate the Web and often view multi-logons as obstacles. Course content can be placed on a password protected site so only those registered students can access course content, postings, quizzes, etc.

Course management is crucial in all classes, especially in over-sized classes. Web-based, course management tools can organize instructor announcements, student comments, maintain grades, display calendars, deliver content/quizzes and allow students to submit assignments. Another question is "Who will provide technical support for students accessing Web-based material?"

Utilizing teaching and or student assistants adds another facet to the online course scenario. Qualified teaching/student assistants must be recruited and trained to deal with issues presented to them by students in asynchronous classes. As the number of assistants increases, the more the role of the instructor shifts to "manager." In large, over-sized classes, the instructor begins shifting from a content expert to a manager of content and services. Large classes rely on many other support facilities including computer labs, teaching assistants, and others. As more resources are required, the span and depth of management control expands. Adding additional levels or numbers of support personnel does not always solve the problem since the instructor must now manage more people and becomes further removed from the classroom. For some academics, this may be an unsatisfactory result.

Similarly, testing in online courses often shifts from testing a student's knowledge of facts and or skills to grading students on their completion of certain activities. For example, how many times they posted a response to the discussion topic of the week. Testing online concerns include credentialing, delivering a skills-based exam, and evaluating assignments given to students outside a proctored environment.

Conclusions

Clearly State the Objectives: The over-sized course suffered from many poorly understood issues. The course was originally established to provide a vehicle for mass coverage of computer literacy. As the size of the project increased, other objectives became predominant.

Student Maturity: Not all students are mature enough to succeed in a self-paced course. An analysis of the post-class student survey indicated that many students had the initial perception that the class would somehow be easier or less rigorous than other classes. Many students misjudged their ability to complete the course work in the amount of time allotted.

Planning: Resource planning and student retention are key issues in managing super-sized classes. While it may be possible to control these classes with qualified graduate students, some level of student screening and counseling must be in place for self-paced mega classes.

Management: Instructors of over-sized classes soon find that they have become managers of the classroom experience rather than deliverers of content. What is a worrisome task in a class of 30 becomes a Herculean task in a class of 800. Merely getting a consistent message to 800 students can be almost impossible.

A Design Model for the Internet-Based Electronic Performance Support Systems

Hakan Tuzun, Hasan Cakir

Indiana University Bloomington

Abstract

This presentation describes the design and development of an Internet-Based Electronic Performance Support System called the Systemic Change EPSS. The Systemic Change EPSS provides systemic change facilitators with the information, tools, and resources they need, and accessibility to other facilitators who are dealing with systemic change effort. This presentation outlines design issues for Internet-based EPSSs and strategies for developing such systems. Based on the formative research experience, we propose a design model for Internet-based EPSSs.

Introduction

What is EPSS?

There are different definitions of Electronic Performance Support Systems (EPSS). Gery (1995), who coined the term, defines an EPSS as a tool for just-in time performance support in the work place. In another term, an EPSS is a complete system or integration of performance support tools to achieve certain tasks in the work setting. The goal of an EPSS is “to provide whatever is necessary to generate performance at the moment of the need”.

Similar to the case of different definitions of EPSSs, there are also different ideas about the components of an EPSS (Cagiltay, 2002). In its basic form an EPSS has the content, the support system, and the user interface that acts as an umbrella for the first two components (Gery, 1995). Cagiltay (2002) summarized different component views from Schwen et al. (1993), Hannafin et al. (2000), and Barker and Banerji (1995). All these component views contained the basic view Gery (1995) put forward.

EPSS Design Models

A small-scale EPSS system might be designed with little or no planning (for example, see the case in Hoyt, Stockman & Thalmann, 1997). However, the use of this approach for the larger systems may not be appropriate since it might cost more time and money. Therefore, we need a systematic planning approach to design such systems, which is called a model. Gustafson and Maribe (1997) explain the role of model as “a model is a simple representation of more complex forms, processes and functions of physical phenomena or ideas. Models are constructed to conceptualize representations of reality.”

The purpose of an Instructional Design (ID) model is “to convey key concepts and processes to be included in a particular approach” (Molenda et al., 1996). Models tell us the critical success factors to instructional design. To be more specific, an ID model tells us what to do and when to do it, and it barely tells how to do it. Molenda et al. (1996) point to the importance of an ID model by this example: “…experience leads the expert away from the cookbook and toward improvisation. But for the apprentice chef, the cookbook is the vital link to maintaining quality and consistency from day to day.” The ID model is the cookbook that will address these concerns for instructional design.

In its early times there was not any specific research-based models available for developing an EPSS (Scales & Yang, 1993). The researchers indicated that it was essential to have an experienced project manager observe the EPSS development process. Since then several EPSS design models have emerged. Four of these models are explained below briefly. As Love and March (1975) expresses, the same thing might have several different models.

Law (1995) organized EPSS design issues into 3 main categories. These categories are front-end analysis, development, and evaluation and research. He presents an EPSS case study, which was designed based on his model. His model includes principals from instructional systems, software engineering, performance technology, and formative evaluation. He concluded that a variety of design strategies should be examined to find out the best solution for the EPSS situation.

The Des Jardins-Davis EPSS design model is a linear model, which has 3 phases (Des Jardins & Davis, 1995). Phase 1, marketing, consists of 1 step: marketing the EPSS. Phase 2, investigating, consists of 3 steps: planning the EPSS, conducting specification analysis of the EPSS, and presenting findings. Phase 3, doing, consists of 6 steps: developing a maintenance strategy, preparing EPSS development plan, building the EPSS, doing the implementation, doing the evaluation, and maintaining the EPSS. Their EPSS design model lacks methodology. In addition, there was no application of the model to any specific EPSS case.

Lohr (1998) indicated that the design and development skills required to produce an EPSS fall into many domains. She offered ADDIE model as an easy to implement design strategy, until easier EPSS development tools for the instructional designers are developed. She describes how the model was utilized to create a graphical user interface, in the form of an EPSS, for a university computer course.

Sheu (2000) followed a socio-technical design framework, user-centered perspective, and a rapid prototyping approach when she designed an EPSS for doctoral students taking their qualifying exams. She developed the model by looking at the previous work practices of the time and psychological behaviors of users preparing to take the qualifying exams.

In common with all these 4 design models mentioned above is the use of ADDIE model, which is a generic, systematic, and classical approach to instructional design. The word ADDIE represents Analysis, Design, Development, Implementation, and Evaluation. In some of these cases, designers utilized a modified version of the ADDIE model. Actually Kruse (2002) states that “there are more than 100 different ID models, but almost all are based on the ADDIE model”.

Internet-based EPSSs

The literature shows that EPSS is still an immature field lacking a generally accepted design model, let alone models for Internet-based EPSSs.

Using the Internet for different purposes has entered a revolution during last two decades. Especially, after the development of the hyperlink on the World Wide Web (WWW), the Internet has offered more user-friendly environments (Starr, 1997). While organizations and educational institutions have been using the Internet to distribute information for a long time, the implications for the instructional design and delivery of EPSSs over the Internet have not been sufficiently explored. Laffey and Musser (1996) envisioned Internet-based tools as a new form of EPSS, creating new performance spaces. They indicated the properties of a dynamic support system as the ability to change with experience, to be updated, and adjusted by the performer, and augment other resources found in the user’s community. However, they did not explain how they merged the Internet and their EPSS, which was built to support pre-service teachers, field-based mentors, and college faculty as they collaborate, engage in practice, document their efforts, share their experiences, and assess outcomes.

Research Questions

The purpose of this study is to propose a design and development model for Internet-based EPSSs. For this purpose the following research question was investigated:

- What should an effective, efficient, and appealing design model incorporate for the design and development of an Internet-based EPSS?

Systemic Change EPSS

The idea of creating an EPSS for systemic change was born after a discussion between an Indiana University graduate student and a professor at the same university. After deciding on designing an Internet-based EPSS for systemic change facilitators, the designers started to search for a model that they could follow throughout the design process. However, the literature had very limited number of design models for the EPSS design. Due to lack of Internet-based EPSS design models, designers decided to create their own model by using the Internet-based EPSS design case. This way they also added new information to the body of knowledge in our field and they provided a reflection of their design process. The model explained here is based on a design process of the Internet-based EPSS case.

Two graduate students and one professor worked on designing the Internet-based EPSS. The designers followed a formative research methodology to create the model. The activities to design the Internet-based EPSS have provided the data for creating the design model.

Methodology

The model developed in this study is a design theory. Theories in applied fields like instructional design can be categorized as design theories and descriptive theories (Reigeluth, 1999). Design theories are different from descriptive theories. While descriptive theories explain existing situations or phenomenon like learning theories, design theories provide models and guidelines for designing and/or improving instructional practices (Reigeluth, 1999).

Formative research is an action research to develop or to improve design theories for designing instructional practices and processes (Reigeluth, 1999). Formative research is driven by "what worked well", "what did not work well" and "what improvements can be made" questions. A practice developed by following a theory may show the weaknesses of the process, which develops the theory. By examining the case, the theory may be improved for further applications. Research theories are based on some values (Reigeluth, 1999). Descriptive theories emphasize the validity of the research since the answer to "what is" question matters, whereas design theories value the preferability, thus the answer to "what is better" question has more importance. Formative research values the process. Reigeluth and Frick (1999) categorized the values of design theories in three categories: effectiveness, efficiency and appeal. Effectiveness implies to get to the target or to get the job done correctly. Efficiency is to reach to the results by using optimum resources. Appeal is the degree the process is enjoyable for the designers and the users.

Reigeluth and Frick (1999) developed three methodological procedures for formative research: designed case, in vivo naturalistic case, and post facto naturalistic case. Each procedure can be used for an existent theory or for a new theory. In our case, a model for designing Internet-based EPSS, we took the approach of designed case for a new theory. The steps involved in this methodology are, with time base sequence:

- Creating a case to generate design theory
- Collecting and analyzing formative data on the instance
- Revising the instance
- Repeating the data collection and revision cycle
- Fully developing the tentative theory

We applied these steps to develop the model for designing an Internet-based EPSS. Since the created case is a work in progress, so is the model. Constant revision cycle takes place in the development of the product and in the process to produce it.

Proposed Design Model

The model presented here is a tentative model for designing an Internet-based EPSS (Figure 1.). The evaluation and modification of the model take place throughout the design process. The model consists of 10 steps. Each step has sub steps for explaining "how to do" for implementing the main step. Sub steps of the model contain procedures specialized for the Internet-based system design.

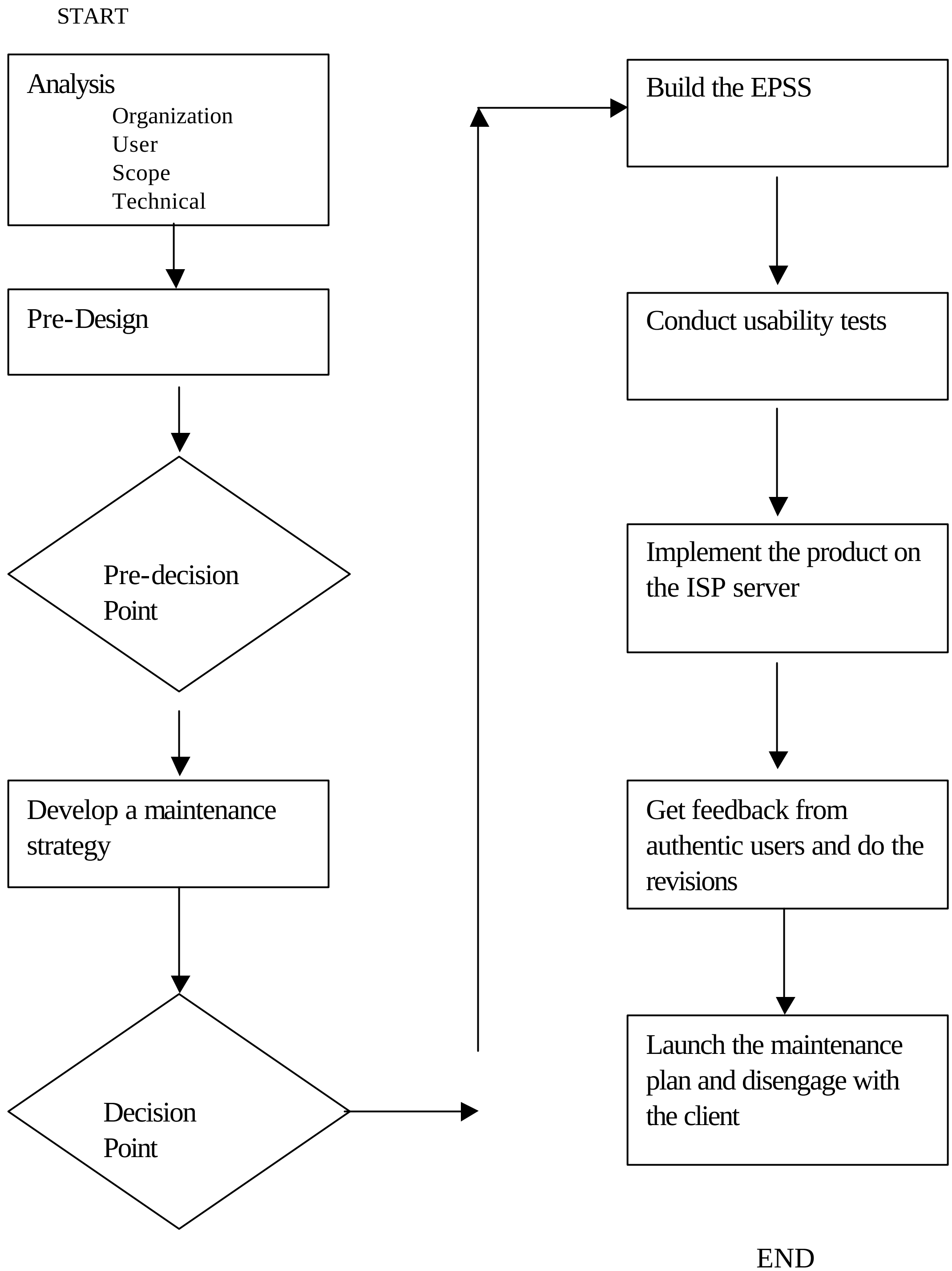


Figure 1. The Model for Designing an Internet-based EPSS

The model is an enhanced application of the ADDIE model. The difference from the ADDIE model is that the model has two design steps (step 2 and step 6) and two decision points (step 3 and step 5) before taking further steps towards building the system. Since the available tools and data communication bandwidth are limited on the Internet medium, the designers have to consider these variables in their design decisions. Because of these limitations, the designers have to consult with the client and get the approval of the client before building any part of the system.

The Internet allows the designers to disseminate the knowledge to a broad audience with easy and low update costs. In order to maintain and to update the EPSS with the most current information, a maintenance strategy should be designed. After compiling all the data about design plans, maintenance, and total and on-going costs of the system, the designers should meet with the client to decide whether the system should be developed or not.

Components of the Model

1. Analysis
    1.1. Organization's or individuals' needs (client's needs): What performance will be increased. How and in which direction performance will be increased.
    1.2. User analysis: Demographics and computer literacy level of the potential users.
    1.3. Scope analysis: Content analysis; according to the needs of the client what content will be covered. Task analysis; tasks involved in the content will be analyzed.
    1.4. Technical analysis: Feasibility - Connection speeds – Internet Service Provider (ISP) software support capability - Browsers that are going to be used - Site address

2. Pre-Design
    2.1. Set-up the specific objectives for the EPSS; what it is going to be accomplished.
    2.2. Determine functional specifications according to the needs.
    2.3. Determine forms of the functions.
    2.4. Determine the connections between the functions based on task analysis. By visiting the task analysis these connections can be determined.
    2.5. Chunk the information. With the help from content creator or subject matter expert, chunk the information based on five plus or minus two rule.
    2.6. Determine connections between information chunks. After determining the information chunks, determine the connections between them if there are.
    2.7. Determine the components of the EPSS as performing technical functions. What components serve as technical functions of the system.
    2.8. Perform feasibility of the functions. Determine if the functions can be implemented according to technical analysis and user analysis.
    2.9. Provide alternatives for the functions.
    2.10. Revise compatibility of functions and components.
    2.11. Determine the responsibilities of the client in the design process.

3. Pre-Decision Point: In this step, client and the development team meet in order to go further or to terminate the project based on the collected data and the resources required to develop the system.
    3.1. Prepare a general outline of the EPSS to the client.
    3.2. Discuss the functions with the client.
    3.3. Discuss the alternatives of the functions.
    3.4. Discuss the possible costs with the client.
    3.5. Discuss the responsibilities of the client.
    3.6. Make DO or DO NOT DO decision.

4. Develop a maintenance strategy
    4.1. Identify on-going maintenance requirements.
    4.2. Develop skill/personal requirements.
    4.3. Estimate cost of maintenance as one time cost and continuous costs.

5. Decision Point

5.1. Discuss with the client total system and maintenance costs, procedures.
5.2. Get approval of the client before starting the development of the EPSS.

6. Build EPSS
   6.1. Prepare a big picture / outline of the system
      6.1.1. Components
      6.1.2. Connections
   6.2. Determine content of each element / component.
   6.3. Select appropriate software for each component and its function.
   6.4. Manipulate the content according to data flow speed.
   6.5. Determine file name hierarchy in the site.
   6.6. Determine general rules for interface design to assure consistency throughout the product.
   6.7. Assign the tasks to the teams.
   6.8. Integrate the elements.

7. Conduct usability tests: Usability tests should be conducted on potential users of the system to fix or eliminate problematic parts.

8. Implement the product on the Internet Service Provider (ISP) server. Install the system to ISP server. In order to protect the product from outside threats, appropriate security settings should be configured.

9. Get feedback from authentic users and do the revisions as needed. After implementing the EPSS, authentic users (in our case systemic change facilitators) send their comments and feedback about the product. According to the change requirements, the designers should change the parts as necessary.

10. Launch the maintenance plan and disengage with the client. After the design of the system is finished, in order to keep the site updated and running, maintenance plan should be launched. Depending on the complexity of the system and the skill level of the maintenance personnel, the designers should make decisions about the support level they will provide and how the maintenance personnel training will be accomplished.

Limitations of the Model

The presented model here has a narrow scope. It is for the design of Internet-based EPSSs. Although it was initially generated starting with the generic ADDIE model, it is different from ADDIE model and it may not be generalized or utilized in instructional design and development processes. The model does not have a great flexibility. Since the details make a difference, all of the steps of the model should be implemented in the design process. When using the model, the design team needs to collect scrutinized data. This requires a lot of time for front-end analysis.

Conclusion

We applied a formative research approach to the EPSS design. A review of the literature on EPSS design models indicated that ADDIE model was largely utilized for the design of the EPSSs. Our model is also an enhanced version of the ADDIE model. The difference from ADDIE model is that the model has two design steps and two decision points before taking further steps. In addition, we provide detailed guidelines on how to implement certain steps. With the help of our case, a systemic change EPSS, we are still in the process of developing this model.

References

Barker, P., & Banerji, A. (1995). Designing electronic performance support systems. Innovations in Education and Training International, 32(1), 4-12.

Cagiltay, K. (2002). An alternative design model for building electronic performance support systems. Unpublished doctoral dissertation, Indiana University, Bloomington.

Des Jardins, S., Davis, H. J. (1995). Electronic performance support systems (EPSS): Making the transition. Paper presented at the Annual Conference of the International Visual Literacy Association, Chicago, IL, October, 18-22, 1995. ED391499.

Gery, G. J. (1995). Electronic performance support systems: How and why to remake the workplace through the strategic application of technology. Tolland, MA: Gery Performance Press.

Gustafson, K. L., & Maribe, B. R. (1997). Revisioning models of instructional development. Educational Technology Research and Development, 45(3), 73-89.

Hannafin, M. J., Hill, J. R., & McCarthy, J. E. (2000). Designing resource-based learning and performance support systems. In D. A. Wiley (Ed.), The Instructional Use of Learning Objects: Online Version. Retrieved 11 11, 2002, from the World Wide Web: http://reusability.org/read/chapters/hannafin.doc

Hoyt, B. R., Stockman, M., & Thalmann, J. (1997). Design and implement custom electronic performance support systems (EPSS) for training in project based classes. Paper presented at the Association of Small Computer Users in Education (ASCUE) Summer Conference, North Myrtle Beach, SC, June, 7-12, 1997. ED410925.

Kruse, K. (2002). Introduction to instructional design and the ADDIE model. Retrieved 11 11, 2002, from the World Wide Web: http://www.e-learningguru.com/articles/art2_1.htm

Laffey, J. M., Musser, D. (1996). Building internet-based electronic performance support for teaching and learning. Paper presented at the WebNet 96 Conference, San Francisco, CA, October, 15-19, 1996. ED427666.

Law, M. P. (1995). Developing electronic performance support systems for professionals. Paper presented at the Annual National Convention of the Association for Educational Communications and Technology (AECT), Anaheim, CA, 1995. ED383317.

Lohr, L. (1998). Using ADDIE to design a web-based training interface. Paper presented at the Society for Information Technology & Teacher Education International Conference, Washington, DC, March, 10-14, 1998. ED421139.

Love, C. A., & March, J.G. (1975). An introduction to models in social sciences. Harper & Row: NY.

Molenda, M., Pershing, J. A., Reigeluth, C. M. (1996). Designing instructional systems. The ASTD Training and Development Handbook. R. Craig. New York, McGraw-Hill.

Reigeluth, C. M., (1999). What is instructional-design theory and how is it changing? In C. M. Reigeluth (Ed.), Instructional-design theories and models, volume II. (pp.5-28). Mahwah, NJ: Lawrence-Erlbaum Associates.

Reigeluth, C. M., & Frick, T. (1999). Formative research: A methodology for improving design theories. In C. M. Reigeluth (Ed.), Instructional-design theories and models: A new paradigm of instructional theory, volume II. K Mahwah, NJ: Lawrence-Erlbaum Associates.

Scales, G. R., & Yang, C. S. (1993). Perspectives on electronic performance support systems. Paper presented at the Annual Meeting of the Eastern Educational Research Association, Clearwater Beach, FL, February, 17-21, 1993. ED354883.

Schwen, T. M., Goodrum, D. A., & Dorsey, L. T. (1993). On the design of an enriched learning and information environment (ELIE). Educational Technology, 33 (11), 5-9.

Sheu, F. (2000). A design of electronic performance support systems. Paper presented at the National Convention of the Association for Educational Communications and Technology, Denver, CO, October, 25-28, 2000. ED455807.

Starr, R. M. (1997). Delivering instruction on the World Wide Web: Overview and basic design principles. Educational Technology, 37(3), 7-14.

An Internet-Based Electronic Performance Support System for Systemic Change in K-12 Settings

Hasan Cakir, Hakan Tuzun, Charles M. Reigeluth

Indiana University Bloomington

Abstract

We present an Internet-based Electronic Performance Support System (EPSS) called the Systemic Change EPSS. Systemic change facilitators can use this system to access the tools, resources, and information they need in the systemic change process. A general outline of the Systemic Change EPSS is introduced. Components of the Systemic Change EPSS and their interconnections are also explained, along with field test and usability test data.

Introduction

The purpose of systemic change is to create a better educational system than what currently exists. Systemic change is a collective effort that should be fostered by school, community and student populations. Yet, the efforts of these people and organizations may not be effective or efficient without receiving enough guidance. Guidelines for these change efforts can be provided by experienced facilitators and researchers in the systemic change field. Jenlink, Reigeluth, Carr, and Nelson (1996) developed a systemic change guidebook to help facilitators create and sustain systemic change efforts.

The guidebook consists of 26 discrete events that occur at distinct points during the change effort. In addition to this, there are 18 continuous events that should be engaged in throughout the change process. Each discrete and continuous event is made up of several activities. Each of these activities is comprised of about 10 pages of detailed guidelines, considerations, and tools. Since the guidebook is so thick and heavy, it might not be practical to carry it to many meetings conducted during the systemic change effort. It would also be expensive to copy it for key participants' use. For these reasons, the authors of the guidebook decided to produce it in the form of an Electronic Performance Support System (EPSS), using hypermedia and the Internet. A team of designers and developers volunteered to accomplish this project.

An EPSS is a tool for just-in time performance support in the work place. An EPSS is a complete system or integration of performance support tools to achieve certain tasks in work settings. The goal of an EPSS is "to provide whatever is necessary to generate performance at the moment of the need" (Gery, 1995). Since the computer networks and especially the Internet have become ubiquitous, we have now opportunities to implement EPSSs which are universally available on demand at any time and any place.

The goal of the Internet-based Systemic Change EPSS is to provide the systemic change facilitators the tools, resources, and information they need in the process, and accessibility to the other facilitators and communities who are dealing with systemic change. The end product offers more functions than just being merely an electronic version of the guidebook.

Functional Specifications of the Systemic Change EPSS

A well planned needs analysis can be used as an information-gathering tool by a wide range of organizations under a variety of conditions (Reviere et al., 1996). A qualitative development methodology using semi-structured interviews was used to address the needs of current and potential users of the systemic change EPSS.

Two systemic change facilitators were interviewed to figure out the functional specifications of the systemic change EPSS. Facilitators were selected with purposeful sampling. At the time of the interviews, the facilitators were dealing with systemic change efforts at an urban school district in Indianapolis, IN. Interviews took approximately an hour long and were audio recorded. The interviews occurred on different dates. The following interview questions were asked:

1. What are the main needs while the facilitator uses the EPSS guidebook?

2. What are the problems the facilitator encounters when following the EPSS guidebook?
3. What does the facilitator expect from the systemic change EPSS to solve these problems?
4. When and where does the facilitator expect to use the systemic change EPSS?
5. Are any materials other than the guidebook needed as resources for the change process?
6. What should the content of the systemic change guidebook be?
7. What other ideas does the facilitator have to add to the systemic change EPSS?

After the interviews, the interview notes were transcribed onto 3x5 index cards for each of the interview questions. These cards were analyzed and compared, and gradually categories emerged. Once the development team members agreed upon all the categories for each question, they carefully defined the categories. Next, the specific responses from the interviews were coded by category. At the end of this process several design specifications were established for the development of the systemic change EPSS.

The most important of these specifications is that the systemic change EPSS should make the facilitator aware that certain issues are important during the events of the systemic change effort. The next important specification is to give guidance on how to deal with those issues if the facilitator does not know how to deal with them. It was indicated that facilitators would use the systemic change EPSS before their meetings with the participants, rather than during the meetings.

Specifications related to the user interface, content, and tools are described below:

User interface related: The systemic change EPSS should be designed with the novice computer and Internet user in mind. The user interface should be simple. All pages should include functions to search for the information and to print the information. Navigation in the system should be easy and consistent, and transitions between the components should be fast. The interface should allow tracking previously accessed screens. The interface should inform the user about where the user is in the system.

Content related: The systemic change EPSS should provide a big picture of the systemic change effort, step-by-step advice for each of the 26 discrete events and the continuous events, information about systemic change, answers to the Frequently Asked Questions (FAQ), a glossary of systemic change, information about systemic change case studies, and interaction with other facilitators.

Tools related: It was indicated that miscellaneous software tools for collecting qualitative data, for highlighting EPSS content and taking notes, and for making casual-loop diagrams are needed by systemic change facilitators.

Components within the Systemic Change EPSS

There are six main design components in the system. They are consulting, e-guidebook, resources, community, glossary and frequently asked questions (FAQ). The consulting component of the system is structured as phase and event based. It provides a bird's eye view of the event to the facilitator. By implementing the consulting element, continuous events in the process are embedded in the discrete events, and the facilitator's consideration of continuous events is assured. As shown in Figure 1, the consulting element provides a direct linkage to resources, community and e-guidebook components of the system.

The e-guidebook component of the system is also structured as phase and event based. The facilitator accesses the content of this section either through the navigation system on the interface or through the link on the consulting page. The resources component of the system is structured according to the immediate needs of the facilitator during the analysis phase of the system. Due to low availability of the resources for each event, the resources section is grouped according to the phases in the change process. Community is another component that can be accessed immediately from the consulting page. In the community component of the system are directory and threaded discussion groups. From the consulting component, there are direct links to reach the community component as shown in Figure 1.

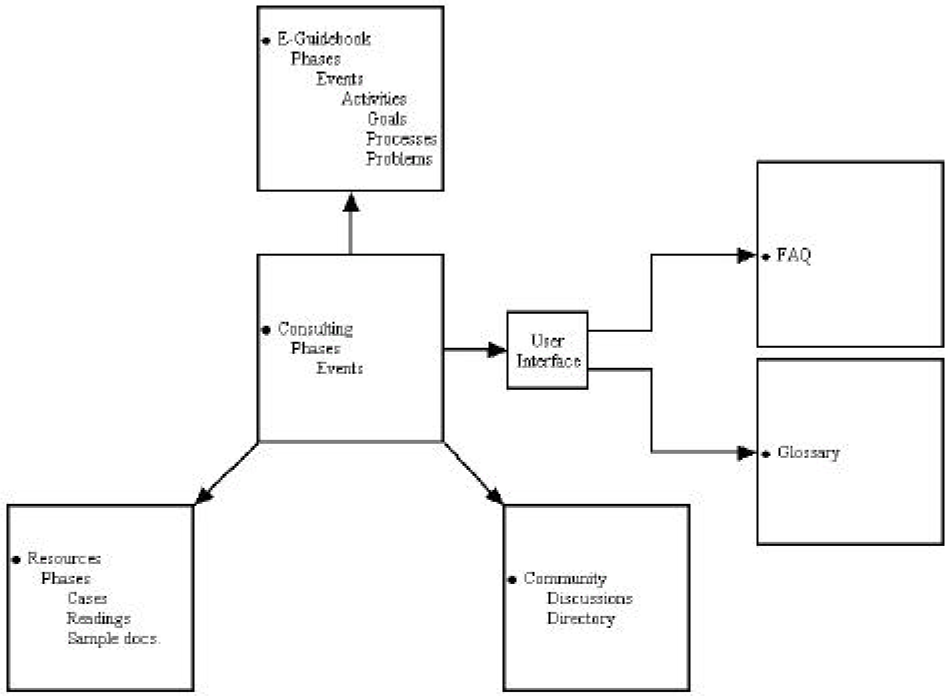


Figure 1. Interconnections between the Components

User Interface Related Components

The interface of the system is based on the frame feature of HTML. Using the frame feature enables designers to make changes on the interface independently from the content. Most of the web interface designers are against using frames on the interface. However, because of some technical reasons we have used frames in the system. The interface consists of two frames, a navigation frame on the left and a content frame on the right (Figure 2).

1. Navigation Frame: The navigation frame is on the left side of the interface. It is designed based on JavaScript from the http://www.treemenu.com site. Tree menu navigation has several advantages. Since it is independent menu software and it is placed in a frame, it is very easy to add new elements to the site. One of the fascinating features of the site is updating the navigation frame within a few seconds without changing any pages. The tracking method of the menu, which is opening the folders according to their level in the entire navigation system, provides the user a powerful navigation system. Opening the sections folder under a folder reduces the cognitive load of the users and provides a clear sense of location for them.

2. Content frame: The content frame is placed on the right side of the interface. This frame contains the formal decisions of our functional decisions. At the top of the page, the main title indicates the name of the site. Under the main title, functional buttons are placed. The search field is an indispensable feature for this site, since there are a huge number of pages in the site. Even though navigation is so clear and easy, sometimes finding specific information through the search field is easier. The "Save and Log out" button helps remind the users where they left the site when they come back. Each page has a print button, which generates a printer-friendly version of the page on the screen. Under the function buttons, the section title appears. Basically, the section title tells the users on which event they are. The content field contains the text from the guidebook. The text is formatted according to the format of the original text.

At the bottom of the page is the footer bar. The footer bar holds the contact information, sitemap and privacy links. Each link opens in a pre-sized window in order for the users to see only related information. The contact link contains sufficient information to contact the site administrators via phone, e-mail or mail. The site map presents a big picture of the site, and a privacy note explains the copyright issues related to the site. Below the footer bar, standard information about the page is provided, such as the page URL and update date, and since the site is sponsored by Indiana University, credit is given to the university.

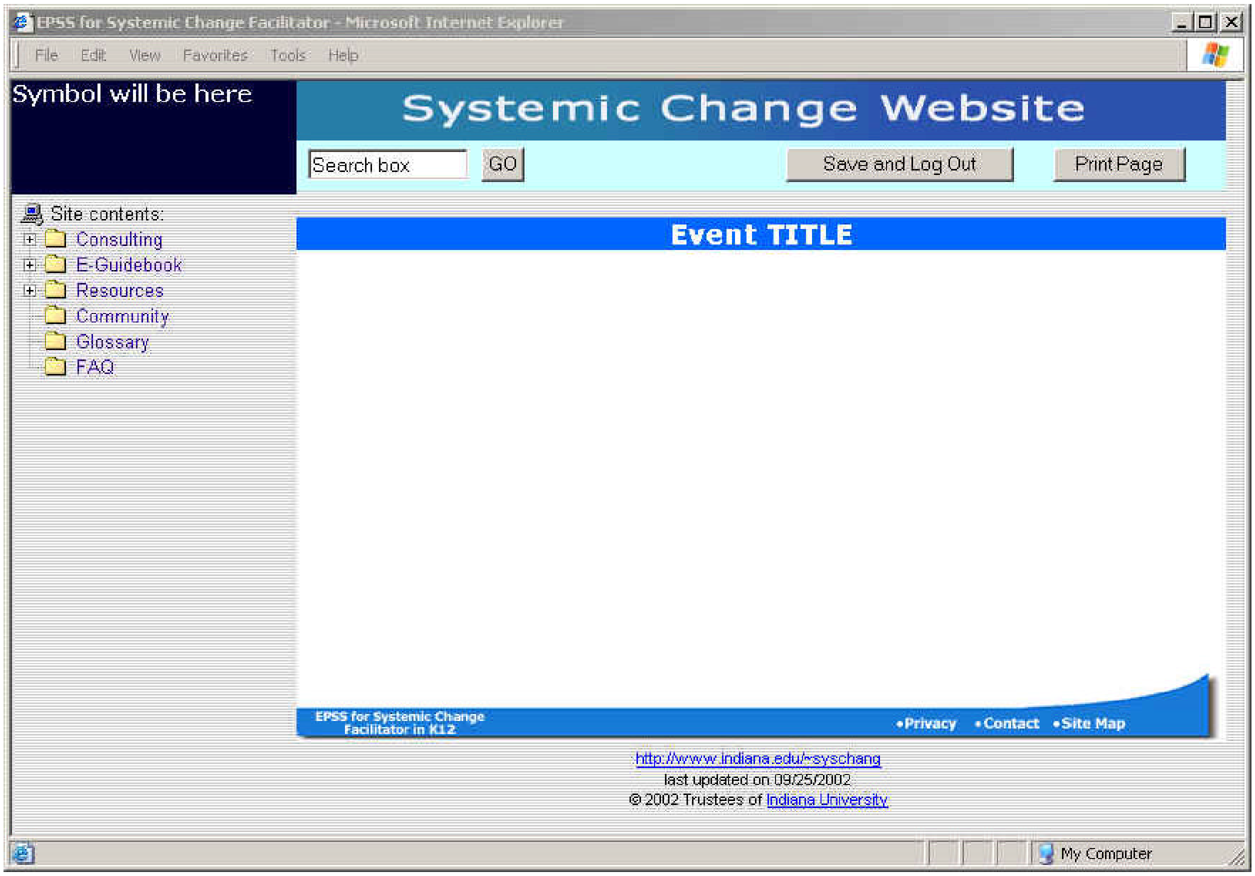


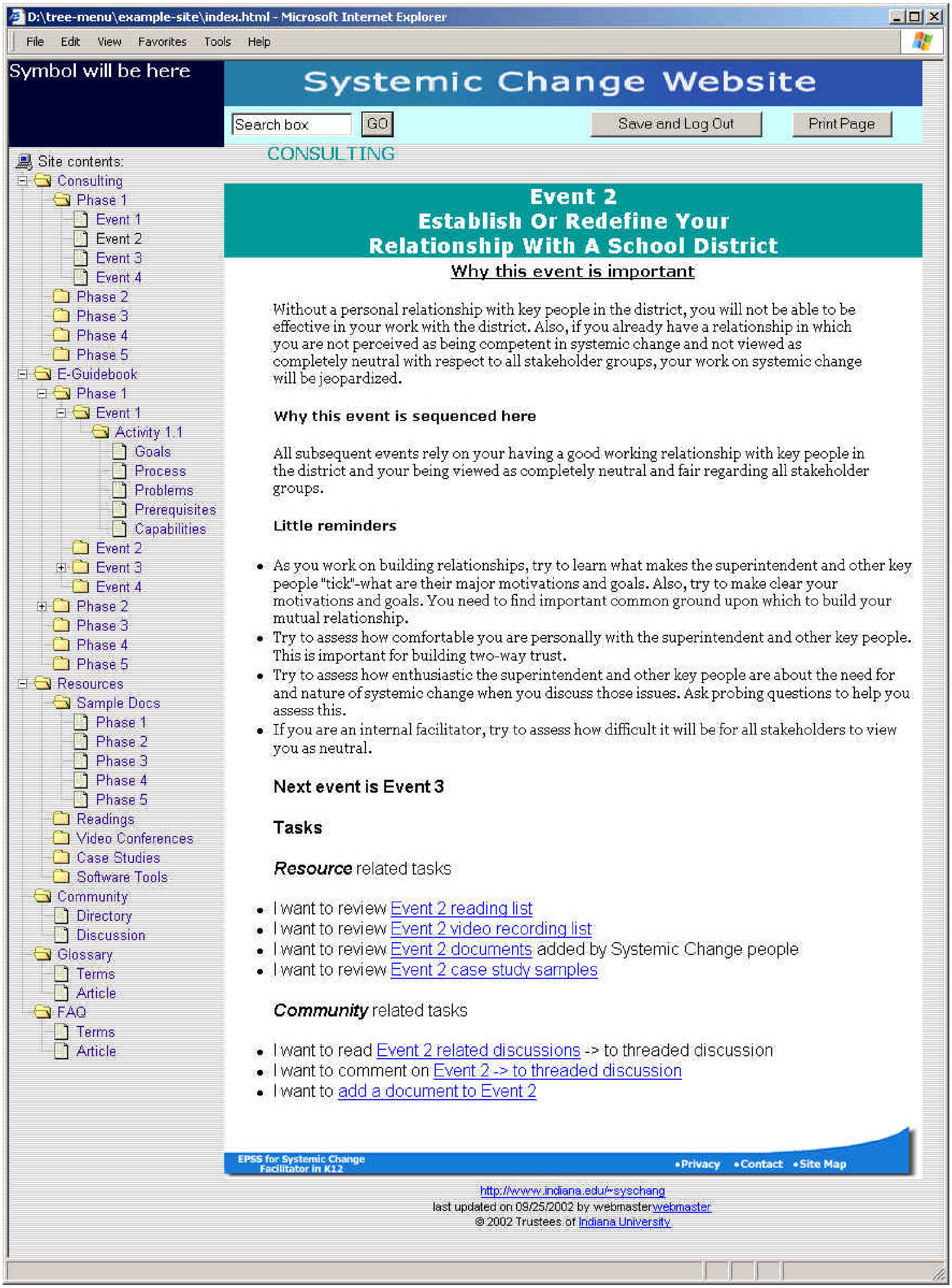
Figure 2. Systemic Change EPSS User Interface

Content and Tools Related Components

The Internet-based Systemic Change EPSS has 6 main components:

1. Providing guidance to the facilitators: This component constitutes the nutshell or kernel of the system (see Figure 3). This component is event based. The facilitator sees a big picture of the event and also the important issues about the event. It gives a kind of bird's eye view to the facilitator of what is going to take place in this event, what issues are important, and the place of the event in the whole systemic change process. The facilitator is able to access to the other parts of the system from this component.

2. Electronic version of the systemic change guidebook: The guidebook is designed hierarchically in phases, events and activities. The book has 6 phases, each of which contains a number of events, and each event has activities. This component provides information about the events, such as things that should be done in order to accomplish the objectives of the event. In this section, the electronic version of the guidebook is provided as the main source of information. Objectives, procedures and activities are accessible through this component of the system.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File Edit View Favorites Tools Help
Symbol will be here
Systemic Change Website
Search box
GO
Save and Log Out
Print Page
CONSULTING
Site contents:
Consulting
Phase 1
Event 1
Event 2
Event 3
Event 4
Phase 2
Phase 3
Phase 4
Phase 5
E-Guidebook
Phase 1
Event 1
Activity 1.1
Goals
Process
Problems
Prerequisites
Capabilities
Event 2
Event 3
Event 4
Phase 2
Phase 3
Phase 4
Phase 5
Resources
Sample Docs
Phase 1
Phase 2
Phase 3
Phase 4
Phase 5
Readings
Video Conferences
Case Studies
Software Tools
Community
Directory
Discussion
Glossary
Terms
Article
FAQ
Terms
Article
Event 2
Establish Or Redefine Your
Relationship With A School District
Why this event is important
Without a personal relationship with key people in the district, you will not be able to be effective in your work with the district. Also, if you already have a relationship in which you are not perceived as being competent in systemic change and not viewed as completely neutral with respect to all stakeholder groups, your work on systemic change will be jeopardized.
Why this event is sequenced here
All subsequent events rely on your having a good working relationship with key people in the district and your being viewed as completely neutral and fair regarding all stakeholder groups.
Little reminders
As you work on building relationships, try to learn what makes the superintendent and other key people "tick"-what are their major motivations and goals. Also, try to make clear your motivations and goals. You need to find important common ground upon which to build your mutual relationship.
Try to assess how comfortable you are personally with the superintendent and other key people. This is important for building two-way trust.
Try to assess how enthusiastic the superintendent and other key people are about the need for and nature of systemic change when you discuss those issues. Ask probing questions to help you assess this.
If you are an internal facilitator, try to assess how difficult it will be for all stakeholders to view you as neutral.
Next event is Event 3
Tasks
Resource related tasks
I want to review Event 2 reading list
I want to review Event 2 video recording list
I want to review Event 2 documents added by Systemic Change people
I want to review Event 2 case study samples
Community related tasks
I want to read Event 2 related discussions -> to threaded discussion
I want to comment on Event 2 -> to threaded discussion
I want to add a document to Event 2
EPSS for Systemic Change
Facilitator in K12
•Privacy •Contact •Site Map
http://www.indiana.edu/~syschang
last updated on 09/25/2002 by webmasterwebmaster
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Figure 3. The View from Systemic Change EPSS for Consulting Page for Event 2

3. Resources: This component of the site holds the resources that are needed to enhance facilitators' skills needed in the systemic change effort. These resources are categorized as readings, videos, case studies, sample documents and software tools. The site coordinator maintains these resources and updates them as required. Facilitators are not currently able to add to the resources.

4. Community: This component's objective is to bring people involved in systemic change all over the country together in one virtual place. The community component enables people to share their experiences, questions, concerns, resources, and documents related to their systemic change efforts. It has a directory of people who are facilitating different systemic change projects in order to introduce the members to each other. The component also enables school districts to find a facilitator who has experience with similar contexts. One powerful feature of this component is the threaded discussion groups that keep the questions and their answers together. The discussion software can be customized according to the topics' needs.

5. Glossary: This component provides a brief summary of the process of systemic change. It is for novice users who want to learn more about the systemic change process and related terms. The component has two sections: terms and the article about systemic change by Jenlink et al. (1996). The terms section provides a glossary of concepts in the systemic change process.

6. Frequently asked questions (FAQs): This component has questions that are asked over and over again, and their answers are provided by experts in the field. The content for this component is compiled from the community's discussion section and from questions asked directly through e-mail messages to the site manager.

Benefits of the System

The Internet-based EPSS for systemic change facilitators provides more knowledge to its users than a regular website. With a very simplistic view, it may seem to be similar to any regular web site. However, it differs from static websites in several aspects. The important feature of the site is that it provides guidelines for each event in the website. Under the consultation link, event-specific guideline pages are provided. These pages contain all information related to the events that the facilitators need. A second aspect is that the EPSS has community building tools, such as threaded discussion groups and a members' directory. These tools add value to the EPSS and give power to the users to reach each other easily and to share their knowledge. Also, by gathering the knowledge from facilitators who are using the website, it provides an invaluable knowledge base for the community.

Since the system is using online technology and disseminates its knowledge via the Internet, maintenance and update costs are relatively low in comparison to printed or optic media. The technology behind the site allows the administrators to maintain and update the site without much software knowledge and programming skills. The interface design of the site allows the administrators to change it easily. Even drastic changes can be implemented within minutes as long as the two frames are preserved. The infrastructure of the site uses DHTML and basic HTML, thus it does not require downloading high-end browser plug-ins such as Flash player or Shockwave.

Usability Tests and Results

Usability testing involves observing people attempting to achieve specific goals within a specific context. Design problems that hinder the ability of facilitators to use the Systemic Change EPSS may also hinder the adoption of this system. Therefore, to figure out such design problems and to improve the usability of the system, several usability tests were conducted on one facilitator and two non-facilitator users.

Setting

The usability tests were conducted with one tester, one computer and one participant. The tester was one of the designers of the system. The screen resolution was 1024x768 and the browser was Microsoft Internet Explorer 5.5. The tests were conducted in a private place, where the users could spend as much time as they wanted on the tasks.

Procedure

Before the test was conducted, the goals of the test and background information were explained to the user. Also the users were advised that they could terminate the test at any time. Then pre-prepared tasks were given to the user and the user performed the tasks in the given order. While the test was conducted, the tester only observed and took notes. After the test, the tester conducted a follow-up interview with the user.

Tasks

During the test, a pre-prepared task list was given to the user. The list included a variety of common tasks that a facilitator would do while using the system. Some of the tasks in the list were: starting with the guidance page and continuing to an event or activity, finding a specific activity, finding the contact information of the designer and posting a message to the threaded discussion group.

Results

Most of the pre-prepared tasks were completed by the users in a reasonable time. In the follow-up interviews, the users were asked about the quality of the interface and to what degree they felt comfortable using the system. Most of the users stated that the interface provided a clear sense of navigation. They did not feel ambiguity while navigating through. It was stated that all the tools needed were on the interface and one click away from them. All users stated that they would prefer a different font type and font size for the content part.

Conclusion

Improving the quality of education is always an objective for any educational system. The guidebook provides a guide for facilitators to transform their educational system in a school district. In order to provide more convenient and up-to-date knowledge for the facilitators and to establish a community among them, an EPSS was designed by a team in the Instructional Systems Technology department at Indiana University. The distinctive features of this Systemic Change EPSS are to provide more guidance, to provide an electronic version of the guidebook, to allow the users to share documents and to have a directory of facilitators.

The system consists of six main sections: guidance, electronic version of the guidebook, resources, community, glossary and frequently asked questions. The guidance section provides a general picture of the events, event-specific tips and guidance for the users about utilization of the event. The electronic version of the guidebook provides the book contents to the users. Resources are the documents and tools that are useful to facilitators. In the community section, a directory of members and threaded discussion groups are provided. The glossary and frequently asked questions sections provide auxiliary information about the transformation process.

The system adds several benefits to the guidebook. Since it is Internet-based, the facilitators can reach it anywhere in the world, and updating the guidebook is easy at anytime and at low cost. Systemic change of educational systems requires experience and knowledge accumulation. The Systemic Change EPSS provides this knowledge and experience accumulation and it disseminates the knowledge to people who need it.

References

Gery, G. J. (1995). Electronic performance support systems: How and why to remake the workplace through the strategic application of technology. Tolland, MA: Gery Performance Press.

Jenlink, P. M., Reigeluth, C. M., Carr, A. A., & Nelson, L. M. (1996). An expedition for change: Facilitating the systemic change process in school districts. TechTrends, 41(1), 21-30.

Reviere, R., Berkowitz, S., Carter, C., & Ferguson, C. (1996). Needs assessment: A creative and practical guide for social scientists. Washington, D.C.: Taylor & Francis.

Analysing Argumentation Procedures of Online Conference Transcripts: A Conceptual Tool

Milton Campos, University of Montreal

Thérèse Laferrière, Laval University

Abstract

We introduce a qualitative method that enables researchers to understand the nature of progressive discourse by focusing on how argumentation manifests itself in the collaborative activity of network-enabled communities. We adopt a socio-constructivist theoretical standpoint, drawing from socio-cognitive approaches to learning and communication, and integrating contributions from argumentation theory, namely informal logic. The method consists of capturing a number of logical and logico-grammatical operations in order to identify (1) attitudes that might have an impact in collaborative behavior, (2) logical procedures that reveal the nature of the inquiry, (3) instances of arguments to understand how thoughts are structured, and (4) relationships between instances of arguments across messages. We illustrate the application of this method by presenting a study of the online collaborative process of a network-enabled community of practice of nurses. Results are indicative of problem-solving, conceptual change, learning, and knowledge building.

Introduction

This paper presents a method developed to analyze online conference transcripts, and more specifically argumentation processes. While the value of using electronic conferencing is increasingly recognized, studies that employ conference transcript analysis methods do not yet form a consistent ensemble; goals are often very different as are theoretical perspectives and ways of defining collaboration. The result is a heterogeneous corpus of inconsistent scientific research. In our understanding, socio-cognitive research is most promising when it comes to communication, learning and knowledge building (Bruer, 1994; Scardamalia and Bereiter, 1994; Campos, 2000). At best, electronic conferencing systems enable learners to further explore knowledge, to restructure it, to deepen understanding, and to build together (Bereiter, 2002; Scardamalia, 2002). We present in this paper a method that enables researchers to study discourse in electronic conferencing systems with a view to describe how the argumentation process may lead to manifestations of collaborative problem-solving, conceptual change, and knowledge building. To demonstrate the method, we present quantitative and qualitative data collected in a network-enabled community of practice of nurses (heart care) that uses Knowledge Forum® software to exchange information and ideas, and to build knowledge.

Theory and Method

The method draws from socio-cognitive approaches to learning (Bereiter et Scardamalia, 1987) and communication (Grize, 1997; de Kerckhoeve, 1997; Breton, 1996), enhanced by new technologies (Scardamalia et Bereiter, 1994; in press), and integrating contributions from argumentation theory (Van Eemeren, Grootendorst, and Henkemans, 1996), namely informal logic (Toulmin, 1958).

Communication, Sociocognitive Sciences and Learning

Although computer technologies developed steadily from the 1950's, communication processes have only been supported by computers since the early 1980's, then subsequently became more widely spread in the 1990's (Harasim et al, 1995). With the Internet, synchronous (real-time) communication systems like chats and video-conferencing, and asynchronous (not in real time) communication systems such as e-mail, newsgroups, and conferencing systems developed. Both kinds of Internet-based communication systems have led to the emergence of network-based (virtual communities) and network-enabled communities (e.g. professional communities or classroom-based learning communities).

There is an obvious need for better understanding of asynchronous networked communication (Campos, 1998, 1999, 2000; Campos, Laferrière, and Harasim, 2001; Campos and Laferrière, 2002) in community contexts in order to enhance learning, problem-solving, inquiry, and reflective practice (Lamon, Scardamalia and Laferrière, in press; Breuleux, 2001; Breuleux, and Laferrière, 2000; Bracewell, Breuleux and Le Maistre, 2000; Laferrière et al, 1999; Gibbs 1994), and to evaluate "what effective learning strategies and modes of learning make the most use of the capabilities of the new technologies" (Haughey, 2002, p.18).

Cognitive scientists and psychologists have studied problem-solving processes extensively, but mostly in well-defined domains such as mathematics. Usually, the procedures to solve these kinds of problems follow clear mental routes (or strategies) that enable artificial intelligence (AI) researchers to model them in software interfaces. Our knowledge is far less developed in ill-defined domains. The approach in this paper is to investigate how hypothetical procedures such as those of argumentation, a critical process for communication (Breton, 1996) occurring in a network-enabled community, can be scaffolded toward online collaborative problem-solving and knowledge building in ways consistent with findings in related studies (Scardamalia, 2002; Hewitt, 2001; Bereiter and Scardamalia, 1996).

A basic assumption is that argumentation is a process that emerges naturally from human cognitive structure through language and discourse. Our working hypothesis is that, in the context of electronic conferencing, this process can be scaffolded through appropriate facilitation strategies and electronic conferencing tools. Here, an *argument* is defined as a conditional structure (If-Then) in which a number of premises lead to a conclusion, and whose content should be understood in the context of its practical use (Toulmin, 1958). To be built in the context of the practice through electronic conferencing, an argument needs to be co-constructed (Grize, 1997). Arguments, therefore, request responses and active engagement throughout the messages that are posted and that form the online discourse. Another assumption of this study is that coming together for the purpose of co-constructing arguments for the sake of problem-solving or inquiry is likely to lead to significant collaboration and, hence, to conceptual change and knowledge building (Campos, Laferrière and Harasim, 2001; Bereiter, 2002).

We understand *network-enabled collaboration* as a process of engagement and active participation in which two or more people, through the use of adequate software, build on the thoughts and ideas of one another. Network-enabled collaboration can be of different levels: from a vague sense of being together to strong procedures of co-work (Campos, Laferrière, and Harasim, 2001). *Knowledge building* represents a continuous process of production and improvement of ideas that are valuable for a community; it is a process in which the sum of individual contributions will be less fundamental than what the community would able to accomplish by engaging in knowledge production, creation, improvement and innovation (Scardamalia and Bereiter, in press).

Transcript Analysis Methods

Most existing methods that aim to study online discourse rely on quantitative measures (Anova, Manova, percentages, etc.) of qualitative categories. Studies have a variety of focuses, including critical thinking processes (Anderson and Garrison, 1995), analysis of patterns of participation (Howell-Richardson and Mellar, 1996; Bullen, 1998), content analysis (Mowrer, 1996; Hara, Bonk and Angeli, 2000), teaching styles (Ahern, Peck and Laycock, 1992), social construction of knowledge (Gunawardena, Lowe and Anderson, 1997; Kanuka and Anderson, 1998), notions related to Vygotsky's zone of proximal development (Fahy et al, 2000), and even argumentation (Marttunnen, 1997). In addition, the unit of analysis varies from the phrase to a whole text (Rourke et al, 2001).

Having worked with transcript analysis for a number of years, we searched for reliable tools to study not only the content of the conferences but also to understand the argumentation procedures underlying the online discourse. The development of this qualitative method is grounded in socio-constructivist perspectives, and studies of logically structured discourse (Toulmin, 1958), meaning making (Piaget, 1991), and conceptual change (Piaget, 1976).

Analyzing Transcripts of Networked Collaborative Argumentation

Our method consists of capturing a number of logical and logico-grammatical operations commonly applied in written discourse. Depending on the level of their use, such operations may indicate major occurrences in the online discourse such as (1) attitudes that may have an impact in collaborative behavior (Campos, 2002a), and (2) logical procedures that may reveal the nature of the inquiry (Campos, 1998; 2000; 2002a). In addition, the method captures the (3) nature of arguments in order to understand how thoughts are structured (Campos, 2000). Furthermore, the method establishes (4) relationships between arguments *across* messages. In order to explore the socio-cognitive nature of collaborative conversation, the method adopts *the phrase* as the *coding unit*. However, to capture the knowledge-building collaborative online discourse, *the relationships between meanings,* as explicitly expressed within the coding units of the messages, are the *units of analysis*.

Analysis requires a four-step process. The first step consists of identifying when the phrase is of a declarative nature (an affirmative, a negative, a conditional or a disjunctive declaration), of an imperative nature (here the imperative form of the verb is used), or of an interrogative nature (a question, which, in logical terms, is often an inverted hypothesis). Our earlier studies have shown that most online discourse is mainly declarative and that the level of use of imperative could reveal a lesser extent of collaboration and even indicate potential conflict (Campos, 2002a). On the other hand, the more questions formulated by participants, the more engaging the conversation seems (Campos, 2000).

The second step consists of identifying some logical operations underlying the discourse such as affirmations, negations, conditionals, and disjunctions (either-or, and or-or operations). Our studies have shown that while affirmations do not usually trigger more engaging conversation, negations and conditionals do so, leading to collaborative learning, problem-solving, and knowledge building (Campos, 1998; 2000; 2002a).

The third step consists of identifying the main components of arguments such as:

- Claim: affirming something that will need data to sustain the argument;
- Data: information necessary to support the claim;
- Warrant: hypotheses put forward that either lead to a claim or that derives from a claim.

These categories were inspired by those identified by Toulmin (1958). The goal here is to understand how people structure their thoughts in order to present ideas and build knowledge.

The fourth step (4) consists of identifying key meanings (ideas) or *themes* (Grize and Pierault-Le Boniec, 1991) in the messages, and the interrelationship of instances of argument between messages. The assumption here is that meanings are carried out in online discourse through *implications*. This technique derives from the meaning implication analysis, already applied in other studies (Campos, 1998; 2000; 2002a). Implications of meanings are expressed by the formula: “if a meaning C is part of a meaning B which is part of a meaning A, then A implies C in terms of meanings” (Piaget, 1991). We proceed by building a conceptual map to identify how ideas were improved (through meaning implications) and to describe processes of collaborative problem-solving and knowledge building.

The first three steps can be seen as a micro-analysis that provides necessary information to enable the researcher to draw the bigger picture of collaborative problem solving and knowledge building.

Application of the method

Context

The research was carried out in collaboration with the Order of Nurses of Quebec (OIIQ), Canada, who has partnerships with a number of Canadian hospitals in the provinces of Québec, Ontario and New Brunswick, and with the Francophone Center for the Informatization of Organizations (CEFRIO) who is instrumental in integrating new technologies into a number of professional health organizations that provide heart care, such as health and research centres and as hospitals. The Order was specifically interested in promoting ways to engage nurses with an expertise in heart care to share knowledge as a means to advance nursing practice (Leprohon, 2001) with the help of new technologies (Dubois, 2002). The reason for such a decision is that heart diseases are responsible for 38% of deaths in Canada (Statistics Canada, 1996, referred by Health Canada). During a six month period, a pan-Canadian network-enabled community of practice comprised of 34 French-speaking nurses engaged in problem-solving and knowledge building. Participants discussed ways to better nursing practices using adequate technology (Russell, 2002). The software used for communication was Knowledge Forum®.

Knowledge Forum® is a research-based conferencing system, developed to enable collaborative knowledge building (Scardamalia and Bereiter, in press). It has web and client versions. The community of nurses used the client version, one that allow users to see a graphical representation of the underlying tree-like computer structure, giving the impression that learners work on a neuronal web. In addition to features common to many conferencing systems (like message key-wording, word search), Knowledge Forum® incorporates some unique affordances:

- Editing – users can edit their messages, and now videos, even after they are posted. Different colours provide visual cues for new, read, or edited messages;
- Annotation – users can annotate messages through the creation of embedded text boxes;
- Rise-above – users are able to synthesize a number of messages that are related by meaning, by collecting them into a separate folder;
- Scaffolds – users can build and insert tags within the text. Five tags, four of them related to argumentation, were negotiated between the researcher and the nurses, in line with participatory design (Silva and Breuleux, 1994; Gunderson, Currie, and Campos, 1999), and one meant to e discourse structuring (Campos, 2002b). Those tags were:

1. Claim: introduction of a contextual situation that expresses concerns or difficulties encountered, for instance, in professional practice, affirming something;
2. Data: introduction of facts, statistics, scientific data, research results or other works that have an influence on the practice and would support the claim;
3. Envisaged solutions: engaging in a process of hypotheses formulation that might respond to the claim that was put forward and is consistent with the data;
4. Questioning: formulation of interrogations;
5. Opinions: offering judgments concerning claims, data, questioning or envisaged solutions presented.

Data

During the six month period, 545 messages and approximately the same number of annotations were generated. For the purpose of this study, that is, to understand the nature of online progressive discourse by focusing on argumentation, we chose two excerpts from two forums: one in which problems related to heart care practices were identified (16 messages corresponding to 11.51% of the 139 messages of the forum), and another excerpt in which nurses worked together to develop content addressing the problems identified (19 messages corresponding to 13.29% of the 143 messages of the forum). In the first excerpt, nurses explored issues and proposed strategies for encouraging patients to take responsibility for prevention of heart failure, and for their treatment. In the second one, the nurses prepared a teaching instrument to be handed to patients to help them to control symptoms and signs of heart failure and therefore to enable auto-surveillance.

Results

Descriptive analysis

Step 1

In the selected thread of the first forum, declarative phrases accounts for 70%, no imperatives were found, questions account for 13%, and ambiguous phrases for 17%. In the selected thread of the second forum, declarative phrases account for 32%, imperatives for 13%, questions for 13%, and ambiguous phrases for 42%. The high number of ambiguity in both threads relates mostly to the presentation, by the nurses, of scientific references taken from other authors and a small number of phrases without verbs. If we exclude ambiguity, in the thread of the first forum we have 84%, 0% and 16%, and in the second 55%, 23% and 22%.

Step 2

In the thread of the first forum, affirmations account for 71%, conditionals for 9%, negations for 3%, and ambiguous phrases for 17%. In the second thread, affirmations account for 42%, conditionals for 16%, negations for 1.5%, disjunctions for 0.5% and ambiguous phrases for 40%. Ambiguity here has the same sense as above. If we exclude it, in the first thread we have 85%, 11% and 4%, and in the second 71%, 26%, 2% and 1%.

Step 3

In the thread of the first forum, claims account for 18%, data for 69%, warrants for 12%, and eliminated phrases for 1%. In the second thread, claims respond for 4%, data for 50%, warrants for 11%, and eliminated phrases for 35%. Eliminated phrases were those that did not pertained to arguments. If we exclude them, in the first thread we have 18%, 70% and 12%, and in the second 7%, 77%, and 16%.

Inter-coder reliability based on Miles and Huberman procedure (two coders) was achieved with the following results: 92.69% for step 1, 92.64% for step 2, and 91.92% for step 3. Coding criteria were established by applying strict definitions for the categories and a scale of category prevalence based on operatory logic (Piaget, 1976b) for use in ambiguous cases.

Conceptual analysis: Step 4

Quantitative data presented above reveal that in the thread of the first forum most phrases were declarative although a significant amount of questions, revealing intentional *inquiry*, were found. In line with these data, most phrases were affirmations although the numb er of conditionals was not impressive and that of negations unimportant. If we look at the way arguments were built, it is not surprising to verify that claims and data to support claims were prevalent. However, although the level of hypothesizing was modest (shown by the triad *questions-conditionals-warrants*), it shows, nevertheless, that nurses do not rely on guesses, even informed ones. Their daily work follows strict scientific rules, and we observe that in their discourse they searched for reliable information (shown by the triad *declarations-affirmations/negations-data*) to support their points.

The conceptual map of the first forum thread reveals that discussions were triggered by a message presenting the following pair: *patients should take charge* (claim) and the hypothesis *if they have to do that then nursing strategies should be adopted* (envisaged solution). Around this pair of arguments, five main themes were linked either to the claim (Best models in heart re-adaptation, Convincing, and “Rewards”) or to the hypothesis (Contracts and The pair counseling/teaching instrument on heart care):

1. Contracts – in the 7 messages of this thread, most discussions were triggered by statements made on phrases coded *warrants* (hypotheses). The nurses explored the possibility of contracts to promote patient responsibility for their own health care: Should it be mandatory? How could a contract engage the ill? Is a contract a real solution? Is a contract motivating? Is a contract an instrument of awareness? What would be the role of doctors in such a contract, that of controlling or one of engaging? How critical is the implication of doctors if such an idea was to be adopted? The responsibility of doctors was further explored by a “thread” of annotations built around those messages.

2. Best models in heart re-adaptation – in the 2 messages of this thread, most discussions were triggered by statements made on phrases coded as *warrants*. Many models of heart re-adaptation were presented as well as proposals of integrating many models or adopting one of them. This theme was extensively discussed in the discussions surrounding the following themes “Convincing” and “Rewards”.

3. Convincing – one single message presented this theme as *data*, through the presentation of a case. A “thread” of annotations was built around this message to hypothesize what would be the “x” element to convince a person of the need to take care of heart health, how to motivate, and how to understand resistance to care.

4. “Rewards” – a thread of 4 messages and a “universe” of 11 annotations was built to discuss cases and the need to provide “rewards” that would serve as a motivating element for the ill to take charge of their health. Here, ideas were equally triggered by statements coded as *warrants* as well as *data*. This theme originated discussions around ideas for rewards, the implications of rewards, how to motivate, psychosocial factors involved in motivation, in addition to strategies to enable this “technique” and models of behavior change that should be adopted.

5. The pair counseling/teaching instrument on heart care – one annotated message is built around an *envisaged solution* according to which teaching instruments, such as a guide of auto-surveillance, might be considered as a kind of counseling.

Concerning the thread of the second forum, quantitative data presented above reveal that although most phrases were declarative, they were not as prevalent as in the first thread, and that an important number of questions and imperatives were present. Imperatives were used primarily for the preparation of the auto-surveillance instrument (example: Press your leg; Look at your finger, etc.). It is striking to note that, although most phrases were affirmations, the amount of conditional reasoning found was high, followed by a small number of negations and disjunctions. The argumentation process, however, was built upon a lesser number of claims and an increased number of data and warrants. Here, we found that the level of inquiry (shown by the triad *questions-conditionals-warrants*) was lower in the thread of forum 1, created to explore and to identify problems, than that of the thread of forum 2, in which nurses agreed to build, in collaboration, teaching instruments for patients. Thus, the data reveal that when working collaboratively on *concrete objects* related to their practices (thread in forum 2), nurses were more able to reflect, to inquire, and to hypothesize. It should be noted that the number of annotations (whose use demonstrate that they could be posted as full messages in the forum, and not published as simple annotations) is much higher (34) than the number (19) of threaded messages. In addition, annotations were mostly triggered by message phrases coded *data*. Furthermore, one quarter of the annotations were made of hypotheses that instigated further hypotheses formulation in the messages. Finally, the other annotations were equally divided between claims and data.

The thread of the second forum should be seen as a continuation of the first. This *continuum* can be seen as a problem solving process; nurses moved from a phase of problem identification to a phase in which they would work on a deliverable to provide a practical solution to the needs of the ill: an auto-surveillance instrument kit. In this thread, discussions were triggered by a message presenting the hypothesis *if an instrument should be built to enable patients' auto-surveillance then what signs and symptoms should be addressed and which actions should be taken when they identify them?* (envisaged solution). Linked to this message, we find three themes (The pair priority information and scale, Building the instrument, Learning auto-surveillance), and a Rise-above (on Symptoms):

1. The pair "priority information and scale" – in this message, surrounded by many annotations, nurses listed priority information for the auto-surveillance instrument and hypothesized which, and how, scales would enable patients to evaluate their own health. *Claims*, *data*, and *warrants* were equally balanced in the annotations.

2. Building the instrument – in the 5 messages of this thread, careful attempt to build the instrument led to a discussion about the adequacy to create a calendar that will serve as patient organizer of the auto-surveillance process. Most messages are hypotheses (*warrants*), followed by *claims* and *data*.

3. Learning auto-surveillance – these 4 messages, surrounded by 23 annotations, discussed extensively different aspects of the instrument such as different kinds of scales, their advantages and disadvantages, useful suggestions, how to address the vulgarization of scientific information, symptoms such as fatigue and increased weight, among others. The discussion was mainly constructed around *data* presentation but *claims* and *warrants* were equally important in messages as well as in annotations.

4. Rise-above – a message-synthesis including 8 new messages and a number of annotations served the purpose of collecting messages whose main themes were signs and symptoms, their definitions, types, occurrences, etc. A few messages, included in the three themes presented above (The pair priority and scale, Building and instrument, and Learning auto-surveillance) and discussing signs and symptoms, were also included.

The conceptual map of the forum 2 thread is evidence of the power of the strategy implemented. A network-enabled community of practice of nurses facilitated by a nurse with an expertise in heart care in regular contact with a facilitator from the action-research team, and supported by software (Knowledge Forum®), engaged participants in knowledge building.

Conclusion

When people use language on a daily basis, they spontaneously structure their thinking. When using Knowledge Forum®, the situation is analogous, but with the difference that the discourse is written. People's thoughts and ideas are naturally structured by subjacent logical operations that are expressed by grammar and by the way we build arguments. Therefore, claims, data, and warrants are naturally interwoven in the process of argumentation. However, it is worth noticing that network-enabled exchanges only happen when people demonstrate engagement by reading and writing notes. This is, essentially, a process of *inference making* about what others mean in the messages. Inferences are If-Then operations. That is, "if" this A is written "then" my reaction to this is B, and *intentionally* I will respond to this by writing C. The data analyzed through our method show that this inferencing process happened at four levels:

a) Application – intentional triggering of collaborative action by the vulgar mechanism of replying to a message (building on) but also by the annotation tool, the rise above, and the scaffolding tool;

b) Unintentional use of logical and grammar operations – comparison of the first and second forum threads shows how the nature of a task alter participants' unknowing use of logical and grammar operations subjacent to discourse. For example, in the second thread few claims were made because what was in question was the building of a kit that requested mostly data presentation and reflexive thinking;

c) Intentional use of argumentation tags – although we do not present here quantitative data related to the use of scaffolding tools, the way participants applied scaffolds was in most instances consistent with our own coding. Concerning the two scaffolds that were not directly related to our coding scheme, "questions" were considered instances of warrants while "opinions", depending on the context, functioned as claims, data or warrants;

d) Intentional idea linking and improving – most *links among messages (ideas or themes)* were originated in phrases coded as *warrants*, which were either questions or formulated hypotheses, although the importance of inferencing upon claims and data put forward should not be minimized. This aspect is indicative of progressive communication and discourse leading to learning, conceptual change, and knowledge building. The progressive discourse of participants is rich in showing how ideas evolved and how nurses enhanced their own practices by applying – and sharing with others – both practical and scientific knowledge.

This method enables researchers to study progressive discourse through argumentation with a view to understanding how collaborative processes of networked-enabled communities engaged in problem-solving lead to conceptual change, learning, and knowledge building.

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References

Ahern, T. C., Peck, K. and Laycock, M. (1992) The effects of teacher discourse in computer-mediated discussion. *Journal of Educational Computing Research, 8*, 3, 291-309.

Anderson, J.R. (1980) *Cognitive Psychology and its Implications*. San Francisco: W. H. Freeman and Company.

Bereiter, C. (2002) *Education and Mind in the Knowledge Age*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bereiter, C. and Scardamalia, M. (1987) *The Psychology of Written Composition*. Hillsdale (NJ): Lawrence Erlbaum Associates.

Bereiter, C. and Scardamalia, M. (1996) Rethinking Learning. In Olson, D. R. and Torrance, N. (Eds.) *The Handbook of Education and Human Development: New Models of Learning, teaching, and Schooling* (485-513).

Bracewell, R. J., Breuleux, A., and Le Maistre, C. (2000) The Role of the Teacher in Opening Worlds of Learning with Technology. In B. M. Shore, M. W. Aulls, M. A. B. Delcourt, and F. G. Rejskind (Eds.), *Inquiry: Where ideas Come from and Where They Lead*. Mahwah, NJ.: Lawrence Erlbaum Associates. Available: http://telelearning.mcgill.ca/Publications/BracewellEtAl.pdf

Breton, P. (1996) *L'argumentation dans la communication*. Paris : La Découverte.

Breuleux, A. (2001). *Imagining the Present, Interpreting the Possible, Cultivating the Future: Technology and the Renewal of Teaching and Learning*. Education Canada, Fall 2001.

Breuleux, A. and Laferrière, T. (2000). Communities of Interpretation within the Telelearning Professional Development Schools. *CILT 2000*, Washington.

Bruer, J.T. (1994). *Schools for Thought: A Science of Learning in the Classroo*m. Cambridge, MA: MIT Press.

Bullen, M. (1998) Participation and critical thinking in online university distance education. *Journal of Distant Education, 13*, 2, 1-32.

Campos, M. N. (1998). Conditional Reasoning: A Key to Assessing Computer-based Knowledge-building Communication Processes. *Journal of Universal Computer Science*, 4, 4, 404-428. Available : http://www.jucs.org/jucs_4_4/conditional_reasoning_a_key (12 September 2001)

Campos, M. N. (2000). The Hypermedia Conversation: Reflecting upon, Building and Communicating Ill-defined Arguments. *Interactive Multimedia Electronic Journal of Computer-Enhanced Learning, 2,* 2. [online] Available : http://imej.wfu.edu/articles/2000/2/04/index.asp (8 November 2000)

Campos, M. N. (2002) Competition, Lies and Dissimulation: Lessons from an Online Learning Clash. *Interpersonal Computing and Technology Journal, 8, 1*. Disponible : https://www.aect.org/Intranet/Publications/ipct-j/2002/Campos.asp.

Campos, M. N. (2002b) *Triggering In-depth Argumentation through Scaffolding Tools.* Paper presented at the IKIT Summer Institute. University of Toronto, Toronto.

Campos, M. N. and Laferrière, T. (2002). Internet en éducation. In: Lajoie, J. & Guichard, É. *Odyssée Internet*. Montreal: Presses de l'Université du Québec.

Campos, M. N., Laferrière, T., and Harasim, L. (2001). The Post-secondary Networked Classroom: Renewal of Teaching Practices and Social Interaction. *Journal of Asynchronous Learning Networks, 5*,2. Available: http://www.aln.org/alnweb/journal/jaln-vol5issue2v2.htm (1 October 2001)

De Kerkhoeve, D. (1997) *Connected Intelligence: The arrival of the web society*. Toronto: Sommerville House Publishing.

Dubois, S (2002). *Inventaire des systèmes d'information dans le réseau de la santé et leur utilisation dans le cadre de la pratique infirmière*. Montreal : Ordre des infirmiers et des infirmières du Quebec.

Fahy, P. J., Crawford, G., Ally, M., Cookson, P, Keller, V., and Prosser, F. (2000) The development and testing of a tool for analysis of computer mediated conferencing transcripts. *The Alberta Journal of Educational Research, 66, 1*, 85-88.

Gibbs, R. W. (1994). *The Poetics of Mind: Figurative Thought, Language and Understanding*. New York : Cambridge University Press.

Grize, J.-B (1997). *Logique et langag*e. Paris: Ophrys. (Original work published in 1991)

Grize, J. and Piéraut-Le Boniec. (1991). Logique naturelle et construction des propriétés des objets. *L'Année psychologique, 9*1, 103-120.

Gunawardena, C. N. and Anderson, T. (1997) Analysis of a global online debate and the develoment of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research, 17*, 4, 397-431.

Gunderson, J., Currie, S. and Campos, M. N. (1999). Advancing Educational Practice through Researcher / Teacher / Student Collaboration. *4th Annual Conference of the Telelearning – Network of Centres of Excellence*. Montreal, 9-8 November.

Hara, N, Bonk, C. J. and Angeli, Charoula (2000) Content analysis of online discussion in an applied educational psychology course.*Instructional Science, 28*, 115-152.

Harasim, L. M. (1990). Online education: an environment for collaboration and intellectual amplification. In Harasim, L. M. (Ed.) *Online education: perspectives on a new environment*, 39-66. New York: Praeger.

Harasim, L.M., Hilts, S. R., Teles, L, and Turoff, M. (1995). *Learning Networks: A Field Guide to Teaching and Learning Online.* Cambridge, MA: MIT Press.

Haughey, M. Canadian Research on Information and Communication technologies: A State of the Field. *2002 Pan-Canadian Education Research Agenda Symposium "Information Technology and Learning"*, Montreal, April-May.

Hewitt, J. (2001). Beyond Threaded Discourse. *International Journal of Educational Telecommunications, 7*(3), 207-221.

Howell-Richardson, C. and Mellar, H. (1996) A methodology for the analysis of patterns of participation within computer mediated communication courses. *Instructional Science, 24,* 47-69.

Kanuka, H and Anderson, T. (1998) Online social interchange, discord, and knowledge construction. *Journal of Distance Education, 13,* 1, 57-74.

Laferrière, T., Breuleux, A., Fitzsimons, R., and Baker, P. (1999). *In-service Teachers Professional Development Models in the Use of Information and Communication Technologies*. Report to the SchoolNet National Advisory Board. Available: http://www.tact.fse.ulaval.ca/ang/html/pdmodels.html

Lamon, M., Scardamalia, M., and Laferriere, T. (in press). The Classroom as a Learning Community: Learning and Knowledge Building. In M. Montane (Ed.), *International Symposium on Learning Communities*: Barcelona, 2004.

Leprohon, J. (Ed.) (2001) *Étude sur la qualité des soins infirmiers dans les établissements de santé du Quebec*. Montreal: Ordre des infirmiers et des infirmières du Quebec.

Marttunnen, M. (1997). Electronic mail as a pedagogical delivery system: an analysis of the learning of argumentation. *Research in Higher Education, 38,* 3, 345-363.

Mowrer, D. E. (1996) A content analysis of student/instructor communication via computer conferencing. *Higher Education, 32,* 207-241.

Piaget, J. (1991) Introduction. In Piaget, J. & Garcia, R. *Toward a Logic of Meanings* (3-8). Hillsdale: Lawrence Erlbaum Associates.

Piaget, J. (1976) *La formation du symbole chez l'enfant. Imitation, jeu et rêve, image et représentation*. Neuchâtel-Paris: Delachaux et Niestlé.

Piaget, J. (1976b) *Ensaio de Lógica Operatória*. São Paulo: Globo/EDUSP.

Rourke, L., Anderson, T., Garrison, D. R., and Archer, W. (2001) Methodological issues in the content analysis of computer conference transcripts. *International Journal of Artificial Intelligence in Education, 12*.

Russell, A. (2002). The Role of Epistemic Agency and Knowledge Transforming Discourse in the Formation of an Interprofessional Knowledge Building Community in Health Care. *Annual meeting of the American Educational Research Association,* New Orleans, Louisiana, April.

Scardamalia, M. (2002). Collective Responsibility for the Advancement of Knowledge. In B. Smith (Ed.). *Liberal Education in a Knowledge Society*, pp.67-98. Chicago: Open Court

Scardamalia, M. and Bereiter, C. (in press). Knowledge Building. In *Encyclopedia of Education*. New York: McMillan Reference, USA.

Scardamalia, M. and Bereiter, C. (1994). Computer Support for Knowledge Building Communities. *The Journal of the Learning Sciences,* 3, 3, 265-283.

Silva, M. and Breuleux, A. (1994). The Use of Participatory Design in the Implementation of Internet-Based Collaborative Learning Activities in K-12 Classrooms. *Interpersonal Computing and Technology Journal, 2,* 3, 1-11. [online] Available : http://quest.arc.nasa.gov/misc/ipct.html (29 juin 2000)

Toulmin, S.E. (1988). *The Uses of Argument.* Cambridge: Cambridge University Press.

Van Eemeren, F.H., Grootendorst, R., Henkemans, F.S. (1996). *Fundamentals of Argumentation Theory. A Handbook of Historical Backgrounds and Contemporary Developments.* Mahwah, NJ: Lawrence Erlbaum Associate, Publishers.

Making It Better – Our Faculty and Ourselves: A P3T3 Case Study of Web Design and Video Integration

Pamela A. White

Chaoyan Dong

James D. Lehman

Purdue University

Abstract

The staff of the P3T3 project have a primary mission to train and mentor faculty members in the School of Education as they assimilate technology in instruction. This study investigates the evolution of select faculty members; how did they 1) integrate technology, 2) perceive technology, and 3) implement technology effectively? In addition, existing problems in faculty training and inefficient processes in technology integration are investigated. The authors provide suggestions for early prevention of similar future problems.

Introduction

During the past two and a half years Purdue's Program to Prepare Tomorrow's Teachers to Use Technology (P^3T^3) has been preparing teacher education faculty to teach pre-service teachers in technology-rich environments by modeling approaches that future teachers should use themselves. In order to achieve this goal, P^3T^3 incorporated a comprehensive faculty development and mentoring program, which is as individual as the faculty members themselves. P^3T^3 combined workshops, training sessions, and one-on-one mentoring to allow each faculty member the opportunity to use their own learning style to expand their use of technology in the classroom. Workshops consisted of a two-day "start-up" session and were held at the beginning of each semester and during summer breaks. Participating faculty members engaged in problem-based learning activities involving technology integration and previewed future offerings of technology skills development workshops. They also had opportunities to view models of technology integration in education. At the conclusion of the "start-up" sessions, faculty members developed and shared personal technology integration plans. Based upon the technology integration plan, a graduate student – skilled in the appropriate software/hardware to meet the goals of the faculty member – was assigned to provide optimal mentoring throughout the integration of technology into teaching during the subsequent academic year. Technology skills development workshops have been held (and are still being offered.) which include workshops on WebCT, PowerPoint, FrontPage, and Dreamweaver, and "how to" sessions focusing on the use of digital video, digital photography, HTML programming language, and the School of Education's ePortfolio system and the Purdue career account system (supporting centrally managed storage for files and web pages).

Through these workshops and personal mentor training provided by the P^3T^3 graduate assistants, some faculty made great strides in the development of technology skills. Others attended the workshops but encountered major struggles and challenges as they attempted to incorporate technology into their courses. A few faculty members chose to continue their curriculum in the same manner as it always was – without the addition of new technology. This study investigates the evolution of select faculty members; how did they 1) integrate technology, 2) perceive technology, and 3) implement technology effectively? In addition, existing problems in faculty training and inefficient processes in technology integration are examined.

Theoretical Framework

Considering the rapid pace of development in educational technologies, coupled with innovations in teaching and learning, utilizing technology is high on the list of priorities of educational managers, administrators and operatives. Sandholtz et al. (1997) noted the use of technology is recognized as a valuable tool – making technology more common while developing it to enhance teaching and learning. However, Brand (1998) found that despite increased access to computers and related technology, educators are experiencing difficulty in combining technology into classroom teaching practice. Training and mentoring provide two major incentives in aiding faculty to successfully integrate technology in teaching (Dusick, 1998; Dusick & Yildirim, 2000).

Methodology

This research relied on case studies conducted by two of the authors. Both are proficient technology users and worked as graduate assistants in the P^3T^3 program. They served as mentors for the faculty members and became a part of the project at its inception in the summer of 2000. One continues to work with the faculty members through the third year in the grant.

Through an interview process, responses from three faculty members and a teaching assistant were videotaped or tape-recorded. Two additional faculty members included in the data were not interviewed, but information about their technology use was obtained from interviews with their personal P^3T^3 mentor. Completed faculty projects were also used as a source of information for the subjects – websites and edited video projects provide evidence of faculty involvement with technology. Selected subjects included individuals who successfully learned and integrated technology as well as individuals who chose not to make changes. The faculty members have been teaching from 10 to 37 years in K-12 and higher education. A variety of developmental stages with computer skills were targeted One faculty member was proficient with technology, but the others were at different levels of expertise. For the purposes of this study, they were categorized into two groups: website designers (using software and their own abilities to program the pages), and innovators who attempted to use video in their curriculum or course presentations. The interviews were conducted to explore faculty member attitudes toward technology integration, the strategies they used to learn the technology and integrate it into their teaching, and to determine the challenges they faced as they incorporated the new skills.

Website Integration

Three faculty members were interviewed about their website design experiences. Two had no prior knowledge of website development but the third supervised a graduate student in the development of her site and maintains her own website.

Successes

Each member of the faculty who was interviewed met success in their ability to learn the process of website programming and management. Some were able to use the tools and make their pages more engaging, but all of the sites met or exceeded the faculty member's expectations. The professors in this study each attended a faculty workshop and began their individual website projects because they felt there was an excellent opportunity to enhance their skills with a personal mentor. A professor in the School of Education for more than 10 years, Dr. F. enlisted the help of her P^3T^3 mentor she created her own professional web site as well as a second one dedicated to her research interests. Professor F. stated, "There are several people I work with that use web pages… It's very convenient for me to get information. Web pages look like the information source. The assistance I get from P^3T^3…definitely impacted me to have my own web page. I don't have the technical skills to do it, but after I went to the Dreamweaver workshop, I know what I can do." Dr. A. was an administrator in the K-12 school setting for more than 30 years. He has been a Professor in the School of Education for four years. Like Dr. F., he created his web pages with the help of his P^3T^3 mentor after attending a faculty workshop. He stated, "I use the web a lot in my work area…this university is a highly-technology involved university. Both of these are motivations for me to create a website for myself." Dr. E. has more than 5 years of experience as a professor in the School of Education. She recognized the value of the web as a communication tool for her students, her associates at other universities, and the outside world even before the P^3T^3 project began. She employed a graduate assistant to create her own website using FrontPage on a PC, but was often frustrated when she tried to edit the pages using a Macintosh computer because the version of FrontPage available on the Mac was not updated at the same pace as PC software. After the offer of technical assistance from P3T3, she was excited about converting her designs from the PC system to Dreamweaver on the Macintosh platform. With positive reinforcement from her P^3T^3 mentor and technical help when she needed it, she found it possible to transferred the pages to the new format rather than recreating the pages in a new website, and has used her own artistic skills to reflect her personality throughout the site.

Challenges

Because of their unique skills, software, systems and desires for programming, some challenges were more easily solved than others. Comments from faculty members throughout the department – even those not included in this interview are frustrated with the lack of time available to learn technology. Although the workshops are offered, they must make arrangements to dedicate their time to attending. Dr. F. stated, "Faculty's time is very tight." Dr. E. agreed and also stated that she is a Mac user; however some web design software, like FrontPage, is updated only on the PC platform. Her need for P^3T^3 assistance occurred when she found a need to update her current site. She approached a P^3T^3 assistant and even though together they had a great deal of skill and working knowledge of technology, they experienced tremendous difficulty making edits, even when working on the platform that was originally used to create the pages. As previously mentioned, a grad student had originally programmed the site, and he was no longer available to ask about specific programming. This meant editing was neither efficient nor easy. Unsuccessful attempts were made to edit the pages in a manner the faculty member could understand and duplicate; there were simply too many variables. Nothing was consistent. The P^3T^3 mentor recognized the faculty member's confusion and frustration as they tried to work on the site together. The mentor chose to work on the site alone, read the HTML coding, identify the problems associated with the programming, and save new documents that were easier for the faculty member to edit. When the mentor and Dr. E. met again, the new documents were successfully updated. The mentor's decision to work on the project alone reduced Dr. E's. frustration and prevented possible faculty burnout, which would have eliminated the desire to make future changes. If Dr. E. had faced the problems alone, they may have been overwhelming. By finding the problems and creating documents that could be more easily edited, the mentor helped the faculty member gain experience and confidence. Currently she needs little more than occasional help for her updates.

Dr. A. was already familiar with specific web-editing software but he was faced with a different software when he began creating his site because of support limitations. He stated, "The changing of the software forced me to learn the new technology. However, it'll be a long process for me to learn and update the new software."

Impact of P^3T^3

In each of the case studies, P3T3 had a direct impact on the success of the faculty project. Their testimonials indicate their satisfaction in working with their mentors, and reaching their personal goals in website integration. Professor F. stated, "Without the assistance of P3T3, I don't know if I would have created [a site] or not. I got hands-on experience, and specific handouts in the workshop; I get back and use it. After the workshop, I got individualized help from P3T3. P3T3 provided me encouragement, support, a sense of 'can-do' confidence." Professor A. stated, "The P3T3 assistant has been indispensable for me to put that [site] on. [She] helped me a lot. It would not be on so quickly, in such a quality without [her] help. I really appreciate [the] help." In contrast, Professor E. stated, "I went to a couple of FrontPage workshops, but they didn't get to the level and skills I needed. They just start teaching how to create a new page, how to insert graphics." Because she was already proficient in these simplistic tasks, she found the P3T3 one-on-one mentoring provided the required, more advanced help.

As P3T3 mentors work with faculty, the goal remains to help the faculty member determine the correct software before their projects begin. When projects are already underway, mentors must watch for signs indicating when faculty members become frustrated and search for ways to minimize the frustration while providing alternative methods and tools for motivations so that the faculty members will to continue making personal technical advancements. Faculty who already have some expertise but desire to learn skills beyond those taught in beginning workshops, have needs very different from the beginner, but those needs must also be met if the project is to be successful.

Video Editing

During the P3T3 beginning workshops, iMovie on a Macintosh was introduced as a quick and easy tool to add video into the curriculum. Several faculty members showed interest in attempting to make a video clip from a digital camera that could be used in the classroom or archived as part of a portfolio. Four faculty members subsequently purchased digital video cameras with a stipend provided from the P^3T^3 project. 14 cameras are available in the department, so anyone with the desire to take and edit a video has the opportunity to do so. A variety of results occurred from the purchase of these cameras and the faculty recording, editing, and incorporation of digital videos. Four faculty members were targeted for this case study. One faculty member and one teaching assistant were interviewed, as well as two P^3T^3 assistants working as a faculty mentors.

Successes

Mrs. L., a teaching assistant taped an interview with a Master Teacher in a K-12 classroom setting as a method to introduce the teacher to her students. By taping the interview, the students could see the teacher in her own setting, surrounded by her "teaching world." Mrs. L. wanted to edit the tape prior to introducing the teacher to her students but didn't realize the commitment of time that was required to accomplish her goal. She was immediately provided with personnel resources and training to help her complete the work within her timeline. The result was a teaching assistant with a new skill, and a polished final product that succeeded in meeting her objectives. Dr. E. first became involved with video through a 3-year project she headed in the Educational Technology Department – a few years before the P^3T^3 project began. Although she had extensive experience with video, she took a more personal interest in adding it to her curriculum when she saw the ease of digital video editing as presented in the P^3T^3 workshops. As a direct result, she purchased a digital camera and began working with it herself without the aid of her mentor. Soon she was editing the videos and she currently has plans to incorporate video in her classroom in the future.

Challenges

Even though Mrs. L. was a new teaching assistant in the School of Education, she set her project into motion with a set of clearly defined goals. However, she didn't realize the amount of video-editing time required to meet those goals. With her new responsibilities and minimal free time she was overwhelmed with the task of editing 60 minutes of video footage. Professor G, a 17-year faculty member at Purdue, wanted to use video to document his research, but he became apathetic when he found that he could not use his video camera to download still photos to his Macintosh due to platform incompatibility. Professor C, a Visiting Professor in the School, was truly interested in incorporating video in her student assignments, but she was personally technically challenged. She attended a P^3T^3 faculty workshop session designed to build computer skills through the use of hands-on training but experienced difficulty during the sessions. She commented that she did not learn skills when she was guided through each "point and click." Even though she wasn't comfortable with her own use of the technology, she realized its significance for her students so she created a lesson plan which included a video assignment for her undergraduates. While this project had great potential, neither she nor her course instructors had the technical skills to support the activity, and there were more than 400 students who would need assistance. When it became clear that P^3T^3 staff would be unable to provide support, Dr. C. changed the assignment. She also complained to P^3T^3 staff that her teaching assistants should not be expected to support the technology. She said that they were already too busy teaching course content – that "they don't have the time to teach technology."

Impact Of P^3T^3

Each of the four instructors had different reasons to use video – personal research, interviewing guests, curriculum enhancement, and to challenge students with technology. Professors G and C do not have plans to continue using video at this time. Their lack of research and quick decision-making affected their satisfaction with this tool's integration. Dr. G purchased a camcorder before realizing it did not fit his needs, and Dr. C assigned a student project before verifying resources for support. In a similar way, Ms. L. was overwhelmed by the amount of work necessary to edit the tape, and didn't plan enough time to do it alone, but she communicated her needs effectively and the P^3T^3 staff were able to help her meet her goals. Each of these three instructors had limited experience with technology. On the other hand, "Dr. E." is technology proficient and realized she needed to take time with a camera and learn to use it prior to adding the component to her classroom, choosing a slower path - and she did this without the advise of her P^3T^3 mentor.

In the hands of experienced P^3T^3 assistants, technology appear simple. It was easy for faculty members to become motivated to learn a new skill when opportunities arise. However, learning a new skill takes time and commitment. Unfortunately; two of the faculty members lost motivation when they learned that their goals had a price that was too high (in time and/or the requirement to learn and teach a new skill). Since these experiences, as P^3T^3 introduces new technology, we remember the two faculty members who were successful. We have become more aware of signs that instructors are planning unattainable goals and try to more effectively communicate the time and resource commitments necessary to integrate these new technologies so that instructors have a better chance of success in developing realistic goals for their future endeavors.

Outcomes

This case study shares successes for some faculty, but more importantly, it identifies problems - including frustration when using psychomotor "point and click" hands-on workshops, platform-dependent issues, lack of awareness of the scope of technology-integration issues, and a need for better pre-planning. When attempting faculty training instructors and mentors must analyze their audience/mentees and strive to meet their needs. It easy to assume all learners need basic skills. It would be beneficial to let the participants bring questions and specific needs or challenges to the workshops. Help them understand what they can achieve at the end of their training, and engage them in dreaming of endless possibilities for future integration. When tasks appear to be as simple as a "point and click" P^3T^3 staff must be capable of explaining the learning curve necessary to become proficient with the software and hardware. Most of the workshops are conducted on PC computers, and skills may not translate easily to Macs. Although many software programs are seamless today, there are issues when older versions of software are used, and these issues should be addressed. Mentors have an obligation to give faculty confidence in themselves by helping them determine realistic tasks using reasonable time and effort while using the appropriate equipment to meet their goals. Faculty must to be able to practice and use their new skills in their own time on their own computers so they are motivated to continue to increase their skills and become independent users of the technology who no longer need assistance. With the new skills, they will develop their curriculum to include technology designed for teachers of the future, and those of us involved with the P^3T^3 project will have met our goals.

References

Sandholtz, J H, Ringstaff, C and Dwyer, D C (1997). Teaching With Technology Creating Student Centered Classrooms. *Teachers College Press*, New York.

Brand, G. (1998). What Research Says: Training Teachers For Using Technology [Electronic version available at http://www.nsdc.org/library/jsd/brand191.html]. *Journal of Staff Development*. 19(1). Accessed December 22, 2001.

Dusick, D. M. (1998). What Social Cognitive Factors Influence Faculty Members' Use Of Computer For Training? A Literature Review. *Journal of Research on Computing in Education*: 31 (2), 123-137.

Dusick, D. M. & Yildirim, S. (2000). Faculty Computer Use And Training: Identifying Distinct Needs Of Different Populations. *Community College Review*: 27 (4): 33 47.

Fisher, C., Dwyer, C. D., & Yocam, K. (1996). Education And Technology: Reflections On Computing In Classrooms. Apple Press, San Francisco.

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The Importance of Structure in Online Educational Conferencing

George W.H. Smith III

Chadron State College

David M Winograd

SUNY Postdam

Abstract

The concept of structure as part of transactional distance theory is changing. There are differing definitions of structure leading to confusion as to what structure is. Structure as an instructional design element in the context of a mandated interaction model and moderator training is described. A dynamic structure is designed in the moderator training model and a static structure is incorporated in the instructional design for the mandated interaction model. The interplay of ideas in the instructional design element of structure in computer mediated communication in educational conferencing is compared using two different models.

Changing technology can dictate differences in how distance education is designed and delivered. Along with changing practice comes theoretical change. As Garrison (2000) notes “Theory in distance education must evolve to reflect current and emerging innovative practices of designing and delivering education at a distance.”

At the heart of current theoretical change is the concept of structure as defined by Michael Moore in the early 1970’s. In the early 1970s IP centric video conferencing did not exist so theory developed now is specific to different kinds of interaction. Dialogue in Moore’s terms is text based. Moore’s transactional distance theory pertains to the interplay between dialogue, structure and learner autonomy. It is described as the greater the structure and the lower the dialogue in a course the mo re autonomy the learner has to exercise. It defines a pedagogical distance related to communication between students and instructors in online courses. In essence Moore’s theory states that the more structure the less communication and the greater the transactional distance (Moore, 1989).

Twenty four or so years later a project was designed by Saba and Shearer using telelessons to provide data. Saba and Shearer (1994) attempted to evolve the construct of transactional distance by constructing and implementing a system dynamic model where the relationship of designated variables is presented. Saba feels that the dynamic and complex nature of distance education requires a system dynamics set of boundaries when analyzing relationships of those variables. Saba and Shearer (1994) tested the model empirically with a limited number of participants. They analyzed instructional discourse and reported the relationships between transactional distance and its two component variables, dialogue and structure. The observations confirm the idea that dialogue and structure are found in an inverse proportion to one another.

In the time between the early 1970’s and now communications technology has evolved to a point where the structural constraint of distance is a relatively minor design challenge (Garrison 2000). The minor design challenge of designing structure in an asynchronous learning network (ALN) is discussed further in this paper and references text based interaction.

The kind of structure employed in the design of an online course determines the quality and amount of interaction. When a delivery medium for instruction is evaluated for use there are many factors that will influence the decision of what to use. The most important factor is how the course is structure d by instructional design. Instructional design considerations for classroom delivery are different than online courses using Computer mediated communication (CMC). When the benefits and disadvantages of delivery of instruction using the Internet are examined it is important to understand how student attitudes are affected. Students using web based delivery of instruction tend to feel isolated from a learning community. Instructional strategies like using photographs and frequent structured interactions can influence whether a student chooses to remain enrolled in a course. Using such strategies can make a learner feel like they are part of a learning community. Making a course interactive by designing structured writing intensive activities between students and instructor and students and students is important. “The potential for students to increase their knowledge through interaction with other students who are separated by time and distance increases as academic discourse is facilitated". (Smith, 2000).

Dynamic discussions can be used as a structural element of a stand-alone online course or as an online component of a face-to-face course. Online courses using structured asynchronous discussions tend to satisfy more learners than other kinds of online courses. Shea, P., Frederickson, E., Pickett, A., Pelz, W., & Swan, K. (2000) noted that "when students reported high levels of interaction with classmates and high levels of participation in the courses, significant correlations were found with high levels of satisfaction and learning. Students who reported the lowest levels and quality of interaction with the instructor and other students reported the lowest levels of satisfaction and learning. They had the least opportunity for collaboration." This concept indicates wider research to determine if courses are designed with a structure facilitating higher levels of quality interaction, will higher levels of learning and consequently greater levels of learner satisfaction occur.

Moreover, as Passmore notes (2002)"learners need information. However, they also need other instructional features. These include opportunities for reflection and varied practice to promote storage and retrieval of information from long-term memory, discussion with peers and the instructor to sharpen their understandings and to test ideas, frequent coaching and feedback on performance to correct their paths toward learning outcomes, case-based and project-based analysis of concepts, and brief periods of apprenticeship to apply concepts within close to real-life situations."

A problem in online courses is lack of participation . As Winograd notes "Full and active participation is a key to taking full advantage of the collected knowledge and experience of the group…"(2002) A moderator can motivate a student to participate through thoughtful and careful wording of messages to the non participating student. "Learner/instructor interaction provides motivation, feedback and dialogue between the teacher and student".(McIsaac 1996, p. 407) Interaction between participants requires a very specific structure created by the course designer, instructor and/or moderator in order to attain the levels of participation required. Moreover the emphasis on structure becomes especially important when there are no strong alpha type personalities who assume a leadership role in moderating discussions. There are demonstrated instances where a student with a strong personality has taken on the role of moderator in a course where there is unstructured conferencing. In unstructured conferencing the structure is dynamic as the moderator interacts with the students.

In a mandated interaction model the structure is static. The rules for interaction are laid out for the participants before the interaction occurs. In this model learners are required to write about a specific topic and are instructed how much to write. An important element in an online discussion is peer to peer writing. When students are mandated to write for one another they tend to write more thoughtfully than if they are writing just for the instructor. It is important to provide a structure for such interactions so there is no question about what is required of the student. For example the following specific instruction from an online portion of a course for school administrators that mandates use of a threaded discussion. What is it like as a female administrator suggesting policy promoting standards reflecting the centrality of student learning to a school board? Post your carefully crafted 250 word response to this question in the discussion board, unit 5, by the end of the day on Thursday. By the end of the day on Monday read all of your colleague's responses and post a reply of two or three sentences to one of your colleagues responses stating why you agree or disagree or what you learned from that response. This kind of structure gives the students the ability to represent personal experiences that may be more relevant to the understandings of other students than the understanding the instructor is trying to put forth. Moreover the precise instruction the instructor provides regarding the discussion can lead to higher levels of perceived learning as determined by percentages of course grades (Shea, P., Frederickson, E., Pickett, A., Pelz, W., & Swan, K., 2000).

Discussion

Structure as a design element plays an important role in online courses, lack of design centric structure leads to lack of interaction. Comparison of cases of design centric structured and unstructured online courses gives a clear picture of how a course can fail in its goal to be interactive. Moreover there is confusion about the exact meaning of structure. As Garrison (2000) states; "…the exact nature of the interrelationships among structure, dialog and autonomy is not clear. There is confusion around whether structure and dialogue are variables, clusters or dimension." Therefore it is important to treat structure as a design element employed to facilitate interaction in online courses where computer mediated communication is used.

References

Garrison, Randy. (2000) Theoretical Challenges for Distance Education in the 21st Century: A Shift from Structural to Transactional Issues. International review of Research in the Open and Distance Learning: 1, 1. http://www.irrodl.org/content/v1.1/randy.pdf

McIsaac, M., Gunawardena C (1996) Distance education. In D. H. Jonassen (Ed.), Handbook for research in educational communications and technology (pp. 1267. New York NY: Simon & Schuster Macmillan.

Moore, M. G. (1989). Editorial: Three types of interaction. The American Journal of Distance Education, 3(2), 1-6.

Passmore D. (2000) http://www.aln.org/alnweb/magazine/Vol4_issue2/passmore.htm accessed 10-24-02

Saba, F., & Shearer, R. L. (1994). Verifying key theoretical concepts in a dynamic model of distance education. The American Journal of Distance Education,
8(1), 36-57.

Shea, P., Frederickson, E., Pickett, A., Pelz, W., & Swan, K. (2000). Measures of Learning Effectiveness in the SUNY Learning Network. Paper presented at
the Summer Workshop on Asynchronous Distance Learning, Lake George, NY.

Smith G. (2000) Using online debate to foster critical attitudes towards images. Unpublished dissertation, Arizona State University, Tempe AZ

Winograd D. (2000) The effect of trained moderation in online asynchronous distance learning, Unpublished dissertation, Arizona State University, Tempe AZ

Integrating Principles of Constructivism into Textbooks for Distance Learners in Turkey

Irem Erdem Aydin

Anadolu University

Abstract

This paper explains the results of an effort to incorporate the constructivist learning theory in a text-based traditional distance education program in Turkey. After a series of expert panels, it has been concluded that it is quite hard to design a distance learning system completely based on constructivist learning theory in Turkey due to many limitations such as large body of students, lack of enough number of facilitators, etc. However, experts participated the panels indicated that it might be useful to use some of the principles of constructivist learning theory in designing distance learning materials-mainly textbooks. As a result of this, a textbook that includes some of the principles of constructivist learning for Anadolu University's distance learners has been designed and distributed to the learners. The survey conducted at the end of the course has revealed that distance learners have shown positive attitudes toward the constructivist parts of the textbook.

Introduction

It can be claimed that increasing population and changing work life are the main developments that boost the demand for distance education. The first one, increasing population, has been one of the main problems of Turkish education system for years. Around 70 million -mostly young- people want to have education opportunity but mainly due to limited number of institutions and instructors as well as economic problems most are not able to get it. For young people, having a higher education diploma seems to be one of the main requirements of getting a decent job. So, every year around 1,5 million people take university entrance exams but only 1/5 of them can get in a traditional face-to-face program.

In these circumstances, Anadolu University has been providing the best alternative for the ones who could not get in a traditional university program since 1982. Exactly 20 years ago, a school titles as Open Education Faculty established to offer two distance education programs in the fields of economics and business administration to mainly people who have a high school diploma but left out of traditional university programs. It started the education with 29,479 bachelor's degree students. In 1999, the World Bank recognized Anadolu University as the largest university on earth with its 504,000 students (MacWilliams, 2000, p. 2). For the 2002-2003 academic year, around 580 thousand Turkish people had rights to get in a university program according to the university entrance exam. Around 300 thousands of them registered for traditional university programs. The other 280 thousands were able to get in one of the distance education programs of Anadolu University and around 200,000 new students registered to these programs. With these students, the current number of the distance learners of Anadolu University reached nearly 800,000. This number can be considered as an indicator of the effects of increasing population on demand for distance education. This number also shows the achievement of Anadolu University in supplying the demand for education in Turkey.

Today, Anadolu University provides education opportunity through its distance programs to the people all around Turkey, around Europe, Turkic Republics and in Turkish Republic of Northern Cyprus. Graduates of these programs work almost all sectors (private-public, for profit-not for profit, good-service).

The nature of students who are choosing to get in Anadolu University's programs is changing, too. Most of its students are working in regular jobs and are coming to the programs for improving their skills in their jobs. Of course still majority of the students are getting in the programs for having a diploma.

In the distance programs of Anadolu University, television programs and textbooks are the main media used for delivering the instruction. The University produces its television programs in-house and sends to national public broadcasting company, Turkish Radio and Television (TRT). TRT airs these programs on one of its channels, which is mainly established for educational purposes. The textbooks are also produced in-house. Anadolu University has professional TV program production studios and publishing facilities. In the processes of designing and developing these materials media personnel work with content experts and instructional designers.

Anadolu University always tries to improve its services. Efforts of integrating new media into its system are the examples of these tries. For instance, delivering some courses through videoconferencing to the students in Kazakhstan and Northern Cyprus, sending video cassettes of television program to the students all over Europe, offering an online associate program on information management can be considered as the indicators of the wish to improve its services.

The efforts for improvement are not limited to the media. Anadolu University is also trying to incorporate new developments in the theories of learning and teaching into its delivery methods. Instructional designers in the course teams are responsible for improving the quality of learning from the course materials (mainly textbooks due to wide spread use of this medium).

This paper is related to one of these efforts about delivery methods. In other words, it explains the results of an effort to incorporate the constructivist learning theory in a text-based traditional distance education program. The main purpose of this effort, which involves a study, is to examine how the distance education textbooks can be designed according to constructivist view and what the distance students' attitudes are about the textbooks, which are designed by using constructivist principles of learning.

Textbooks and Constructivism

For years textbooks have been designed to convey the content, or a linear mode of thinking to learner. In order to help designers to accomplish this duty, first behaviorist theories have provided detailed prescriptions and then cognitive theories offer some additions.

Recently, however, an alternative view about the learning process has gained attention. Recent studies on learning have revealed that learning is a change in meaning constructed from experience, and after bringing his/her prior knowledge to the learning experience, the learner co-construct new meaning onto former knowledge through interaction with the material, with the other learners and with the instructor. That is why this new approach has been called as constructivism, or constructivist learning (Ertmer & Newby, 1993).

Due to its social nature constructivist learning is usually associated with new computer-based communication systems (Vrasidas, 2002). Literature is full of using constructivism into online learning environments (e.g. Jonassen & Rohrer-Murphy, 1999; Lefoe, 1998). However, there is not any study on using only constructivist perspective to design and develop a distance education system that involves large group of learners, one-way communication, and requires individualized learning.

On the other hand, current applications have revealed that textbooks will still be used in learning environments which is whether constructivist or not and online or face-to-face. Some expert such as Cunningham, Duffy and Knuth (2000) indicate that textbooks can be designed to use in constructivist learning environments. Although, they point out that future textbooks will be different than today's textbooks.

The Study

In the first phase of the study a list of instructional principles prepared after completing literature review. Then for the second face a group of senior instructional designers who work in course materials' design and development teams of Anadolu University brought together for brainstorming in a series of expert panels. The results of these panels and literature review revealed that it is quite hard to design a distance learning course completely based on constructivist learning principles in Anadolu University's traditional distance education system. Some of the limitations of the system that supported this decision are that

- There are too many students to provide two-way, interactive instruction
- The programs requires individual, self-paced learning
- There is not enough number of instructors
- Lack of student-to-student interaction
- Time limitations of the television programs
- Page limitations of the textbooks
- Cost-benefit factors

However, the experts indicated that some of the principles of constructivist view might be used in designing textbooks for distance learners of the Anadolu University. Providing realistic examples while presenting the content, including directions that encourage students to find their classmates live in the same area and study together, giving authentic problems to solve (or projects to complete or cases to analyze) as embedded tests, providing opportunities to generate solutions, ask questions, underline important points, presenting readings related to the content and suggesting a list of other information resources are the main principles that the experts offered to use in the design of textbooks.

As a result of this phase, the textbook for "Introduction to Business Management" course, includes these principles for Anadolu University's distance learners, has been designed and developed. Later this material presented to the experts to determine if the suggested principles properly used. Experts indicated that most of the principles somehow successfully incorporated but especially the one related to directing students to different information resources was not proper. Experts explained the proper way of suggesting other information resources to the content experts. However, they could not give the information resources properly and the textbook is published and distributed to the learners.

At the last phase of the study, an evaluation questionnaire was prepared to determine the learners' reactions to the textbook. The questionnaire was consisted of a Likert type scale including 38 items and a 2 open ended questions. The 12 of those 38 items were directly related to the parts of the textbook that reflect the constructivist principles.

The questionnaire was sent to the academic advisors of AOF in seven different cities of seven provinces of Turkey. These cities were Eskisehir, Gaziantep, Aydin, Van, Canakkale, Samsun and Mersin. The advisors administered the questionnaires to the 457 Anadolu University's distance students who had been participated their face-to-face evening classes.

Frequency distributions and *t*-test were used in analyzing data. For the analysis of the frequency distributions, 3.41 mean score determined as the critical value. That is, the means equal and higher than 3.41 were interpreted as positive attitudes. Table 1 shows the frequency distributions, mean scores and standard deviations of the items related to the constructivist view.

Table 1: Frequency distributions, mean scores and standard deviations of the items related to the constructivist view

Item #	**N**	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**M**	**SD**
2	457	21 (4,6)	55 (12,0)	57 (12,5)	213 (46,6)	111 (17,5)	3,7396	1,1160
4	457	26 (5,7)	47 (10,3)	108 (12,5)	196 (42,9)	80 (17,5)	3,5624	1,0704
5	457	21 (4,6)	70 (15,3)	84 (18,4)	188 (41,1)	94 (20,6)	3,5777	1,1160
6	457	19 (4,2)	41 (9,0)	82 (17,9)	209 (45,7)	106 (23,2)	3,7484	1,0409
9	457	21 (4,6)	28 (6,1)	74 (16,2)	207 (45,3)	127 (27,8)	3,8556	1,0392
10	457	17 (3,7)	28 (6,1)	68 (14,9)	203 (44,4)	141 (30,9)	3,9256	1,0168
11	457	21 (4,6)	58 (12,7)	86 (18,8)	191 (41,8)	101 (22,1)	3,6411	1,0974
12	*457*	*66 (14,4)*	*79 (17,3)*	*112 (24,5)*	*149 (32,6)*	*51 (11,2)*	*3,0875*	*1,2323*
15	457	13 (2,8)	36 (7,9)	58 (12,7)	231 (50,5)	119 (26,0)	3,8906	0,9739
17	457	21 (4,6)	48 (10,5)	93 (20,4)	215 (47,0)	80 (17,5)	3,6236	1,0358
37	457	27 (5,9)	41 (9,0)	72 (15,8)	169 (37,0)	148 (32,4)	3,8096	1,1570
38	457	17 (3,7)	21 (4,6)	55 (12,0)	190 (41,6)	174 (38,1)	4,0569	1,0093

The results revealed that distance learners have mostly shown positive attitudes toward the constructivist parts of the textbook except other information resources part. They indicated "no comment" on this part of the textbook (M_{12} = 3.0875). The learners expressed that they like the real life examples most (M_{38} = 4.0569; M_{10} = 3.9256).

Furthermore, the t-test analysis has shown no significant difference between means scores of female and male students. Also there is no statistically significance between mean scores of students who live in eastern part of Turkey and western part of Turkey.

Conclusion

Does not matter how successful they are, all the educational institutions should always work toward improving their services. Anadolu University, as a mega university, always tries to do so.

As a result of those tries, a textbook model for distance learners was developed by senior instructional designers of the University. The claim of this model is that some parts of the textbooks might reflect constructivist learning principles.

A textbook titled as “Introduction to Business Management” for the distance learners of Anadolu University was designed and developed according to this model. The parts that reflect the constructivist view of learning are related to provide realistic examples while presenting the content, to include directions that encourage students to find their classmates live in the same area and study together, to give authentic problems to solve (or projects to complete or cases to analyze) as embedded tests, to provide opportunities to generate solutions, ask questions, underline important points, to present readings related to the content and to suggest a list of other information resources.

Results of the evaluation questionnaire have revealed that all the students (female-male, live in eastern part of the country or western part) expressed positive attitudes on the parts that reflect constructivist views. They especially liked to come cross the real life examples rather than fiction.

This effort and study show that even the non-traditional students have positive ideas about the constructivist principles and designers should look for more ways of incorporating principles of constructivist learning principles in any all kinds of instructional settings.

References

Cunningham, D.J, Duffy, T & Knuth, R.(1993) *The Textbook of the future Hypertext: A psychological perspective*. Retrieved 15.03.2001 at http://www.scism.sbu.ac.uk/inmandw/review/hypermedia/review/rev6073.html.

Ertmer, P.A. & Newby, T.J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 6*(4), 50-72.

Jonassen, D.H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. *Educational Technology Research and Development, 47*(1), 61-79.

Lefoe, G. (1998). *Creating constructivist learning environment on the web: The challenge in higher education*. Paper presented in ASCILITE98 Conference.

MacWilliams, B. (2000). Turkey's Old-Fashioned Distance Education Draws the Largest Student Body on Earth. *The Chronicle of Higher Education*, September 22, 2000.

Vrasidas, C (2002). Constructivism Versus Objectivism:Implications for Interaction, Course Design, and Evaluation in Distance Education. Retrived 12.04.2002 at http://Ceti.macam.ac.il/Courses/ma2/Consructivism-Versus Objectivism2000.htm.

Training to Performance Support: A Case Study in Change Management

Helen Gregory, Veena Mahesh, and Susan Tatby

Intel Corporation

Abstract

This paper expands on a human performance technology model used by a training department within a large global corporation to help transition into becoming a performance-centered group instead of focusing entirely on training. The paper specifically addresses the change management principles and processes used to ensure a successful implementation of the human performance technology model. It also outlines benefits and results in addition to issues and challenges faced during the implementation of the model.

Introduction and Problem Statement

Make the shift from training to performance support! Everybody's talking about it. Cost reduction and the need for revenue enhancement provide the driver to deliver products faster, better and cheaper (Tosti & Stotz, 2000). Although it's easier said than done, a change in focus from training to human performance technology (HPT) needs an emphasis on enabling individuals and organizations to meet their goals by delivering appropriate solutions (Farrington & Clark, 2000). For that reason many training divisions within major corporations are trying to make the transition to becoming performance support organizations. This paper presents a case study on how a training department within a large global corporation approached this transformation by creating and implementing a new performance improvement process to address production, quality and speed of solution development. The new process, the Process Life Cycle (PLC) Workflow, takes advantage of emerging capabilities in training and information delivery technology while retaining an emphasis on supporting performance.

In stating the original problem, we had to admit that we, like many training departments, had a well-developed order-taking process but were not experienced in the more subtle types of skills and practices that would facilitate our transition from our order-taking role to the new role of change-agent/solution-recommenders. We were comfortable with our order taking methods, and our customers were accustomed to it. Our own departmental performance analysis indicated that we needed not only to reset expectations across the department and within our customer base and foster partnership arrangements, but we also needed an established process, refined tools, skill development, a different level of management support, and systems to support the implementation of new ways of working.

The Solution – Part One

Upon reviewing the solutions that we could implement to enable us to make the transition to becoming a performance support organization, we concluded that a standard, repeatable process that incorporated documents, templates and guidelines for performance consulting would be the first solution recommendation. This decision was based on key learnings related to analysis and design gaps that were identified in some initial ventures outside of training. This performance improvement process (the PLC), helped integrate performance thinking into the everyday business workflow of training development.

The PLC Workflow is a human performance technology, problem/solution methodology for enhancing human performance in the workplace. The model combines processes from standard problem-solving methodology, instructional systems design, and human performance technology. It stresses the importance of applying a stand-alone repeatable methodology to performance problems and opportunities. The PLC workflow was enhanced with the addition of specific elements of customer engagement as well as other business process elements required by our corporate environment and infrastructure. In addition, the process emphasizes and enhances a number of elements that were seen as important to a performance support model: Analyze Performance and Analyze Cause and an expanded Intervention Selection phase.

Along with the PLC process, we developed a number of tools and templates to support performance. Tools were modeled partly on some of our own best practices and partly after a group HPT tools that were adapted from the

International Society for Performance Improvement (ISPI). We developed an extensive web site to make the tools more accessible and to further explain the use of each tool. The site structure is based simply on standard HPT phases along with additional sections to provide quick access and enhanced usability to the tools and templates. A search engine allows the user to access information quickly on any specific topic of interest pertaining to the PLC. The web site also provides access to a useful element of support in the PLC, the generic Gantt, developed in MS Project. The Gantt provides a checklist and timeline approach to the PLC process, with notes to help clarify steps in the process, hyperlinks to tools and templates, and clearly identified input, output, and dependencies for each step in the process.

The Solution – Next Steps in Change Management

"Build it and they will come" is a catchy phrase, and it might work in some arenas; but we found that changing organization and customer expectations involved more than making a process and tools available for use. Implementing a new work model and getting it adopted is a lengthy process and often requires alteration in the structure and function of the social system in which it is deployed (Day, Shoemaker, & Gunther, 2000). Change Management is also an essential component of the Implementation portion of the ISPI HPT model. For performance technologists, organizational change is a route to achieving their goals of productivity, cost reduction, and quality (Rosenberg, 1995). Organizational change is an area of professional practice that involves the proactive management of change using standard models, techniques and tools (Nickols, 2000). It usually results in organizational change, which is defined as follows:

> "Organizational change is a social process taking place over a period of time during which people and systems must undergo significant change, learning, adaptation and growth" (Carlopio, 1996, p.1).

The change campaign we employed involved the delineation of a strategic model for managing change, which included components such as organizational change, employee development, performance support and communication. Using HPT strategies within our own implementation enabled us to role model Human Performance Technology principles as well as provide critical support to the performer. This strategy focused our efforts on the most critical resource of our organization: the people.

To implement the PLC Workflow and to enable people to follow the steps it outlines, we applied a number of key change management steps to our implementation to ensure that the process and the supporting tools and templates are fully incorporated into the day-to-day business process of the department. Training on the use of new process and tools, along with mentoring and coaching were used to support the process. We relied on gathering input from stakeholders at every step along the process development to ensure strong buy-in from all levels of management and employees. The involvement across all levels in the department was also a direct attempt to ensure full departmental ownership of the new processes and tools.

The details around the actual steps involved in our change management roadmap are outlined in Figure 1 in greater detail.

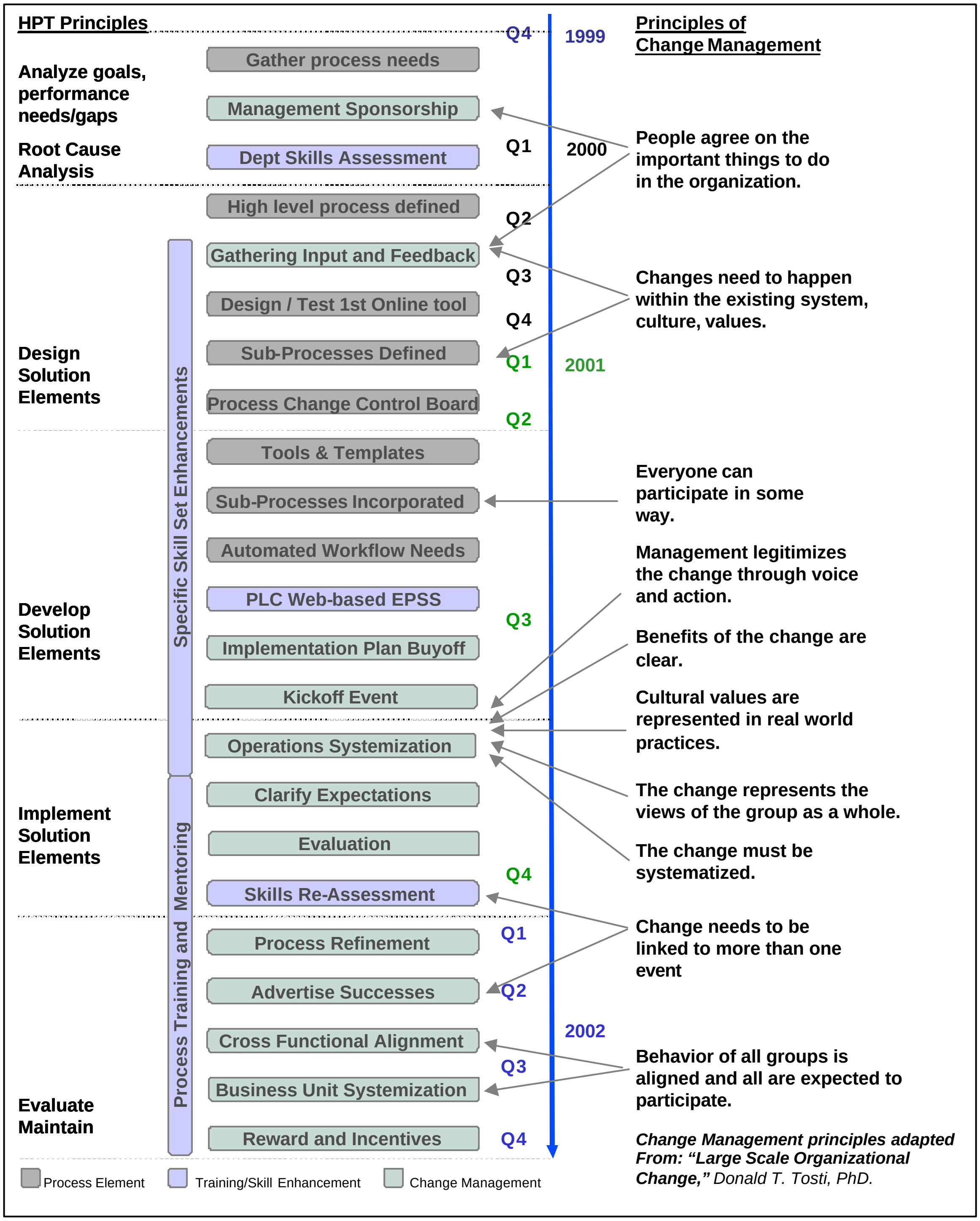

Figure 1. Training to Performance Support Change Management Roadmap

Ongoing Challenges

To say that our implementation was a smooth transition would be a significant denial of the pain involved in this type of transition. With 129 people in our department, perhaps our biggest challenge was around communication. We found that we could not communicate too often with the different organization units in the group. We also found more resistance to changing the way we worked than we might have hoped from some of the late adopters in the department. Our early practice of involving all members of the organization needed to continue as an ongoing part of process improvement. Instilling discipline around thorough up-front analysis is an ongoing challenge that we hope will become somewhat easier with the implementation of an automated tool for parts of the business process.

These challenges have mandated a continuing effort around implementation. And as more people in the department begin to embrace the change, their involvement, while a positive indicator of a successful implementation, makes it necessary to continue to monitor the process closely and to maintain a formal change control process. In tight economic times, maintaining the commitment from management for continued resourcing is a challenge that has become a seemingly constant factor.

Benefits and Results

In spite of ongoing challenges, the implementation of the PLC Workflow has resulted in a number of benefits for the department. Initial data regarding the implementation show a high rate of process awareness across the department when compared to earlier data that show a lack of process awareness. Initial data related to defect reduction showed a 50% decrease in defects rated important, 100% reduction in critical defects for web-based training, and an 82% level of user confidence that PLC adoption will lead to process standardization. In addition, process applicability has led multiple groups outside of our own department to pursue using the PLC more widely across the enterprise.

We are currently at the one-year point following our initial implementation and we see some additional benefits to implementing the PLC. We see people in the department starting to use a common language: we now hear people discussing projects in terms of analysis, design, requirements, and testing. In addition WBT products built using the PLC are being released consistently with zero defects in integration testing, and we are seeing an increase from 100 to almost 200 hits per month on the PLC web site indicating an increase in users for the process in general. PLC use has resulted in products that receive customer kudos, and in our most recent employee performance evaluation cycle, the PLC methodology was mentioned as the means for achieving results. Lately we have had experiences with some late adopters requesting help for PLC components to be implemented into vendor equipment training. Several strategic directives have also focused on cross-functional alignment and optimization of the PLC.

We have also made progress against our original goal of transforming ourselves from being a training organization to becoming a performance support organization. One of our department's key strategic programs for 2002-2003 is a large-scale Electronic Performance Support System (EPSS) initiative. We have made progress in supporting our automation customer base by becoming Graphical User Interface (GUI) consultants where we previously had often been asked to provide training to compensate for poorly designed application interface design. We are also developing methods for designing solutions around the delivery of multiple knowledge product types, and we have implemented a number of limited Knowledge Management (KM) solutions. When one of our partner organizations requested training to remediate the implementation of their own PLC, we were able to offer some of our key learnings around human performance technology as an alternative.

Key Learnings and Recommendations

Our key learnings from this implementation seem to fall naturally into two general categories; those related to people and those related to time. The fact that people are inherently resistant to change cannot be overlooked in a transition of this type. It might seem like an obvious statement, but acknowledging it openly, planning for it, and understanding the pockets of resistance within a given organization can be immensely helpful in understanding how and where to focus attention. Process change must be tied to specific environmental factors which requires a solid understanding of the organization and the environment in which it operates. Our own environment offered a number of specific challenges that were inherent in our culture such as the way we reward people. Those types of factors can in no way be generalized.

Another key learning related to the people aspect of change is that once you include everyone, you really have to include everyone's ideas, and it is imperative to stay open for others to contribute to the change. We understood from the onset of the project and our early change management considerations that this aspect was critical. We may have underestimated the challenge this would pose, however. As more and more people accept the new process, more and more people want to be involved in defining and refining the process. This poses challenges around integrating the new ideas and sometimes around making decisions about which ideas to even include. It appears to be a complex process that requires ongoing orchestration.

It is little wonder that our industry has been discussing the topic of moving from training to performance support for a number of years. Some of our own key learnings are related to the time aspect of change. To say that large scale change cannot be event based may be an oversimplification. Our experience indicates that we cannot overemphasize the need to think long term and that when you think it's finished it's really just starting. Although we planned and held project celebrations a year ago at the point of our initial implementation, we still face the ongoing challenge of integrating the increasing number of ideas that are added to the mix. Plan to resource this type of transition for longer than the initial estimate. Our department continues to resource this change implementation and will likely continue to do so for some time.

Finally, it's critical to appreciate the value of even small steps in the right direction. To undertake and own a transition of this type, it is essential to have vision and passion around making that vision become reality. Sometimes the level of passion required to support this type of change can result in impatience. It helps to temper that passion with a lot of patience. The understanding of organizational change being long term as opposed to event based really translates to the change occurring in small steps over a period of time. Understanding that and accepting it at the outset may help ease the transition.

Future Plans

The future resourcing of this effort within our organization will be centered on a number of planned small steps that will continue to move us toward our overall goal. We have immediate plans for additional upskilling in Analysis and Requirements Engineering. We continue to learn new ways to improve tools and templates connected with the PLC to make it easier for even non-experts to use them. To date our process is only fully developed for a number of training and software interventions. We would like to incorporate process definition for some of the knowledge-based solution that we are beginning to design and develop.

Since one of our key drivers for this transition was related to cycle time decreases in our industry, we are working to develop tools for better tracking of cycle time by phase. We have identified a department metric around cycle time with the ultimate goal of using enhanced project tracking tools to achieve cycle time optimization. To that end, our department is at the point of testing a new tool to automate this tracking.

Our long-term future plans go beyond implementing the change in our department. In response to requests from some of our own internal groups we plan to explore the feasibility of productizing the PLC workflow web site and tools and templates for use by equipment vendors. Productizing will also better enable us to share our process across the corporation.

Summary

The paper delineates a strategic model for managing change, which included components such as organizational change, employee development, performance support and communication. Key learnings from the implementation of a human performance technology model fall into two general categories; those related to people and those related to time. All experiences point to the fact that large-scale organizational change should be planned out over an extended period of time, must be inclusive of the people that it will impact and requires a good understanding of the organization and the environment in which it operates. Above all, it needs planning, passion and dedication in order for it to be successful.

References

Carlopio, J. (1996). Implementing Workplace Innovation and Technical Change. Available Online: http://www.agsm.unsw.edu.au/ob/jrc/1title.htm.

Day, G.S., Shoemaker, P.J.H., & Gunther, R.E. (Eds.). (2000). Wharton on Managing Emerging Technologies. John Wiley & Sons: New York.

Farrington, J., & Clark, R.E. (2000). Snake Oil, Science, and Performance Products. *Performance Improvement Journal*, 39 (10), 5-10.

Nickols, F. (2000). Change Management 101: A Primer. Available Online: http://home.att.net/~nickols/change.htm.

Rosenberg, M.J. (1995). Performance Technology, Performance Support,
and the Future of Training: A Commentary. *Performance Improvement Quarterly*, 8(1) 94-99.

Tosti, D.T.& Stotz, R. (2000). Internal Branding: Using Performance Technology to Create an Organization Focused on Customer Value. *Performance Improvement Journal*, 39 (9), 5-11.

Pulling Tigers' Teeth Without Getting Bitten: A Robust Human Relationship between Instructional Designers and Faculty

Cheng Chang (Sam) Pan

Jennifer Deets

William Phillips

Richard Cornell

University of Central Florida

Abstract

This directed qualitative research project concentrated on an instructional designer's (ID) expert qualities and their inter-relatedness to interpersonal dynamics with faculty in terms of the role the ID is playing. The designer's personal practical theories (PPTs) and their relationships to his effectiveness as an ID were discussed. Researchers hope to present a vivid portrait of an ID and to provide insights into the profession as reflected in a southeastern university setting. Implications and significance of the case study are also addressed.

Introduction

> *"Pulling tigers' teeth without getting bitten"---a Chinese proverb, annotation of the accomplishment of a task that includes great danger or risk (Anonymous, n.d.).*

In cybereducation, a term used by Vandervert, Shavinina, and Cornell (2001), the role of instructional designer (ID) has arisen as a result of the increasing presence of web-based instruction. An ID's role is unique, neither clearly leading nor supporting, as revealed in the comments of one faculty member:

> *He makes appointments to suit my schedule (rather than his), often within a very short and pressing timeframe. He takes the time to find out what I really need (rather than coming from presuppositions), then gives me concrete, easy-to-follow instructions.*

Making an appointment based on the other individual's schedule is a course of action expected of a subordinate, whereas giving instructions is deemed the prerogative of a leader. Yet both actions were revealed in the above comments, indicating a need for more nuanced understanding of the role. Thus, this project was undertaken as an ethnographic case study in the hope to better understand the complexities involved in the work and experience of IDs.

One of the researchers, Sam (as a student researcher), and participant ID, Bill, both work in Course Development and Web Services (CDWS) at the University of Central Florida (UCF). UCF has been implementing an online initiative since 1996 (have been using WebCT since 1997) and in 1998 won the American Productivity and Quality Center and State Higher Education Executive Officers (APQC-SHEEO) Faculty Development Award for Teaching with Technology. The United States Distance Learning Association (USDLA) conferred the 1999 "Excellence in Distance Learning Programming Award in Higher Education" on UCF for its use of distance learning media, including embedding the World Wide Web in online courses as an instructional strategy.

CDWS was established in order to create a staff of IDs to work with UCF faculty members (subject matter experts) in the development of pedagogically sound design, implementation, and evaluation of asynchronous learning courseware on both one-on-one and team basises. The instructional design team is one of the eight units of

CDWS supervised by the executive team. The ID team is known for supporting UCF faculty teaching and student learning by means of consulting and facilitating training of the clients (UCF faculty members and/or graduate teaching assistants) as well as coordinating with the other seven teams of CDWS (University of Central Florida, n.d.). The uniqueness of any ID's job is unquestionable; however, whether the ID's role is leading or supporting remains less clear. Understanding the nuances of the roles that IDs play is a major issue that the authors highlight and discuss in this report.

Background

An ID's job performance is strongly related to his or her experiences with real world situations and projects (Julian, 2001; Summers, Lohr & O'Neil, 2002). Professional IDs depend on prior experiences to perform their complex work on a daily basis (Julian, 2001).

An ID is conceptualized as a teacher, based on the nature of the ID's job -- conducting workshops, teaching groups for various purposes, and holding customized consultations. Frequently these consultations are to facilitate faculty members' and Teaching Assistants' (TA's) literacy of educational technology to help them meet their instructional needs. Sanches (1993) also argued that "the teacher appeared as decision-maker, 'rational executive,' and as physician who diagnoses learning needs and prescribes 'instructional treatments'" (p.23). The authors wondered what and how the ID's previous experiences might affect his beliefs about his job, his instructional decision-making, and his effectiveness.

The relationship of an individual's previous life experiences and activities to his or her beliefs about instruction as a result of designing, implementing, and evaluating the curriculum can be emphasized in the notion of personal practical theories (PPTs) (Cornett, Yeotis & Terwilliger, 1990). Cornett (1990) stated that each teacher possesses PPTs, which are statements of what he or she believes with respect to decision-making in curriculum and instruction. Cornett stressed that these PPTs are derived from all life experiences, non-teaching as well as teaching activities. Grimmett and Erickson (1988) argued that PPTs are not merely practical beliefs of teaching but a type of ideology that drives the individual to more consistently reflect on his or her perceptions, beliefs, and practice. Through reflective practice, theories are tested repeatedly; judgments and beliefs are built. Reflection is essential in order to better understand educational experiences and to develop better curriculum and instructional skills, knowledge, and attitude. Reflection is also a recurring theme in teachers' sense-making, concept development, and decision-making (Ertmer & Quinn, 1999; Rowland, 1992).

These reflective activities are in concert with what Condit (1996) coined "critical common sense." Condit stated, "This common sense is a reflective one, one that takes into account not only the lessons of daily experience, but also reflection on how those experiences fit into larger social structures, [thus] one can refer to "critical common sense" (p.169). Critical common sense about teaching is reinforced and accentuated by continuous interaction amongst professionals working within unique organizations with unique situational factors affecting the interaction.

Situational factors, such as an organization's culture, structures, and values (Frost & Teodorescu, 2001), exert a significant influence on professional competence and practice (Kaufman, 1990). Environmental attributes or external forces affect any worker's motivation, professional competence, and job performance if a supporting institutional culture is not created and nurtured in response to inevitable change (Votruba, 1990).

Choosing to focus on the motivation dimension of external vagaries of organizational life, especially as articulated in Herzberg's (1966) work motivation theory (the motivator-hygiene theory), two concepts are crucial: *basic needs*, such as salary, peer relationship, supervision, and company policy, and *growth needs*, like achievement, recognition, advancement, responsibility, and work itself. In Herzberg's language, basic needs are hygiene factors, and the lack of those factors is associated with job dissatisfaction, whereas the presence of growth needs, which are also named motivators, would attribute to the feelings of growth and development at work.

Although debate about generalizability, oversimplification of Herzberg's theory persists (Cooper & Locke, 2000; Farr, 1977; Graen, 1966; House & Wigdor, 1967), basic needs and growth needs are useful constructs for this study. For example, two growth needs, work itself and organizational processes, are also two vital sources of motivation (Farr & Middlebrooks, 1990). As Pinder (1998) suggested, "One need only believe that building jobs to provide responsibility, achievement, recognition for achievement, and advancement will make them satisfying and motivating" (p. 38). Further study for more empirical support is also recommended by Brief (1998). Thus, how the ID's basic needs and growth needs interrelate with his PPTs and, further, how they affect his performance at work are major factors in understanding the nuanced role(s) of the ID.

Research Questions

Following the five elements of the case study design by Yin (1994), the authors proposed three research questions: (1) What is the nature of the role(s) played by the ID? (2) What is the relationship of the ID's role to interpersonal dynamics with faculty? (3) How do the ID's basic and growth needs interrelate with his PPTs?

Methodology

In addition to Yin's (1994) case study design, Tellis (1997) recommended three major components of qualitative method that need to be employed: describing, understanding, and explaining. The ID was selected based on familiarity, which smoothed the student researcher's transition from simply a colleague to a participant observer. Additionally, asking a familiar colleague to serve as research participant expedited entrée, which was a consideration given the short duration of a typical academic semester. The collegiality between the student researcher and the ID smoothed the process of data collection.

In addition to interviews with the ID and observation of him alone and in interaction with others, a seven-item online survey was designed to target 70 colleagues and clients, who had or have been working with the ID in the past two years. Although the response rate was not strong (approximately 26%), 18 valid respondents (thirteen faculty or staff, four coworkers, and one unidentified) shared their perceptions of an ID's role, especially Bill's. Video-taped interviews with the ID and five other ID's (including one of the supervisors from the executive team) were conducted. The videotape was transcribed. The student researcher was scheduled to spend three hours each week in the field (i.e., the ID's office) observing the ID during the first eight weeks of the spring semester in 2002. E-mail correspondence between the ID and 25 of the ID's clients were chosen, and the results reviewed and analyzed. Information on the unit's and the Human Resource office's Web sites was documented. Copies of official job descriptions, used from the last round of ID recruiting, were provided by the ID, photocopied and filed. The goal of such description is to assist the reader in knowing what the researcher saw by visualization and emotion (Eisner, 1998; Glesne, 1999).

Regardless of the evolving themes in this case study (Zucker, 2001), the iterative process of analysis could be considered a sort of triangulation as it was intended to enhance the worth of the project (Kaulio & Karlsson, 1998; Silverman, 2000; Yin, 1994). For pragmatic and instructional purposes, the faculty researchers confronted and questioned the student researcher to refine and distill the latter's understanding and thoughts about the case as well as to reconsider and review his judgment skills.

Findings of the Study

Roles

The dynamics between the ID, Bill, and the faculty are intimate but vague in terms of interpersonal dyads. Due to the nature of an ID's job, Bill works closely with clients, especially when IDL6543, an eight-week-long faculty development course for online teaching and learning begins. While he was facilitating a first-time faculty member's use of WebCT software, an interesting dialog occurred:

Bill:	*You went to the GroupWise thing* [a training session on the use of the university's E-mail program] *in the morning?*
Faculty (F1):	*No.*
Bill:	*OK. Before you leave, remind me, I have the handout from that session. This Friday we are gonna teach you how to set up what is called 'rules' in GroupWise.*
Faculty (F1):	*Oh, OK.*

Asking for a reminder like this was not a breach of professionalism for the ID. The question indicated that they work closely with each other, so the ID did not feel uncomfortable about asking for information like that. When it comes to faculty's preference for a varying degree of service from the ID, the following conversation occurred:

Faculty (F2):	*I think it's* [giving individual consultation] *helpful, myself. Do I have the ability to go in and make changes to the REACH pages (i.e., WebCT course pages)?*
Bill:	*Yes. Yes.*
Faculty (F2):	*O.K. I didn't know that. That's why I stopped using it, because I thought I had to go through the (instructional) designer to set those up.*
Bill:	*You can use us, or you can do it yourself…*

For this first-time faculty user of WebCT, a close relationship between him and the ID is evident in this face-to-face individual consultation. "Use" is causal language as indicated from the previous conversation. In this case, the ID reminded the faculty member that he could do the work alone or could use the services/assistance of the ID staff. Bill indicated that the faculty member's preference for one route or another did not matter to him, but that he was willing and glad to be helpful as needed. The consultation also clarified some misunderstanding of how the ID functions.

The authors use the relationship between a catcher and a pitcher as a metaphor. The pitcher takes the catcher's (usually the team captain) hand signals to throw different curves, and then the catcher uses all means to catch any ball the pitcher threw. Based on the closeness of the ID/faculty member relationship, the authors believe that the relationship established in the creating and maintenance of on-line courses was as partners and teammates.

The relationship between the two players – ID and faculty member – was strong and interdependent. The ID's primary job is to design, in WebCT, and to set up courses on the Web. Most faculty interviewed perceive the ID's job to be technical-knowledge-based rather than pedagogically-oriented. Although the consultations observed by the student researcher were related to technical questions and issues, a Web-based course will not exist without knowledge, skills, and right attitudes from the two parties. They both influence each other.

Bill:	*But if you ever have a question for me, I am gonna be working with you and developing a course. The best way to get me is email. Or if you want to call here, you may want to try and see if I am around. What I am gonna do for you is to get you a good course experience.*
F2:	*There is something that I find, something really amazing, about developing courses through technology. Students walk in the classroom and interact in the discussion board. They become more active.*

Indeed, for a novice on-line instructor, a good beginning experience can affect their attitude toward using the system and a good experience ultimately affects the actual use of the technology (Harris, 1999). Like fish and coral reefs that depend on each other for survival, the ID and faculty members in a sense cohabit within a closed system. Without the technical and pedagogical knowledge from the ID, a course with good content (from faculty or subject matter experts) will not succeed on the Web.

As previously mentioned, the ID always made an appointment at a suitable time to conduct an effective consultation; meanwhile he exerted an influence on faculty by giving constructive advice. He acted as a leader who offered suggestion and guidance, but he was also adaptive and willing to show his support to maintain a balanced relationship. A client recalled:

> *Bill is easy to talk to. He is prompt in responses to any questions I have had. He is knowledgeable about WebCT and keeps me abreast of changes. He is a pleasant person to work with. In no way does he condescend. He never brushes me off--even when I've done something stupid.*

On the other hand, if the shared goal is not sustained (i.e., designing a sound Web-based course), faculty can maintain good quality of instruction by teaching a conventional manner (i.e., face to face instruction) or they can teach "whatever and however they want" on the Web. Another conversation between Sam and Bill is as follows:

> *SR: What do you think of this class? A class without a sound instructional design…*
> *Bill: Right, and I am gonna tell you…I am gonna recommend to that instructor what he should be doing to really kind of hold the line to make it right, but he is not gonna listen to me…and that is fine. If what he is doing makes him successful, makes his learners successful, then he is doing something right. Maybe that is a little bit radical for a real instructional designer to talk like that. If it works for him, it works for students, then it works for me.*

Bill's stance in this case, was strongly in favor of neutrality on his part. For IDs, if the mission (i.e., supporting teaching and learning at the university, affiliated academic units, and partner organizations) is not carried out, their presence and existence will not be justified. One of the practices this ID honed was developing and maintaining a smooth relationship with his clients. The need for smooth relationships also holds true in corporate settings. Liang (1999, p.319) claimed that "They [IDs] present a low profile, a technique helpful in developing and maintaining personal relationships. They may sacrifice professional ego to accomplish managerial and people-oriented tasks." Similarly, when the faculty member's experiences and competencies of teaching online courses increase, IDs will be of more of an assistance role rather than an advisory one.

Eventually, both IDs and faculty become more field independent, which is what Kelvin Thompson, Coordinator of Professional Programs of CDWS at UCF described as "three ways to see the relationships playing out, very simply, in terms of control, authority, and power hierarchy or clout." He saw one with the ID being subordinate to the faculty member, another with the faculty member being subordinate to the ID, and the final one being one of balance. In an interview he said, "The third way I perceive kind of playing out is one of the more independence. There is alongsideness, coming alongside, being supportive and helpful, you know, something of a partnership."

Personal Qualities

Whether working in corporate journalism or for the university, the ID is an individual who is enthusiastic about what he is doing and seeks fun in his work at all times. Fun is the source of his motivation for work. According to the people around him, the ID appeared to have personal traits that made him stand out from his peers. After a workshop at another campus, a university staff person told the student researcher:

> *Staff 1 (S1): He is casual, he is very relaxed, and he is humorous…kind of takes the stiffness out of the way…he continued to go over his points and instructed that you have to do something and kind of gives you a recap what we have done.*

The ID was described by his colleagues as a professional (i.e., knowledgeable about what he does), who was personable, reliable, and humorous. A coworker said on the survey, "Again, I think his humor is what makes him great to work with. He always gets his job done but always in a light-hearted way. Bill is awesome." Another indicated, "His sense of humor puts people at ease which allows for easier communication." The other mentioned his great communication skills and that the ID "works/plays well" with others.

These co-worker comments were congruent with how his clients felt about him. Their impression of the ID was that he was a patient professional with an appropriate mindset. A faculty member wrote on the survey:

> *He's intelligent and has a sense of what faculty do. He is open to letting faculty deal with technology themselves rather than forcing us to submit to the whims of Course Development [where the ID works], who as a rule, seem to know*

nothing of what faculty actually do. He has a sense of what good pedagogy is and cares that we are able to be the kind of teachers we are, despite what WebCT would seem to enable or disable.

The quote also reveals that uniqueness and advantage of his personal traits and prior experiences as an adjunct faculty are involved in his job performance. While cultivating positive, productive interpersonal relationships with faculty, IDs in a higher educational setting often serve as change agents. As previously quoted, a faculty member commented that Bill has kept her "abreast of changes," Thompson concurred on the "change" issue that ideally an ID should carry two dispositions, high tolerance of change and willingness to be the agent of change,

When asked about the qualities of a competent ID at the university level other than what was addressed above, other IDs mentioned: organization (e.g., time management), empathy, assertiveness, work ethics, good energy, creativity, proactivity, interpersonal sensitivity (Snodgrass, 2001), and the concept of group-as-a-whole (Ringer, 2002). Equally revealing are attributes of instructional technology professionals found in the AECT book, *Technology in Instruction: Standards for College and University Learning Resources Programs, 2nd Edition* (Cornell, 1989*)*, in which almost all of the qualities for instructional designers found within the UCF Course Development & Web Services are showcased.

Needs and PPTs

The ID provided the following list of his PPTs (Personal Practical Theories). The ten beliefs are listed in order of priority to the ID:

1. Lifelong learning is essential. In order to prosper, mature or gain knowledge throughout life one must learn and continue to learn or become stagnant.
2. Anyone can learn if motivated. Learning is fun if motivated and one has a desire to gain knowledge.
3. Everyone learns in a different way. Each person learns in his or her own way and at their own pace.
4. Learning must take place for one to grow. To grow on the inside or on the outside one must learn.
5. Learning comes faster when doing while learning. If an exercise is handed to the learner, the learner will learn faster when doing as opposed to just listening.
6. Adult learners are motivated learners. Adult learners want to learn and to grow and to gain knowledge. To the adult learner, knowledge is strength. Adult learners understand the consequences of learning or not learning.
7. Learning in a group environment is stimulating. Playing off of others while learning is fun and stimulating and motivating for the learner.
8. Learning should be organized in order to be effective. By organizing curriculum, one is facilitating the learner and makes learning easier to understand and absorb.
9. Learning takes place at an individual pace. Each person learns at their own pace and in their own way.
10. Learning should be in bite-sized nuggets. Too much curriculum at one time is not fun and not stimulating for the learner. Curriculum should be organized in bite-sized chunks to be learned effectively.

While he was teaching as an adjunct, these beliefs started to grow in his mind:

SR: While you were a journalist instructor…
ID: Right. And I loved it, it was a fun course…students wanted to be there…wanted to learn as much as I could give them. To learn about communications and education. So we had a great time. And I discovered during that 7 years, that you know…I think…I was meant to be a teacher. So I kind of went in and learned a little more about being a teacher.

From the dialog above, "Students wanted to be there…wanted to learn as much as I could give them." corresponds to his PPT6: Adult learners are motivated learners. The last sentence represents the PPT1: Lifelong learning is essential. For the ID, it is never too late to learn. In the interview, Bill talked animatedly about learning how to do some household projects. Bill is also pursuing an Ed.D. in Curriculum and Instruction at UCF, indicating his life long learning. To him, "fun" is the drive, and excitement is his motivation. In a sense, learning about being a university teacher is not just advancement to him, but also a responsibility. Both advancement and responsibility are regarded as growth needs in Herzberg's (1966) language. However, the coexistence of both growth and basic needs is identified in the following conversation:

> *SR: OK. Tell me something more about the transition [from being in photojournalism to becoming an ID].*
> *ID: Yeah, it [being an ID and teaching] was the only motivation. It was most of it. It is funny. I wanted something new, something challenging, something on the cutting edge, something close to home…*

The following conversation falls into his PPT2: Anyone can learn if motivated.

> *SR: Correct me if I am wrong…you were saying if the course is fun, students would get motivated. Right?*
> *ID: Right. I think so. I think if it is fun…they will enjoy it. They are gonna learn more and they are gonna have a better time taking that class. Their grade may…you know…show through that.*

The ID set a goal that students come to his class and enjoy themselves in the class, which is in concert with another growth need, achievement.

> *SR: You mentioned that maybe this summer you might have more time to do your personal learning profile thing? Is it required to do this?*
> *ID: We just actually formalized this. We are in the process of writing those now. That is, what do we want to learn and what would the benefit of that be to the unit? I kind of came up with an idea…last year we did IDA7000, Instructional Designer Academy…I am sure we are going to move it to another level pretty soon. But we created IDA and a couple of us went on the road and presented this. It was incredibly successful. IDA is basically a WebCT course where we teach instructional designers what we do and how we do it. I want to do the same thing with a course for adjuncts. Because I was an adjunct, I know the frustrations and I know what adjuncts go through…to find a parking place at night… you know, little things like that…I want to build not just a course that will teach adjuncts of all these logistics over here but also I want to give adjuncts…there are a huge number of adjuncts who teach at UCF…I want to be able to give adjuncts an online tool or an "E" course to facilitate their learners' growth and make their teaching more effective.*

Based on the dialogue above, his PPT9, "Learning takes place at an individual pace." was identified. An online training session occurs at an individual pace. At the same time, the work itself brought achievement and recognition to him and his abilities.

He even used himself as an example when it comes to the notion that everyone learns in a different way (i.e., PPT3 and PPT5).

> *SR: Do you believe that each of us learn differently?*
> *ID: I do. Because I am a visual learner. And I cannot tell you how frustrating it is for me to be given verbal information from an instructor and expect to learn it. So I need a picture. Maybe that is because my 25 years in photojournalism. I need a chart or picture or a diagram or a table. I am having a real hard time right now with a class I am taking, trying to differentiate between the behaviorist and constructivist…you know…Piaget*

and Vygosky and you know…because I don't have the pictures of all these…actually I know where the picture is. It is from a class I took last semester. It is in one of the textbooks. I just didn't go back and copy this to be able to visualize it. Therefore, when I teach, I teach toward the visual learners. I try to get the visual learners as many pictures as I can. And I am a firm believer of giving the learners something to do…if you involve them and create the interaction between the learners and materials or the content. I firmly believe that they will learn quicker and easier and comprehend more.

He strongly believed that for various learners, different teaching models are needed. Web-based instruction (WBI) is believed to bridge the gap between these two factors (i.e., various learners and different teaching models). Kahn (1997) defined WBI…

Web-based instruction (WBI) is a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported (p. 6).

Bill's PPT5 is about learning by doing, which is illustrated in the following quote:

SR: Is that what you do to your clients when you are doing your IDL and other training sessions?
ID: Right. You don't know how hard it is to do, because especially like I want to teach somebody how to dial in on Dreamweaver and change their office hours on their homepage. …I can do it like that (easy). Instead I want them to turn on the computer and open Dreamweaver to set up the dial in information, to dial in and connect to the site, and to make changes and save it and put it back up…I want them to learn how to do it but it is frustrating because I know I can do it so much quicker. But if they do it a few times they are gonna learn how to do it. If I do that for them, it is all about teaching a man to fish…

His bite-size-nugget learning (i.e., PPT10) is exactly what the research demonstrated is a productive approach to take. Chunking is a fundamental instructional tactic familiar to educators and serves to decrease the limited cognitive load of human beings (van Merrienboer, 1997).

Workload

The authors expected that external forces like work itself and environmental change could at times prohibit the ID from acting on his stated PPTs, and thereby interfere with his job satisfaction and possibly his performance at work. Although most of the PPTs the student researcher scrutinized were well-articulated with his personal growth and survival needs, one issue, workload (i.e., a large number of clients as well as additional workplace responsibilities), which is commonly seen as problematic in the organization, commanded attention (Mouly & Sankaran, 1999; Tattersall & Morgan, 1997). One of the faculty members who completed the survey pointed out an intriguing phenomenon, "He should have fewer faculty that he's responsible for or more assistants."

The ID stated:

Since last December, after IDL and the Winter Workshop was finished, the faculty were knocking down our doors asking for our professional services and technology (WebCT) facilitation. Our workload has been increasing even since. We created over two hundred new courses in just over a month starting about December 15. The Pegasus Disc, faculty training, and faculty projects like Winter Workshop and Summer Institute and things like that kept us very, very busy. I can't spend as much time on each course as I would like to. I have

> *ideas that can make these courses better in terms of sound pedagogy, but due to the time constraints…I feel bad about what is going on, because now I am always looking for shortcuts. I do not really mean that in a negative way but...I didn't do that before. I do wish to spend more time interacting with faculty 'as they teach' f2f [abbreviation in the e-mail] and online…observing, challenging. I wish I could research other courses, schools and programs for good ideas. I just don't have time to do it now. Hopefully the summer semester will allow us more time to think and write and work on some creative projects.*

Not only the faculty members, but the ID himself realized that workload may have exceeded his capacities. Thompson acknowledged this challenge in the interview:

> *Obviously, we cannot keep the same number of people and continue to increase the workload. You cannot continue to pile on. We have a policy here that the faculty are free to be anywhere they choose to be on a full service to self service continuum with us…Most faculty are somewhere between those…those two extremes. That is all good. That is all fun. But that means if you worked with me once three years ago, you are technically in my workload.*

It sounds straightforward that the ID was drowning in his work. The student researcher wondered how long this situation could last before problems occur. If the ID failed to accomplish things that he used to do, did this change impact his work effectiveness and job performance in the faculty's eyes? According to the survey results, 16 out of 18 valid respondents indicated that the ID was weighted 5 (5 as the highest and 1 as the lowest), in terms of his job performance. One gave him a 4.9, and the others a 4. On average, the ID's work effectiveness seemed not to be a problem to the clients. In any event, the student researcher suspects that the silent non-respondents (approximately 54) may have a different viewpoint regarding the ID's effectiveness at work, but due to the timeline of this study, the next phase of this study will have to address this issue in more depth.

Conclusion

The relationship between the ID and his clients (i.e., faculty) is subtle. While the interpersonal connection was reciprocal to some extent, the ID, in most of the work performed, was supporting faculty in teaching and learning, both from faculty's viewpoints and what the student researcher observed from the university's description of expectations, regardless of the leading role in the process of curriculum and professional development. It is, after all, a harmonious relationship in most of the cases. It is also the ultimate form of partnership and collegiality. Both the ID's distinctive personal traits, such as humor, humanity, patience, and empathy, and his professionalism led him to be a success at work. These good qualities are also consistent with the four competencies of instructional designers at CDWS: faculty interface, curriculum development, instructional materials design and development, and curriculum delivery. The qualities the ID possesses are endorsed by Thompson:

> *We have these two things working together. It is easier to characterize one curriculum development as an introverted trait and the standup training stuff as an extroverted trait…We expect people [new ID applicants] to do both. We often vote people out for that [not having both traits].*

Additionally, Bill's previous working experiences contribute implicitly to the formation of his personal practical theories as well as to his job performance. As discussed, his PPTs were interwoven with personal needs for survival and growth. All of these traits illustrated the ID's life at work. Sources of data revealed that he essentially plays a sensitive but tricky role, as pulling tigers' teeth without getting bitten. This finding may or may not introduce a vertical dyad relationship, which is a superordinate-subordinate relationship. A mutually-important, peer relationship was witnessed in this case. That this ID was able to interact well with a large number of differing personalities does not necessarily mean that a harsh or unbalanced linkage (perhaps fueled by perceptions of differential professional status as determined by degrees held, etc.), suspected by the researchers, would not take place. According to Bode (1999), the issue of collegiality and mentoring to the new faculty is a concern of community building in the university setting.

As the university continues to grow, more new faculty will be hired, some of whom will want to use on-line options for instruction, and the matter of the interpersonal skills of the ID to those newcomers remains considerably significant. Exploration of possibly unbalanced relationships would further the research in the next steps. Any possibility of an ethnographic case study of the ID team by conducting a 360-degree performance appraisal (i.e., collecting information from all directions and sources with respect to the ID team's performance) can shed additional light on job performance of IDs in an educational setting. Application of the Western mindset in differing cultures with respect to instructional designers' dynamics with faculty is worth probing (Pan, Tsai, Tao & Cornell, 2002). Over the years, whereas the ID team at UCF has gone through group socialization, it has also moved to a certain level of bureaucracy, which might hamper the ID's individual job performance and, ultimately, degrade team effectiveness (e.g., creativity and tolerance to change) (Brown, 2000; Levi, 2001). This balance between the prevailing bureaucracy and the implementation of innovative uses of instructional design is also an issue of interest to Thompson:

> *But I think as we have grown more established in ID [as a] team as we have more process and procedures, documents, and the trapping of bureaucracy…I am curious myself to what degree that tolerance to change is still there with individual or the team as a whole. I think within an individual primarily it is there, but with a team as a whole I wonder if it is there.*

After all, this case study documents, in detail, the robust relationship of the ID and faculty by examining the ID's personal traits, needs, and philosophical beliefs of teaching. The paper can help other IDs with in-depth insights in better serving their clients in a time-efficient fashion, especially in the context of higher education. The value of this case study lies in its identification of the significant part an ID can play within an academic unit. It also provides university instructors with a closer look at the potential relationship and interaction with IDs. Moreover, it can allow university administrators to further examine how their systems might benefit from the UCF model and experiences, like job (re)design, resource allocation, and ID recruitment.

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References

Bode, R. K. (1999). Mentoring and collegiality. In R. J. Menges, & Associates (Eds.), *Faculty in new jobs: A guide to setting in, becoming established, and building institutional support* (pp. 118-144). San Francisco: Jossey-Bass.

Brown, R. (2000). *Group processes* (2nd ed.). Malden, MA: Blackwell.

Condit, C. M. (1996). Theory, practice, and the battered (woman) teacher. In K. J. Mayberry (Ed.), *Teaching what you're not: Identify politics in higher education* (pp. 155-174). New York: New York University Press.

Cooper, C. L., & Locke, E. A. (Eds.). (2000). *Industrial and organizational psychology: Linking theory with practice*. Oxford, England: Blackwell.

Cornell, R. A. & others. (1989). *Technology in instruction: Standards for college and university learning resources programs* (2nd.). Washington, DC: Association for Educational Communications and Technology.

Cornett, J. W. (1990). Utilizing action research in graduate curriculum courses. *Theory Into Practice, 29*(3), 185-195.

Cornett, J. W., Yeotis, C., & Terwilliger. L. (1990). Teacher personal practical theories and their influence upon teacher curricular and instructional actions: A case study of a secondary science teacher. *Science Education, 74*(5), 517-529.

Eisner, E. W. (1998). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice.* Upper Saddle River, NJ: Prentice-Hall.

Ertmer, P. A., & Quinn, J. (Eds.). (1999). *The ID casebook: Case studies in instructional design*. Upper Saddle River, NJ: Merrill.

Farr, J. L., & Middlebrooks, C. L. (1990). Enhancing motivation to participate in professional development. In S. L. Willis, & S. S. Dubin (Eds.), *Maintaining professional confidence* (pp. 195-213). San Francisco: Jossey-Bass.

Farr, R. M. (1977). On the nature of attributional artifacts in qualitative research: Herzberg's two factor theory of work motivation. *Journal of Occupational Psychology, 50*, 3-14.

Frost, S. H., & Teodorescu, D. (2001). Teaching excellence: How faculty guided change at a research university. *The Review of Higher Education, 24*(4), 397-415.

Glesne, C. (1999). *Becoming qualitative researchers: An introduction* (2nd ed.). New York: Longman.

Graen, G. B. (1966). Motivator and hygiene dimensions for research and development engineers. *Journal of Applied Psychology, 50*(6), 563-566.

Grimmett, P. P., & Erickson, G. L. (1988). *Reflection in teacher education*. New York: Teachers College Press.

Harris, R. W. (1999). Attitudes towards end-user computing: a structural equation model. *Behaviour & Information Technology, 18*(2), 109-125.

Herzberg, F. (1966). *Work and the nature of man*. Cleveland, OH: World Publishing.

House, R. J., & Wigdor, L. A. (1967). Herzberg's dual-factor theory of job satisfaction and motivation: A review of the evidence and a criticism. *Personnel Psychology, 20*(4), 369-389.

Julian, M. F. (2001). *Learning in action: The professional preparation of instructional designers.* Proceedings of the National Convention of the Association for Educational Communications and Technology, USA, 1, 200-208.

Kaufman, H. G. (1990). Management techniques for maintaining a competent professional work force. In S. L. Willis, & S. S. Dubin (Eds.), *Maintaining professional confidence* (pp. 249-261). San Francisco: Jossey-Bass.

Kaulio, M. A., & Karlsson, I. C. M. (1998). Triangulation strategies in user requirements investigations: a case study on the development of an IT-mediated service. *Behaviour & Information Technology, 17*(2), 103-112.

Levi, D. (2001). *Group dynamics for teams.* Thousand Oaks, CA: Sage.

Liang, C. C. (1999). Benchmarking competent instructional media designers in the corporate world. *Educational Media International, 36*(4), 317-320.

Mouly, V. S., & Sankaran, J. K. (1999). Barriers to the cohesiveness and effectiveness of Indian R&D project groups: Insights from four federal R&D organizations. In J. A. Wagner III (Ed.), *Advances in qualitative organization research: Vol. 2* (pp. 221-243). Stamford, CT: JAI Press.

Pan, S., Tsai, M. H., Tao, Y. D., & Cornell, R. (2002, October). *Technology's impact: symbiotic or asymbiotic impact on differing cultures?* Paper presented at the annual meeting of International Council for Educational Media, Granada, Spain.

Pinder, C. G. (1998). *Work Motivation in Organizational Behavior.* Upper Saddle River, NJ: Prentice Hall.

Ringer, T. M. (2002). *Group action: The dynamics of groups in therapeutic, educational, and corporate settings*. London: Jessica Kingsley Publishers.

Rowland, G. (1992). What do instructional designers actually do? An initial investigation of expert experience. *Performance Improvement Quarterly, 5*(2), 65-86.

Sanches, M. (1993). The teachers as school governors: Patterns of personal practical organizational perspectives. *Journal of Structural Learning, 12*(1), 23-34.

Silverman, D. (2000). *Doing qualitative research: A practical handbook*. London: Sage Publications.

Snodgrass, S. E. (2001). Correlationl method for assessing interpersonal sensitivity with dyadic interaction. In H. A. Hall, & F. J. Bernieri (Eds.), *Interpersonal sensitivity: Theory and measurement* (pp. 201-218). Mahwah, NJ: Lawrence Erlbaum Associates.

Summers, L., Lohr, L., & O'Neil, C. (2002, January/February). Building instructional design credibility through communication competency. *TechTrends, 46*(1), 26-32.

Tattersall, A. J., & Morgan, C. A. (1997). The function and effectiveness of dynamic task allocation. In D. Harris (Ed.), *Engineering psychology and cognitive ergonomics, Vol. 2: Job design and product design* (pp. 247-255). Burlington, VT: Ashgate Publishing.

Tellis, W. (1997, July). Introduction to case study. *The Qualitative Report, 3*(2). Retrieved May 28, 2002, from http://www.nova.edu/ssss/QR/QR3-2/tellis1.html

University of Central Florida. (n.d.). *Faculty handbook* (chap. 3). Retrieved June 4, 2000, from http://www.ucf.edu/provost/handbook/chapter0305.html

van Merrienboer, J. J. G. (1997). *Training complex cognitive skills: A four-component instructional design model for technical training*. Englewood Cliffs, HJ: Educational Technology Publications.

Vandervert, L. R., Shavinina, L. V., & Cornell, R. A. (Eds.). (2001). *Cybereducation: The future of long distance learning.* Larchmont, NY: Mary Ann Liebert.

Votruba, J. C. (1990). Strengthening competence and vitality in midcareer faculty. In S. L. Willis, & S. S. Dubin (Eds.), *Maintaining professional confidence* (pp. 214-232). San Francisco: Jossey-Bass.

Yin, R. (1994). *Case study research: Design and methods* (2nd ed.). Beverly Hills, CA: Sage Publications.

Zucker, D. M. (2001, June). Using case study methodology in nursing research. *The Qualitative Report, 6*(2). Retrieved February 12, 2002, from http://www.nova.edu/ssss/QR/QR6-2/zucker.html

P R D Theory Personal Relationship Development Learning How to Develop Personal Relationships: A Theory of Instruction for Self-Directed Learners a Theory of Instruction

Sari M. Pascoe

Daniel Pascoe

Introduction

My intent is to develop an instructional theory to assist Self Directed Learners (SDLs hereafter) to learn how to monitor their learning process and develop needed skills to successfully reach identified learning goals. The purpose is to design instruction that makes learning painless, efficient, and a truly enjoyable experience for the learner (Reigeluth, 1999 [online]). One of my objectives is to assist SDLs to identify what methods of instruction to use in different situations. I intend to do so by creating a knowledge base about methods to support SDLs in their quest for independent growth and learning (Reigeluth, 1999 [online]).

Goal and Preconditions

The primary goal of the Personal Relationship Development (PRD) theory is to assist SDLs in learning to establish, develop and nurture healthy patterns of communication in long-lasting, meaningful personal relationships. The purpose is that SDLs take responsibility for structuring their learning process. A way to do this could be by setting expectations, designing assessment, facilitating practice and feedback opportunities, transferring performance skills into new situations, and evaluating their performance.

PRD theory is specifically designed for youth and young adults entering long-lasting, meaningful relationships; independent adults who are new partner(s) in personal relationships; and for recently divorced adults who are starting new relationships. In my experience, I have learned that there is not a formal education forum for the general public that instructs how to develop communication skills to nurture and maintain healthy personal relationships. Therefore, I am targeting this audience with the objective to assist them in their journey to strengthen and improve their performance, participation and expectations in their personal relationships.

A secondary audience could include families, counselors and advisors (e.g. ministers), classroom teachers and professors. Criteria that support the identification of this secondary audience are based on the access these individuals have to formal education settings. For example, if a teenager were exposed to structured mentoring and support environments that explored personal needs, strengths, and interests during his or her academic development years as a preventive approach to developing healthy personal relationships, I believe that a greater number of adults in society would be more satisfied with their performance and expectations of personal relationships in their lives.

In conclusion, PRD theory has been developed with the purpose to assist SDLs in their quest to identify, design, develop, nurture and strengthen meaningful, long-lasting relationships that could function as their support system through life. I believe instructional support is highly needed in this area of human development and I have designed the PRD theory as a first step toward addressing this need.

Principles and Values

Some of the principles and values upon which PRD theory is based include the following:

People learn at different rates. Most formal academic environments function under an old paradigm of learning that believes an individual learns a fixed amount of content in a fixed amount of time efficiently and successfully (Reigeluth, 1999). This is why most school systems continue to support and implement assessment tools such as standardized testing. PRD theory will try to reconcile the need to recognize and praise the abilities developed by SDLs as a new paradigm emerges, moving away from standardization into customization (Reigeluth, 1999).

Different instructional methods are needed in different learning situations. I believe that SDLs must be responsible for identifying best instructional methods for particular learning situations: cognitive learning domain, affective learning domain, motor learning domain. PRD theory aims to provide a knowledge base to help SDLs in their quest for independent growth and learning.

Personal Motivation should be the driver for learning and sustainability efforts. I believe that SDLs should develop a drive to pursue growth and learning through a lifetime. A key element in sustaining their independent efforts to succeed in set personal goals is their motivation to achieve them. PRD theory aims to provide structure to help SDLs maintain a high level of motivation through goal achievement.

Careful selection of learning topics should facilitate understanding and transference of knowledge into new situations. Understanding happens when the learner makes/creates relationships among elements of knowledge. By constructing these relationships, knowledge elements are organized into structures, called schemata (Reigeluth, 1999). I believe that when SDLs link constructed schemata, new learning occurs enabling them to transfer previous knowledge into new situations. PRD theory assists SDLs in constructing schemata inductively.

Contribution

PRD theory provides an inductive approach (from real situation to theory) to structuring, analyzing and successfully learning to establish patterns of communication in meaningful relationships. It is a constructivist approach to relational development. The latter is an utterly important aspect this instructional theory has to offer.

Throughout our academic and individual development within our families and social groups, we have mostly been taught to relate to others under a Behavioristic approach.

For example, growing up we have been taught to interpret that if a friend talks to one every day that means the relationship is healthy, but if the friend stops talking to one for a period of time that must mean the relationship has broken (Stewart, 1990). A behavioristic approach to human relations engages individuals in judging attitudes, emotions and behaviors toward relationships, both inwardly and outwardly. In 1986, Albert Bandura [Self-Efficacy Theory] advanced a view of human functioning in which an individual is viewed as self-organizing, proactive, self-reflecting and self-regulating rather than as a reactive organism shaped by environmental forces or driven by concealed inner impulses (Pajares, 2001).

PRD theory gives attention to the possibility of entering and developing long-lasting, meaningful relationships from a Constructivist stand point in which all involved parties purposefully contribute to the construction of schemata resulting in a constantly novel, authentic and self-renewing relationship.

Literature Review

PRD theory is the product of a number of instructional theories. It came to exist based on a perceived need to address relationships and human interaction from a unique perspective. In order to understand how this theory functions and its implications, we must first identify the knowledge base that supports its structure.

Self-Directed Learners

According to Robotham (1995), master SDLs demonstrate ability to identify learning needs, have a positive self-image about their achievement capacity, know how to set and attain goals, have expertise in selecting or devising new strategies for different situations, are self-motivated and self-disciplined, are flexible in setting objectives, know their learning strengths and weaknesses, and demonstrate knowledge and skill in learning (Robotham, 1995, p. 6). The success of SDLs in establishing and developing healthy personal relationships is dependent of each and all of these characteristics. The more ready an individual is to direct his/her own learning, the higher degree of success in attaining his/her goals. All individuals are potential SDLs. The more guidance (vs. imposed control) received during developing years, the greater the number of self-directed skills attained/mastered.

According to Lowry (1989), one way in which an individual demonstrates self-directedness is when s/he can be in control of learning topics, resources, content, and assessment (Oswald, 2001, p. 6). Grow (1991) developed a model of self-directed learning (SSDL – Staged Self-Directed Learning). He believes an individual moves from a dependent to a self-directed stage in his/her instructional decisions. Stage one learners (dependent) require coaching with immediate feedback; stage two learners (moderate) are interested and responsive to subject matter but ignore content; stage three learners (intermediate) are pro-active in their educational experience; stage four learners (self-directed / independent) take responsibility for their learning, direction and productivity (Grow, 1991, p. 134). In PRD theory, SDLs are encouraged to move through different stages of performance depending on specific learning goals they are trying to achieve. SDLs must be in control to choose next steps in their learning journey.

Garrison proposed that learners should have choices, flexible pacing and multiple resources in their learning process. He suggested that when an individual is in control of external conditions to his/her learning, s/he actively makes learning meaningful by monitoring his/her own learning process (Garrison, 1997). It is based on Garrison's proposal that learner choice and control of learning situations are values of PRD theory because they increase intrinsic motivation. SDLs are responsible for maintaining high levels of motivation that can carry them through their efforts as they accomplish goals.

Self-Efficacy

Self-efficacy is the *belief* in one's capabilities to organize and execute the sources of action required to manage prospective situations. Self-efficacy influences the choices we make, the effort we put forth, how long we persist (when we confront obstacles and in the face of failure), and how we feel (Bandura, 1986). In PRD theory, the inclusion of Bandura's Self-efficacy principles could assist SDLs in focusing their vision and finding motivation toward achieving learning goals and growing in their personal relationships.

Self-efficacy beliefs are at the core of human motivation, well-being and personal accomplishment because when an individual believes that his/her actions can produce the outcomes desired, s/he has the incentive to act or persist in the face of failure (Pajares, 2001). In 1997, Bandura contended "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively true" (Bandura, 1997, p. 2). Since then, Bandura has conducted innumerable research studies to arrive at reliable conclusions. Pajares (2001) says that behavior can be better predicted by the beliefs an individual holds about his/her capabilities than by what s/he is actually capable of accomplishing. He believes self-efficacy perceptions help determine what individuals do with the knowledge and skills they have.

Cognition and Understanding

Reigeluth and Moore (1999) concluded that most theorists categorize kinds of learning in three domains: cognitive, affective, and physical/motor. Cognitive learning is the ability to recall or recognize knowledge, which results in the development of understandings and intellectual abilities/skills. In PRD theory, cognitive learning is one of three kinds of learning domains SDLs must master and transfer to establish, maintain and develop healthy personal relationships.

Gardner (1999) suggested that the observation, assessment and improvement of applied knowledge content are measurements of understanding. Mental representations are validated when activated by performance. Further, he believes that an emphasis on performance stimulates the learner's acquisition of concepts and constitutes the best way to achieve enhanced understanding of content. PRD theory envisions learning environments in which practice, application and performance are conducive to learner's understanding of differences and strengths in a personal relationship.

Perkins and Unger (1999) wrote that learning with understanding yields learner's higher engagement, increased active use and transfer of knowledge, and its improved retention (Reigeluth, 1999, p. 95). PRD theory promotes SDLs' acquisition, performance and practice of understanding in their learning process, which could significantly improve the quality of lines of communication in their personal relationships.

Learning Environments

Corno and Randi (1999) suggest that creating an environment that is conducive to learning starts with the generation of appropriate instructional methods that foster self-regulated learning. This is supplemented by providing ample opportunities to engage in self-regulated learning and to feel successful via the identification of self-regulatory strategies in literature and learner's life experience. In PRD theory, SDLs are encouraged to develop and nurture learning environments that foster self-directed learning for the benefit of all active participants in the relationship. SDLs are expected to design and customize their learning environment.

Kovalik (1999) identifies the 'absence of threat' as an indispensable element in establishing healthy learning environment. In PRD theory, SDLs must own their learning process by having full control over their learning environments, actions, thought process, and conflicts. Hannafin, Land, and Oliver (1999) identify two kinds of learning environments: directed and open-ended. In the latter one, the learner defines meaning, establishes learning needs, determines learning goals, and engages in learning activities independently. In PRD theory, SDLs define their learning environment depending on the goal to be achieved.

Another important element of learning environments according to Jonassen (1999) is the "constructivist conceptions of learning, which assumes that knowledge is individually constructed and socially co-constructed by learners based on their interpretations of experiences in the world." In PRD theory, SDLs engage in construction of new schemata by solving new dilemmas through the assistance of previous knowledge.

Physical and Affective Domains

Romiszowski (1999) wrote an instructional theory for the development of physical skills through which he identified three major methods toward developing physical skills. These are 1) imparting knowledge of what should be learned via expository and discovery-learning techniques; 2) developing basic skills via demonstration and controlled practice; and 3) developing proficiency (automatization, generalization) via shared knowledge, opportunities for practice, offering of feedback, promotion of transfer, and development of inner-self. In PRD theory, SDLs are encouraged to explore the development of physical/motor skills to improve the communication in their personal relationships by incorporating the above-mentioned methods.

Martin and Reigeluth (1999) consider that affective domain refers to the development of internal changes or processes, while affective education refers to education for personal-social development of feelings, emotions, morals and ethics. In PRD theory, SDLs must develop, practice and master affective skills in their personal relationships to maintain a healthy balance between actions and feelings.

Affective education includes work conducted by Goleman (1995). He researched about theories on the architecture of the brain and human evolution, which have shaped his understanding of how the human brain responds to dilemmas. Goleman says there are two systems in the brain, an emotional brain and a thinking brain. While the emotional brain tends to engage first when an individual is faced with a challenge, the thinking brain is still processing the information. Goleman identified this process as 'emotional intelligence.' He says that the development and strengthening of emotional intelligence can assist learners grapple with problems by managing their feelings, becoming more self-aware and improving their cognitive skills as they become more empathic (Reigeluth, 1999, p. 488). In PRD theory, SDLs could master the affective learning domain in their personal relationships by developing emotional intelligence.

Instructional Design

PRD theory intends to provide SDLs with methods that are relevant to real-life situations as they journey to establish, develop and nurture healthy personal relationships. Methods could be implemented sequentially or cyclically. By this I mean, the methods in my instructional theory have been designed to foster growth in specific learning domains. Some methods are geared toward improving affective learning, others are better suited to assist cognitive learning, and yet others are specifically designed to develop physical/motor learning. It is the responsibility and choice of SDLs to identify what methods are appropriate for the successful accomplishment of specific goals.

Personal relationships are ever evolving and intricately complex. In many instances, after defining specific goals and objectives, SDLs could find that in the process of achieving those goals, new goals and objectives could surface. SDLs are encouraged and, to some extent, expected to re-evaluate and assess growth opportunities as they present, while maintaining a balance between motivation and success.

Organization of Design

Each of the six methods described in this section contains two or three sub-methods. To assist SDLs in acquiring proposed learning concepts, each sub-method is broken down into two different sections. First is Purpose, which briefly describes the importance and focus of each particular sub-method within the context of its method. Second is Suggested Application, which explores possible applications of each sub-method via a heuristic approach. [For the purpose of this Proceedings document, I have decided to exclude the Suggested Application sections as they are in the process of being published in a book.] I deemed important to include these two sections to clearly describe, explain, and give closure to each sub-method. I believe these sections assist a learner's ability to acquire and transfer knowledge as s/he explores the PRD theory.

Methods

Construct the Environment - Goals

'Construct the Environment' is a crucial method, purposefully placed as a starting point in any given instance of the learning process. SDLs are charged with the responsibility of identifying the degree of motivation and scope of vision necessary to drive the efforts invested in their relationship into successful outcomes. Most importantly, SDLs need to accommodate their personal interests to those of their partner(s) via a contract (as defined below) with the purpose of creating a safe environment free of threat (Reigeluth, 1999 [Kovalik]) for either party. Constructing the Environment has two sub-methods that address specific arenas of development.

1) Explore and create a contract of performance

The purpose of this sub-method is to assist SDLs in naming boundaries, identifying goal(s), initiating engagement, and committing to actively participate in the relationship. SDLs are responsible for determining expected performance during the exploration of new ways to communicate with their partner(s). This is a key sub-method to clarify and understand roles in the relationship by giving and receiving feedback that encourages and expects active participation. The goal of this sub-method is for SDLs to reach a performance agreement with their partner(s) in their quest for growth and improved communication.

2) Consider investment

In this sub-method, SDLs are responsible for estimating their level of investment and intrinsic motivation during the learning process. SDLs must decide whether to believe their actions could produce the desired outcomes, and whether they have the motivation to persist in the face of challenge (Bandura, 1997). Appraising levels of investment and motivation could determine the likelihood of successfully reaching desired performance objectives in the relationship, or failing in the attempt to improve the performance of all involved parties.

Elicit Exploration – Means

'Elicit Exploration' is the next method to 'Construct the Environment.' After identifying boundaries and investment, SDLs have to search for sources of support in their journey toward improving their personal relationship. The purpose of this method is to assist SDLs with the identification of tools and means that could facilitate their learning process. There are two sub-methods to eliciting exploration.

1) Implement new research modes

The purpose of this sub-method is for SDLs to explore and identify tools that could assist them in learning more about themselves and their partner(s) (i.e. MBTI --Myers-Briggs Type Indicator). Identifying priorities and individual characteristics is of equal importance because these shape the focus and relevance of new learning goals in the relationship. Implementing strategic research modes presumes that involved parties in the relationship are actively interested in learning more about themselves and the other(s).

2) Provide safe space for new experience

The purpose of this sub-method is to create ample opportunities to experiment individual and shared performance in the relationship. By promoting and pursuing safe forums for communication and performance, SDLs could develop healthy lines of communication based on trust, safety, and 'absence of threat' (Reigeluth, 1999 [Kovalik]). Each person in the relationship is in control of the learning process, and able to form new partnerships.

Apply Understanding – Cognitive Learning ①

The 'Apply Understanding' method refers to the cognitive learning domain. The purpose is to develop reflection skills and form collaboration partnerships as SDLs transfer and automatize performance skills. This method includes three sub-methods.

1) Develop reflection skills

The purpose of this sub-method is for SDLs to conduct self-assessments specifically for the purpose of identifying whether it is necessary to ask for help (e.g. counseling). Counseling is suggested as a tool for reflection because the process of reflecting on inner-needs and characteristics can be confusing, specially when simultaneous to attempting to care for and reflect on one's partner(s)' needs and characteristics. SDLs are expected to identify the need and appropriateness of asking for help.

2) Create collaboration partnerships

The purpose of this sub-method is to seek support from experts, mentors, literature and/or friends. This sub-method is designed as a support tool to the previous sub-method. Given that counseling is a viable option in the relationship, support tools will be needed to strengthen efforts toward developing a healthy personal relationship. Relying on others to assist the learning process is a tool SDLs must use time and again. This sub-method should be implemented as a structured support system.

3) Transfer and automatize performance skills

The purpose of this sub-method is for SDLs to develop abilities toward the application of learning in new situations. In new learning situations new knowledge can become overwhelming if it is not practiced, causing the understanding of content to be lost. When SDLs acquire new knowledge, they should reflect on its impact and consequences on themselves and their partner(s), to finally apply it to new situations. Transferring new knowledge into new situations will equip SDLs with tools to master different cognitive learning arenas. By transferring new knowledge and practicing it consistently, automatization of new skills becomes inevitable.

Identify Alternatives – Affective Learning ②

The 'Identify Alternatives' method refers to the affective learning domain. In this method, SDLs recognize affective limitations and needs, and identify possible solutions. This is an important method because it addresses the emotional state of individuals and their relationships. SDLs must be diligent and systemic in their approach to learning in the affective domain in order to address their own and their partner(s)' needs respectfully and punctually. There are two sub-methods to identifying alternatives.

1) Recognize needs, wants and compromises

The purpose of this sub-method is for SDLs to identify individual and relational orientations and collaboration patterns. SDLs are in charge of distinguishing and sharing what they *would like* to have or see happen in their relationship, what they *need* to have or see happen in their relationship, and what they *could give up or compromise* in their relationship with the ultimate goal of learning and growing. Identifying needs, wants and compromises is a conflictive process for most individuals and relationships. It requires SDLs to be timely, purposeful and determined in their attempts to learn from themselves and their partner(s).

2) Implement possible alternatives

The purpose of this sub-method is for SDLs to actively identify alternative solutions and best ways to implement them. SDLs must purposefully engage in meaningful dialogue to suggest, model and understand different approaches to addressing needs, wants and compromises in the relationship.

Assist Practice – Physical/Motor Learning ③

The 'Assist Practice' method refers to the physical/motor learning domain. SDLs are encouraged to address physical/motor needs periodically in their personal relationships because these usually account for a large percentage of the needs and wants of each party in the relationship. This method focuses on practicing new performance skills, enabling feedback opportunities, and appraising motivation. There are three sub-methods to assisting practice.

1) Practice new performance skills

The purpose of this sub-method is to provide ample opportunity to apply new skills. The learning and development of physical/motor skills is easily neglected in personal relationships. Allowing safe spaces for practice could ensure improved communication and enhanced participation in the relationship.

2) Enable feedback opportunities

The purpose of this sub-method is for SDLs to find ample opportunities to evaluate success or interpret and analyze failure. As new skills are applied and practiced, success and failure performance areas should be determined and addressed. SDLs are encouraged to embrace performance results and carefully analyze patterns of behavior and response to needs and wants.

3) Appraise motivation

The purpose of this sub-method is for SDLs to re-assess intrinsic and extrinsic motivators. When physical learning is being practiced for mastery and automaticity, assessment of motivation levels is a key element that could elicit success or failure in the performance. Evaluating levels of motivation could determine long-lasting efforts of improvement.

Facilitate Evaluation – Closure

'Facilitate Evaluation' is the last of the sequential methods offered by the PRD theory. The purpose of this method is to give closure to a stage, to assess areas of growth, and to discover next steps. SDLs are expected to actively implement this method before moving to the identification of new goals and objectives. There are three sub-methods to facilitating evaluation.

1) Give closure to a stage

The purpose of this sub-method is for SDLs to develop the ability to recognize the end of a growth, comfort, or faulty stage/situation in the relationship. A growth stage is one that has been determined successful by involved parties in the relationship. A comfort stage is one that impairs SDLs to move forward and begin addressing new challenges. A faulty stage is one that has been determined a failure by any involved parties in the relationship. SDLs are urged to acknowledge and address the existence of any of these three stages in their relationship. SDLs are responsible for identifying the need for closure to any given stage.

2) Assess areas of growth

The purpose of this sub-method is for SDLs to create environments and practice communication routines that elicit feedback about accomplishments. SDLs should focus their strength, effort, motivation and decision-making on the accomplishments of their learning process. Growing stronger and healthier relationships is very hard work. Acknowledging accomplishments is a reward that needs to be systematically implemented by SDLs.

3) Discover next steps

The purpose of this sub-method is for SDLs to identify new challenges and establish a vision for next steps in their relationship. This sub-method is conducive to a new ‘constructing the environment’ method, which is designed to begin any learning effort in the relationship. SDLs are expected to design and envision next steps toward new learning and growth.

Discussion

PRD theory is meant to be but only a first step toward providing SDLs with tools to improve their personal relationships. It briefly addresses parallel issues of importance such as motivation, self-esteem, vision, effort, and investment, among others; these, and many other learning elements must be present during the decision-making process, construction, implementation and assessment of SDLs performance in their personal relationships.

PRD theory offers SDLs a generalized and systemic approach to daily functioning in a personal relationship. The scope of my theory precludes it from being clinical or scientific in its approach or content. The purpose of the PRD theory is to support SDLs in developing skills that could assist them in identifying, establishing, developing and nurturing healthy personal relationships.

The Presentation of the PRD theory in the AECT 2002 conference described the application of one sub-method over a period of six months. The purpose of the research conducted was to ground one instance of the theory in practice to assess its value and effectiveness. If you are interested in receiving information about this study and its impact in the lives of study participants, please contact me at spascoe@indiana.edu.

Personal Investment

I have been involved in a meaningful personal relationship for the past fifteen years. During this time, I have developed communication skills in this relationship that have strengthened and sustained it through time. However, it has only been by chance that in my experience I have found necessary skills, tools, and communication patterns for my relationship to survive. By this I mean, no one ever taught me how to relate or behave in a meaningful relationship. I have had to force myself to think in new ways, re-focus my goals and search for new meanings; this has meant being intrinsically motivated to investing myself when I am emotionally drained, stumbling into walls to change decision-making patterns, and picking-up the pieces to continue making it worthwhile.

Through this pragmatic process I have wondered, why is it that I was never provided with tools to manage a personal relationship while growing up. As I started turning to friends for support, advice, mentorship or modeling, I could not find healthy relationships from which to feed my desire to improve, grow and learn. I realized that most adult meaningful, long-lasting relationships struggle to make sense of their nature and purpose. Therefore, I saw an imminent need to design an instructional theory (PRD) addressing this aspect of human performance.

It is my intent to propose a theory that systemically and systematically provides SDLs with tools and structures that support their efforts as they struggle and journey toward developing healthy patterns of communication in their personal relationships. I believe meaningful relationships in the life of an individual could become the axis of all personal and social functions. They could serve as a support system in times of pain and dismay. They could provide strength in times of success and growth. But most importantly, healthy meaningful personal relationships could serve as the backbone to a happy and balanced life. I wonder why I have not yet found a publicly accessible instructional theory that addresses this aspect of our human performance.

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Next Steps

The PRD theory must recognize that personal relationships are ever evolving and that new patterns of communication and new schemata must be constructed on a daily basis to sustain growth efforts. Therefore, PRD theory must envision the inclusion of new development steps toward supporting its goal and methods. My goal in publishing the PRD theory as a means of publicly stating: we need instructional theories in this area of human performance.

References

Bandura, A. (1986). Social Foundations of Thought and Action: A Social Cognitive Theory. Prentice Hall. Englewood Cliffs, NJ.

Bandura, A. (1997). Self-Efficacy: The Exercise of Control. Freeman Publishers. New York, NY. USA.

Garrison, D. R. (1997). Self-Directed Learning: Toward a Comprehensive Model. [online]. Adult Education Quarterly. Volume 48, p. 18-34. EBSCO: ISSN: 0741-7136.

Goleman, D. (1995). Emotional Intelligence. Bantam Publishers. New York, NY. USA.

Grow, G. O. (1991). Teaching Learners to be Self-Directed. Adult Education Quarterly. Volume 41, Number 3, p. 125-149.

Lowry, C. M. (1989). Supporting and Facilitating Self-Directed Learning. [online] Columbus, Ohio: ERIC Clearinghouse on Adult, Career, and vocational Education. ERIC#: ED312457.

Oswald, D. (2001). Self-Directed Learning: A Review of Literature to Inform Instructional-Design Theory Development. IST Department, Qualification Exam Committee Question. Indiana University, Bloomington.

Pajares, F. (2001). Overview of Self-Efficacy. [online] http://www.emory.edu/EDUCATION/mfp/eff.html. Emory University. School of Education.

Popper, K. (1962). Conjectures and Refutations: Growth of Scientific Knowledge. Basic Books Publishers. New York, NY. (p. 33-65)

Reigeluth, Charles, M. (1999). Instructional-Design Theories and Models. A New Paradigm of Instructional Theory. Volume II. Lawrence Erlbaum Associates, Publishers. USA.

Reigeluth, Charles, M. (1999). Instructional-Design Theories Site. [online] http://www.indiana.edu/~idtheory/methods/m1a.html. Indiana University, Bloomington. School of Education.

Robotham, D. (1995). Self-Directed Learning: The Ultimate Learning Style? [online]. Journal of European Industrial Education. Volume 19, p. 3-8. EBSCO: ISSN: 0309-0590

Stewart, J. (1990). Bridges Not Walls. A Book About Interpersonal Communication. McGraw-Hill, Inc. USA.

Global Snapshots of E-Learning: A Series of Case Studies

Ke Zhang

Jonathan U. Dougherty

Rakel-Kavena Shalyefu

Tugay Tutkun

Abstract

This paper will report a series of case studies of e-learning, each of which represents a different region of the world to get a global perspective. An example case from each region of the United Nation's division of the world, was studied, described and compared to the others. These regions included: Africa (Sub-Saharan), Asia and the Pacific, Europe, North America, and Latin America and the Caribbean. The only region not yet represented in our case studies was the Arab States (North Africa and the Middle East).

Introduction

This paper includes a series of case studies on e-learning in varied regions of the world. In this paper we first briefly discuss e-learning perceptions and practices in general. Then five cases of e-learning in a different region of the world will be presented. An example case from each region of the United Nation's division of the world, will be studied, described and compared to the others. These regions include: Africa (Sub-Saharan), Asia and the Pacific, Europe. North America, Latin America and the Caribbean.

These cases represent not only various geographical regions of the world, but also various types of e-learning applications, including e-learning service firm, higher education institutions, and industry using e-learning for training and knowledge management.

Each case will start with a description of the region, focusing on its culture, technology status, and value of learning. Then the authors will zoom in and focus on the selected case with detailed discussions of its e-learning strategy, its propensity for sustaining e-learning and its vision. As Rosenberg (1999, 2001) recommends, the authors will analyze each case with the following criteria, how e-learning is viewed and aligned with business, the current state of e-learning and technology, funding, evaluation, coordination, competition, and instructional development capabilities. In each case the authors will make recommendations with dos and don't for successful e-learning application.

Zhang will report a case study about an e-learning service company in China, focusing on the cultural factors that impact the design and implementation of e-learning. Shalyefu will discuss the challenges faced in implementing e-learning solutions in Namibia. Dougherty will look at the e-learning implementation in a building company in the United States. Tutkun will report the e-learning status in a largest Turkey university.

References

Rosenberg, M. J. (1999). E-Learning: Strategies for Delivering Knowledge in the Digital Age. McGraw-Hill.

Rosenberg, M.J. (2001). E-Learning: Building Successful Online Learning in Your Organization. New York, McGraw Hill.

Global Snapshots of E-Learning: A Series of Case Studies An E-Learning Dot Com in China

Ke Zhang

Abstract

This paper reports a case study on an E-Learning service company in China, which will be referred to as EL.com throughout the paper. This paper starts with a brief review of the current e-learning status in China, and follows with a selected case of e-learning service company. The case study provides detailed description of and analysis on the perception and practice of e-learning, and concludes with recommendations and discussions on the key elements for engaging e-learning, as indicated in this particular case.

The Bigger Picture: E-Learning in China

Distance education has progressed in China aggressively since the 60s with nationwide television systems (Carr-chellman and Zhang, 2000; Gao, 1991; Howells, 1984; Keegan, 1994). Varied technologies, such as telephone, television, satellite televising systems, correspondence, and face-to-face learning centers across the country have been integrated for distance education since then, which is typically vocation-oriented (Carr-Chellman and Zhang, 2000).

In recent years there has been a surge of online learning in China (Carr-Chellman & Zhang, 2000; CERN, 2001). In 1999, the central government of China and the Ministry of Education announced a development plan for "modern open distance education" with networking technologies. Since then, the government has taken a series of initiatives to promote joint efforts from varied parties for developing "modern distance higher education" in China. As of 2001, two years later, China has thirty-one accredited universities providing on-line education packages and has approximate 190,000 registrants (CERN, 2001). At the same time, increasing number of non-traditional learning institutions become available, most of which provide web-based certificate programs.

In the past three years, internet and networking technologies have been utilized in all level of educational institutions, from K-12 to higher education, for varied purposes (e.g., information and communications, teaching and instruction, and other learning activities). Many institutions are now providing some sort of e-learning opportunity to enrolled students and/or public. Most of the applications, however, are limited to communication and information updates. A few corporations, with partnership with higher education institutions, are in the early stage of active marketing for the new concept of e-learning.

An E-Learning Dot Com: General Information

Established in 1999, EL.com is one of the few companies in China providing e-learning products and services to individuals. Although named as a vendor for general e-learning, the company specializes in information technology and other e-commerce related learning with an e-commerce certificate program. As the targeted customers are individuals and not organizations, the current e-learning services focus on individuals, and for organizations the services is limited to a lower rate for company/group registration. The company offers some highly demanded learning packages free to public, such as web design and authorware tutorials. Currently eleven instructors are available for twenty-six courses and five course packages. As of fall 2002,it reports approximately ten thousands online learners daily, mostly from China and some from UK and Canada.

The brick and mortar office of EL.com is in Beijing, capital and cultural center of China. The geographic location makes it more convenient to recruit instructors and subject matter experts among faculty members from the best universities of China. As Chinese culture highly values academia and university brand names have particularly strong marketing power (Carr-Chellman & Zhang, 2000), this partnership has helped the company establish credibility as a learning institution, and thus helped building more confidence in the learning programs.

The course price ranges from 30 Ren Min Bi Yuan (less then 4 US dollars) to 250 Ren Min Bi Yuan (approximately 30 US dollars) per course and 1,500-3,100 Ren Min Bi Yuan (approximately 180 – 380US dollars) per package.

Strategic Partnership

EL.com has established partnerships with the Chinese Ministry of Information Industry (CMII) and Tsinghua University (THU). As a result of the partnership with CMII, learner who have successfully completed the e-commerce learning through EL.com are granted CMII-issued e-commerce certificate. The e-commerce certificate program has thus attracted a lot of interests and participation, and helps EL.com establish a unique, strategic position in competition against rivals. The partnership with THU eases the efforts to recruit instructors and subject matter experts from the high status university, and the big names further attracts learners and strengthens the company's credibility as a learning institution. In the partnerships EL.com is responsible for design and development of the e-learning system in addition to delivery, management and marketing of it.

The strong partnerships with CMII and THU have enabled EL.com to strategically position itself as a provider of convenient learning with famous universities for nationally accredited certifications in addition to all the general advantages of e-learning.

Considering the current technology status in China (see Carr-Chellman & Zhang, 2000 for details), EL.com has built partnership with some local learning centers, who are responsible for local recruitment and management. Thus el.com is able to provide e-learning services to meet the high demands for e-learning, even in less-developed areas.

Status Quo

The company's focus, as of November 2002, is on individuals, not organizations. It is clear that EL.com views e-learning as technology-leveraged learning with a series flexible learning modules.

Consistent with China's current technology status, e-learning through EL.com does not require heavy technology, plug-ins or broadband. The only technology requirement is a standard computer and Internet access. The e-leaming system, including the courseware, information dashboard, instructor's course management system, and learner's learning management system, is available through the world wide web. All the learning activities happen on the Internet or, if chosen by leamers, in local learning centers. Through the geographically dispersed learners and the World Wide Web, EL.com has successfully spread the concept of e-learning.

For EL.com, e-learning *is* the business. Funding for the company comes from private parties, commercial banks, and tuition revenue. Currently the company evaluates e-learning based on learning outcome and learners' satisfaction. Operating as business, learners are considered customers and clients, and learner satisfaction is critical for the company's development. Thus learners' evaluation, comments, suggestion and other feedback are highly valued as the evaluation of the "consumed" e-learning. Those evaluations, if published through the online forums, are open and available to general public. The open evaluation data is very telling and attracting to general public. It helps educate general public about e-learning, which in turn, promote e-learning in general and may develop business opportunities for EL.com.

El.com's major rivals are similar e-leaming service companies in China and higher education institutions offering web-based course and training programs. Yet because of the unique focus on e-learning and CMII-issued certificate, no rivals are competing for the exactly same market with EL.com, and it is not likely to be any in the very near future. Thus EL.com has successfully established a strategic position in the market.

As a start up company, EL.com has only about ten full-time IT professionals and staff in addition to the instructors and SME.

Vision of E-learning

Currently the company has limited its e-learning services to individuals and has not considered organizations as potential clients. Such strategic positioning is consistent with their view of e-learning. As indicated in their current e-learning model, EL.com views e-learning as a new learning method beneficial to individuals with flexibility and convenience, yet its potential to benefit an organization with features as knowledge management and task enabler is not of an interest to EL.com.

E-learning is a brand new idea in China. As one of the pioneers, EL.com has little to learn from others but has to learn while practicing. With general understanding that learning needs to be flexible to meet varied needs of different learners, EL.com offers portable learning modules and enables learners to monitor and manage their own learning through the web-based learning management system.

According to its statement on the company website, its mission is to promote e-commerce by providing related e-learning. Thus all the activities are devoted to e-commerce and related knowledge and skills.

Learning Methods

EL.com markets e-learning as web-based, convenient, flexible and self-adjustable learning. The EL.com website serves as the major venue to the e-learning services it provides. The website is designed with the following four categories, course and service information, cyber space for e-commerce, learner center, and learning forum. The first two categories are open to general public, free of charge, and the last two, learner center and learning forum are available only to registered learners. Course and service session provides detailed information about the courses and learning methods. Cyber space for e-commerce serves as an information dashboard with e-commerce related information, discussion and communication. It has actually emerged as an online community of e-commerce practitioners and others who are interested in e-commerce. Learner center is a learning management system for registered students, where they can monitor the progress, conduct evaluation and adjust the learning pace.

It offers all the courses in portable modules, and students can choose to skip some of the modules and adjust the leaning pace accordingly. All the course materials are offered through email or downloadable from the internet. Learners also have access to asynchronous online forums to communicate with the instructor and peer learners. For some certificate programs, learners can choose to enroll in a face-to-face training session instead of online learning to fulfill the certificate requirement.

The company’s website, which includes information dashboard, courseware, learning management system and virtual community, illustrates that EL.com is trying to offer e-learning to the public through means of information sharing, community support, and interactive collaboration together with learning and instruction. With easy and open access to information and community support, EL.com promotes accidental learning, knowledge sharing and collaboration together with formal learning and instruction.

Instructional Design Issue

In order to gain first-hand experience of e-learning services provided by this company, the author has registered as a student and taken two courses from El.com, both of which were free of charge for public.

As a registered student, the researcher is able to experience e-learning as they define. In general, the learning experience is easy and rewarding. As an experienced online learner, the author dose not find it very difficult to complete the web-based learning. The learning has three major components, instruction, case study, and peer collaboration. The real-world cases are very interesting and challenging, and so are the peer collaborations. However, the instructional materials appear like shovelware (Rosenberg, 2001) at the first sight. In another word, they look like duplication of classroom lectures. The text reads like word-by-word transcript from a classroom lecture. And in most cases, they are simply e-reading. But on the other hand, reading the text is very similar as listening to a lecture in person. The text is written in a personal, dialogue style in most cases. Thus it reads more personal and approachable, and the author, as a learner, feels easily attached to the materials. As a Chinese, the author understands that many Chinese like to learn with the masters, especially in person. So for learners like personal instruction, this type of “shovelware” of a lecture from a famous scholar is not a bad thing at all. Many courses use real-world business cases to illustrate the points, and the major assignments are all real world projects, which are very exciting and motivating, as indicated in students’ evaluations. So in general, the course materials and learning activities are good.

There is no real time instruction or interaction with the instructors. Interactions are only available through the learner’s forums or personal emails. With the time differences, my personal experiences with those communications are rarely in a timely manner, but I suspect it would be much less of an issue for domestic learners residing in China. However, if the company is interested in the overseas Chinese market, as it claims, they would need to address the time issue carefully to achieve customer satisfaction.

Discussion

El.com has a good understanding of the dominant culture about learning and the current technology status in China as well. Accordingly, it has tailored e-learning with limited technology requirement and established strategic partnerships with the influential government and well-known universities. With a simple stated, straightforward mission, EL.com is able to stay focused on the targeted market and population.

With the click-and-mortar operation model, minimum technology requirement, and free or low-cost learning, el.com is able to provide very affordable and accessible e-learning services to the targeted population.

Its partnership with the government and a best university immediately helps EL.com build credibility as a leading company in e-commerce related e-learning. The partnership with the government also helps EL.com build an image as an e-learning champion with powerful authority.

With the online community emerged from the el.com website, the company has successfully attracted not only registered learners but also general public, and potentially people from the cyber community will take some of the e-commerce courses with EL.com and increase its reputation as a leading learning community for that subject area. In addition, for enrolled learners, this cyber space serves as a supporting community, which further promotes e-learning.

From the online communications that the author has accessed to, it is clear that the online community has established a very positive learning culture highlighted with optimism, energy, and hardworking spirit. The free courses from EL.com have attracted more people to participate in e-learning, and thus further promote the learning culture. Such culture in turn eases the efforts to overcome difficulties and challenges associated with e-learning as an innovation. The company website does not provide successful stories to promote e-learning, yet the real-time updated students' evaluation vividly illustrates the success of EL.com. It is obvious that learners are very excited about the new learning method as well as e-commerce, the subject that they are all interested in and enthusiastic about.

Through the online communities, the general e-commerce community and the e-learning community, the company helps learners and general public understand and implement e-learning through communications with a diverse population. I am very surprised to find few complaints about the new learning method, and think the company has done a great job with the communities' help.

Personally, I am very happy and excited with the e-learning experiences with el.com. And I believe that the e-learning they provide has met people's needs with all the technology restraints. As an instructional designer, however, I would like to see more interactive collaborations among peer learners and between learners and the instructor. Being very aware of the lack of instructional design professionals in China, I would like to suggest that e-learning companies in China seek partnership with instructional design professionals or partially outsourcing instructional design tasks.

Although for such a small business it is understandable to not have an e-learning system, I would still like to recommend a knowledge management system for the learners and the company itself. A knowledge management system will enable learners to better manage the often over-loaded information and promote knowledge sharing and collaboration. For the company itself, if the instructors from the top universities and the government can have a shared knowledge management system for knowledge sharing and collaboration, it will further boost their motivation for e-learning. To achieve that, the company needs to secure funding from various channels, including income stream from their e-learning services.

Reference

Carr-Chellman, A. A & Zhang, K., China's Future with Distance Education: Rhetoric & Realities, Information, Communication and Society (2000) 3(3), 303-312

Carr-Chellman, A. A., Fitzpatrick, S., Salt, B., & Zhang, K. (2000). The rhetoric of democracy in international online education. Information, Communication, & Society, 3 (3), pp. 289-348.

Gao, F. (1991). The challenge of distance education in China. American Journal of Distance Education, 5 (2), 54-58.

Howells, G (1989). Distance Teaching in China. Journal of Educational Television, 15 (2), 79-85.

Keegan, D (1994). Very Large Distance Education Systems: The Case of China. ZIFF Papiere 94. EDRS Price - MF01/PC04 Plus Postage.

Rosenberg, M. J. (1999). E-Learning: Strategies for Delivering Knowledge in the Digital Age. McGraw-Hill.

Rosenberg, M.J. (2001). E-Learning: Building Successful Online Learning in Your Organization. New York, McGraw Hill.

Online education Brings Learning Revolution. Retrieved from the World Wide Web on September 20th, 1999 in Chinese at: http://www.online.edu.cn/remoteedu/ycjyxz/gyycjj/lx.htm).

The Central Committee of the Chinese Communist Party (1999). Decisions on Furthering Educational Reform, and Advancing Quality Education in an All-round Way. Retrieved online in Chinese on September 20th 1999 at: http://www.online.edu/cn/remoteedu/xgzc/zy.htm

Important Experiment of Developing Modern Distance Open Education-Interview with Liu Zhipeng, Associate Director of Higher Education Department, Ministry of Education, P. R. China, Retrieved online in Chinese on September 20th, 1999 at: http://www.online.edu.cn/remoteedu/xgzc/fy.htm

Wei, Y. (1999). China's Modern Distance Education. Speech by the Associate Chairman of the Ministry of Education, P.R.China. Delivered at the Conference between Egyptian and Chinese leaders. Available online in Chinese at: http://www.online.edu/cn/remoteedu/ycjyz/gyycjj/zg.htm)

Zhao, Y. (1988). China: Its distance higher-education system. Prospects, 28 (2), 217-228.

Global Snapshots of E-Learning: A Series of Case Studies An E-Learning Application in the United States' Building Industry

Jonathan U. Dougherty

Introduction

The following abstract is based on a case study of the e-learning strategies developed by a nationally recognized construction firm in the United States. The firm concentrates on construction projects in industrial, institutional, and commercial sectors and also serves clients in the advanced technologies market. At the request of the company, any identifying information about the firm will be withheld. To meet the learning needs of the firm's employees, the company established a corporate university.

The firm offers an appropriate technology infrastructure to the majority of its employees. The issue of connectivity at individual construction project sites must be addressed. Time and money are the key factors in providing a solution to this infrastructure concern. As new technology is developed, it will be easier and cheaper to implement an effective infrastructure on an enterprise-wide basis.

More important than issues of appropriate infrastructure is company culture and the readiness and willingness for all of the company's employees to take advantage of such technologies. This culture does not merely exist at this firm but resonates throughout the entire building industry. Construction professionals can be considered traditionalists – they are used to drawing by hand not with a computer, they like to be on the construction site to see and feel what is going on, they like to learn in a classroom with a recognized expert. Clearly, this is a culture, which will not readily embrace e-learning. The adverse understanding of technology is indeed a problem; however, this company has already committed so much into issues of infrastructure, software development for project management, and corporate learning that letting this get in their way would be disheartening. The issue of company culture must be dealt with and overcome.

On the opposite end of the spectrum is the corporate university's ability to build support from top management. Not only are company executive "buying into" the corporate university, they are singing its praises in newsletter articles and developing online classes, which they will teach. Part of the university's success is stakeholder management. All too often, the word stakeholders is accompanied with a negative connotation of people or groups who are quick to point out weaknesses but shy away from offering solutions. This is not the case in this instance. All stakeholders, including senior management, play an integral role in the operation of the corporate university. This is definitely one of the reasons for the success of the firm's corporate university.

E-Learning Strategy

For reasons of confidentiality, the firm was reluctant to divulge specific information on the development and preparation of their learning strategy; however, detailed information was received on the corporate university's stakeholders and their purpose. The firm has adopted the best qualities of stakeholder management into their corporate university. To effectively incorporate the ideologies of the various stakeholders, this corporate university has provided these people with the ability to actively participate in the development, administration, and everyday activities of the learning process.

Propensity for Sustaining E-Learning

This company believes that offering employees an e-learning environment allows them the ability to take charge of their careers by exploring and defining their career aspirations and participating in the firm's success as a leader in the construction industry and in the area of providing lifelong learning opportunities to employees.

The corporate university has a realistic perception of e-learning and is working to build these educational initiatives into a premier construction education and career development source for its employees. The use of a learning management system and an educational intranet website (the company's version of a knowledge management system) is effective to date and addresses the current needs of its users. As e-learning is more appropriately integrated into the learning vision, these systems should be updated to mesh with employee usage and business strategy requirements.

Vision

While the firm's primary focus is the construction business, the company's vision statement revolves around people, both clients and employees, and the desire to provide opportunities for continuous learning. This vision, while seemingly general, is quite telling in its simplicity. The vision statement uses powerful language and allows the corporate university the opportunity to develop and utilize unique and cutting-edge technologies in their pursuit of providing an environment indicative of knowledge sharing and continuous learning for all employees. The firm's mission and vision statements and the adoption of e-learning technologies position the company to not only enjoy a productive future in providing educational initiatives to employees but also to be a leader in construction education throughout the United States.

View of E-Learning / Aligning with Business Objectives

The company has a well established corporate university which serves as the cornerstone of education and training and incorporates applications of electronic learning. To better articulate the value of a corporate university, the firm has done an excellent job of providing senior management and employees with a knowledge base on the importance of continuous learning. This corporate university also recognizes and embraces the ideologies of e-learning, and defines e-learning as online learning with occasional utilization of CD-ROM technologies. The primary emphasis of employee training is technical skills, i.e. courses related to construction management and project controls. They do, however, identify the need for computer and Internet skills and an equal need for leadership and interpersonal education.

Aligning business strategies with the mission of the corporate university is a cornerstone to its success. Business principles must be appropriately integrated into an e-learning strategy to continue to strengthen the role of information and communication technologies. By implementing these core values into the corporate university, the firm can offer a fusion of business strategies and corporate education. This unification will be especially beneficial in rationalizing e-learning and all learning initiatives during difficult economic times when employee training usually takes a backseat to the everyday business of the company.

Current State of E-Learning and Technology

Based on the previously mentioned vision statement for the firm, it is easy to see their continuing dedication to their clients. In addition, the firm places much effort on the attraction and retention of highly motivated employees who can accept the challenges of working in the constantly changing building industry. The reasoning for the building industry being described as changing is due to the wide variety and complexity of construction projects an individual can be a part of during his/her career.

The corporate university is integral to the firm's passion for continuous learning and challenges all employees to learn while providing the knowledge and skills necessary to excel both within the firm and the construction industry. The corporate university strives to balance employee growth and advancement through job experience and company training. The university facilitates access to learning through face-to-face instruction, online courses, a learning management system, an education intranet site, and dedicated learning professionals.

The beacon of the corporate university's e-learning initiatives is the recently introduced learning management system (LMS). This learning management system is made possible through a partnership with a well-known LMS vendor and provides employees with:

- Course catalogs outlining face-to-face and online courses, videos, books, and CD-ROMs
- Personalized employee transcripts to track learning history
- Up-to-date announcements
- Self-registration
- Automated management approval processes
- Track and renew certifications (e.g. Occupational Safety and Health Administration)

With regards to the company's current state of technology, the firm has been recognized by the building industry as a leader in the area of cutting-edge information and communication technologies. However, it is important to point out that the company does experience connectivity issues due to the vast geographic regions, which it serves, and the issues involved with providing Internet and intranet service to individual job sites throughout the United States. Despite the overall readiness of the firm to provide IT services to all of its employees, there are employee readiness factors, which must be considered. Some employees gravitate to the use of Internet and intranet applications for managing construction projects and participating in online learning, and some do not. Issues of company culture and its relation to information technology are omnipresent.

Funding

While specific funding information was withheld by the firm. An article in a company-wide newsletter addresses issues of funding by stating that the firm's annual training expenditures exceed $1000 per employee. This staggering dollar value truly illustrates the firm's dedication to all aspects of learning, including e-learning. The corporate university is provided with no direct cost to the employee.

Evaluation

For reasons of confidentiality, the company did not disclose the methods of evaluation for corporate learning activities. The reviewer established an action plan for the corporate university, and it is presented here to address the evaluation process. It was important for an e-learning strategy to address critical success criterion, and that these factors be a driving force in the implementation of effective and efficient e-learning initiatives. The following criterion should be addressed:

- Ability to meet learner expectations
- Ability to attract and retain employees
- Ability to translate lessons learned from courses to building projects
- Learner satisfaction with e-learning experiences
- Ability to provide meaningful e-learning experiences for all employees at Internet speed
- Ability to offer accurate, relevant, and complete information using e-learning
- Maintaining cost effective solutions
- Adhering to budgetary constraints as mandated by senior management
- Justifying costs/expenditures to senior management

Much emphasis is placed on continuous learning, and undoubtedly, the firm is a pioneer in providing structured employee education; however, now the focus of the corporate university must shift to the continual enhancement of information and communication technologies into each employee's career development curriculum.

It is the opinion of this critic that these objectives can be successfully improved by continuing to implement a comprehensive learning architecture, which addresses ideas of face-to-face instruction, e-learning, and on-the-job training.

Coordination

Another important issue the corporate university has faced and will continue to face is outsourcing and vendor management. When the learning management system was in its infancy, the corporate university team researched available systems and developed a checklist of needs to help in the selection of a LMS provider. As the university continues to grow and improve on their e-learning strategy, more issues of outsourcing and management will become evident and steps should begin now to deal with such items. In essence, the key element is vision. The team must deal with the daily operation of the university; however, without appropriate vision and the ability to act on that vision, the future success of any corporate university will be diminished.

Competition

This corporate university is truly on the leading edge of the successful integration of educational initiatives with employee's career development. Being a pioneer means that for the most part there were no mentors for the firm to look to in this endeavor; however, the corporate university now has the opportunity to be a mentor for a nearly $600 billion construction industry. This is an awesome responsibility to undertake, especially given that the company wants to maintain the highest of quality within the organization and not provide competitors with "trade secrets" from the substantial work that has been accomplished. The firm must prepare and take the necessary steps to act on a plan to share their considerable knowledge in providing corporate education without compromising the integrity of their program.

Instructional Development Capabilities

It is important to recognize the employees, the clients, and the corporate university team. The team consists of a meager staff of three, which includes a director, an instructional designer, and a learning technologist. The staff serves over 1000 employees of the company and in turn serves all of the firm's clients. Clearly, issues of staffing and instructional design capabilities must be more appropriately aligned with the number of learners.

Recommendations

The following are recommendations based on the case study:

- Work to continue strong commitment from upper management and all stakeholders
- Better utilize employees as Subject Matter Experts (SMEs) in the development of online courses
- Continue internal and external communication and visibility of company's commitment to life-long learning
- Build course offerings to include all employees and provide more and better instruction in leadership and interpersonal skills
- Provide appropriate infrastructure to all employees
- Link education to other online firm resources, including project websites
- Provide appropriate training for all instructors
- Address issues of technophobia and company culture within the company
- Expand corporate university staff to address the needs of a fast growing company

Global Snapshots of E-Learning The Challenges of E-Learning Solutions in Namibia: The Current View

Rakel-Kavena Shalyefu

Introduction

The Information and Learning Resource Center Project (ILRC Project) is a capacity building of the Human Resource Development Project (HRDP) in Namibia with partly sponsorship of the African Development Bank (AfDB), the Arab Bank for Economic Development in Africa (BADEA) and the Namibian government.

The ILRC is housed by the University of Namibia (UNAM), but it is a national project. UNAM spearhead the project without owning it. The primary purpose of this project is the integration of the latest technological resources. The ILRC is expected to facilitate the improvement of educational performance through increasing use of relevant information in all formats while it also functions as a national reference library, a "library without walls," that will open up resources making Namibian sources available worldwide as it accesses foreign databases and other electronic share waves. The ILRC is a network of human and material resources, and will enable information to be used in formal and nonformal education. The major objective of the HRDP is to train users in Information Communication Technologies (ICTs) and Instructional Design (ID) through e-learning strategies.

ILRC's view of e-learning

ILRC views E-Learning as: the use of technology 'from print to electronics' to deliver solutions, to enhance and support knowledge and performance. In this view, E-Learning includes: books, audio tapes, video tapes, CD-ROM, Web-based Training, the Internet, CD-ROM, Computer-based Training, Web Conferencing, Web Meetings, the Internet, the World Wide Web (WWW) and other online performance support tools.

E-Learning is seen as anything delivered, enabled or mediated by information communication technologies for various purposes such as: learning, instruction, information, knowledge and training. E-Learning for ILRC therefore does not mean online learning only; it should be a combination of different kinds of technologies including print. Rosenberg (2001) supports this view by stating that E-Learning is networked, delivered to end-user via computer, go beyond traditional paradigms of training, but it is not tantamount to distance learning. So we can say E-Learning is part of distance learning, information, training and instruction but it is a disservice to the advancement of E-Learning to call it 'alternate learning' or 'alternate delivery.'

ILRC's technology status

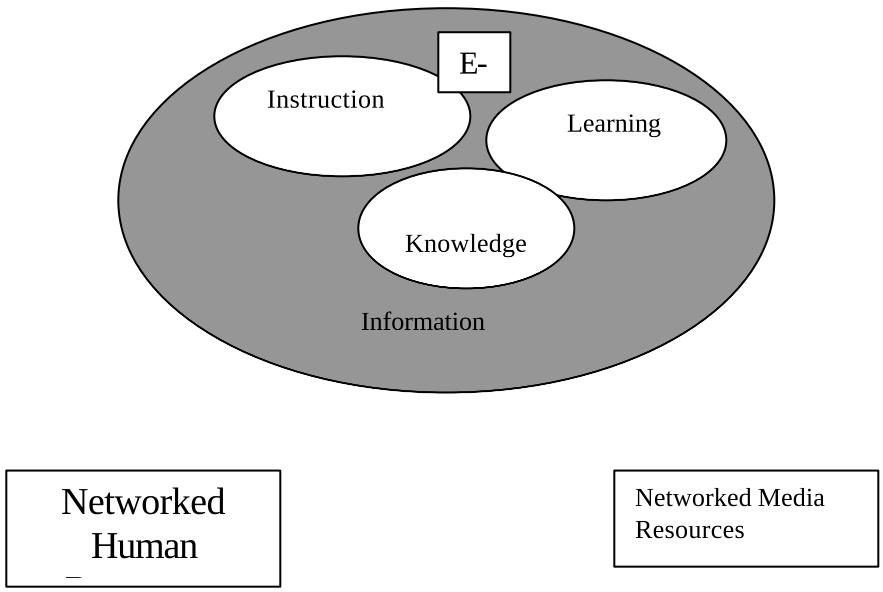
Computer technology and the Internet brought excitement to the world of knowledge, but there are limitations. There are Regional Outreach Centers that have been furnished with Internet access and other equipment like portable screens, stand-alone screens, LCD Projector, video players, HP Scanners, CD ROM Reader/Writer, etc. There are no web-based courses for the pioneers to see yet, but they are referred to web sites (information) to add to their knowledge and also to enhance their understanding of information communication technologies.

There are a lot of Internet problems, because of various reasons: 1) an archaic, outdated network with its outdated equipment, 2) a limited bandwidth (128kb leased line) is a major impediment to browsing the Internet effectively. To upgrade these, there are financial implications involved, 3) modems with slow download speeds are experienced, 4) virus outbreak, though a worldwide phenomena, added a denial of service (DOS) to many popular websites. This virus activity on the Internet has placed an added strain on limited networking resources. 5) Certain sites have been blocked (which made the management team very unpopular with fellow colleagues), even if it was done in hope to free up some bandwidth, so that customers could effectively access popular sites (like CNN especially with the World Trade Center saga).

The mission and vision of e-learning in the ILRC

The mission and vision of the ILRC project is well-represented by the diagram of Grabowski and Small (1991) which indicates e-learning, e-instruction and e-knowledge sharing shoulders under the umbrella of information with the supporting poles of networked human resources and networked media resources.

The diagram below demonstrates this concept:



Adapted from: Grabowski, B. and Small, R. (1991). “Information, Instruction and Learning: A Hypermedia Perspective.” Performance Improvement Quarterly. 4(3), 3-12.

The mission of ILRC is to use the powers of information communication technologies to increase access to learning, instruction, information and training. A combination of technologies will be provided to support outreach operations at different levels of the education systems.

It is the vision of the ILRC to take information and education to the homes of the Namibians. Though not all users have computers in their homes, there are Regional Outreach Centers, Open and Distance Learning Centers and commercial points that will assist e-learning to become a supporting mechanism for learning at a distance.

ILRC capabilities to launch and sustain e-learning

The major assumption of the HRDP is that the University of Namibia (UNAM) would be able to establish staff and maintain the ILRC. Good reason to believe this stand is the fact that Namibia has only one university and a polytechnic to serve a national population of 1.8 million people. This diverse and widespread population demand learning at a distance as a solution to avoid over-crowdedness at the UNAM main campus or satellite campuses and centers. This demand can be met by an e-learning strategy that the ILRC offers. Now that Namibia has a local technical infrastructure, the first of its kind in Southern Africa, it can respond to the market demand especially by offering enhanced quality training, instruction and information in fields of science, engineering, agriculture, technology and education. The key stakeholders who will be networked through the ILRC management team can cater for the demand of knowledge and skills.

The networked resources, the Internet opportunities and multimedia sources will be able to launch and sustain e-learning, especially in cooperation with Namibia's state of the art fiber optics telecommunication.

Instructional development capabilities

Currently there are few local people with information communication technologies expertise, but various stakeholders have been asked to select capable candidates from their institutions to be trained in information and communication technologies and in instructional design over a period of time and enable them to plough back their skills at the community level. ILRC regards this as a cascading model.

The role of Instructional Designers in the ILRC at the University of Namibia will be to:

- Identify and communicate best practices for applying teaching and learning theories and instructional technologies to curriculum design.
- Evaluate diverse individual and department training needs in the area of instructional technology.
- Assist lecturers in the design and development of engaging, interactive and instructionally sound materials that address various learning styles and are accessible to all students, including those with disabilities.
- Design and deliver training programs, workshops and seminars on Internet, multimedia and other instructional technologies and their implementation.
- Plan and coordinate training programs with ICT training staff.
- Research, write and produce clear documentation and other instructional materials (websites, multimedia and online tutorials) to support instructors in the performance improvement process.
- Keep instructors informed about instructional-technology events and resources.
- Organize instructional-technology activities and events for personnel staff development.
- Serve on the professional staff development teams of the various stakeholders and provide leadership in instructional technology planning, development, implementation and evaluation.
- Remain current on emerging technologies that have potential value for teaching and learning, through evaluation of training sessions, conferences and publications.

The Instructional Design Unit will be responsible for the design and development of high quality materials that meet learners' needs. It will also provide training sessions on instructional design on a competitive fee paying basis (HRDP Report, 2001); run workshops on how to improve teaching and learning, and conducting e-learning with partnership with the subject matter experts (SMEs).

Coordination of e-learning

According to Horton (2001), moving into an e-learning venture is a complex, sprawling, and dynamic endeavor. It requires a range of skills, talents, knowledge, and viewpoints. The best way to meet ILRC requirements is to assemble a multitalented, dynamic team. Some individuals can perform multiple roles and not everyone is needed on every phase of the effort. At every milestone, there will be need to adjust team membership to better accomplish the next phase of work. The composition of the team will depend on several factors, such as

- Size and scope of the project
- Amount of work at that moment
- Specific media and technologies required

The business rationale for ILRC's e-learning strategy

The ILRC project was initiated as a response to the market demand. The marketing plan will depend on the stakeholders. It is of great importance to highlight this type of project as the first of its kind in Southern Africa. Given that position, there is a potential for ILRC to grow fast to neighboring countries like Angola, where Namibia already receives a substantial number of students, as well as to other neighboring countries like the Democratic Republic of Congo and form a network beyond Namibia and more so beyond Africa. Networked systems and networked operations management will enable the ILRC to become an international institution that can expand its services worldwide.

When the ILRC expands its wings of cooperation to other e-learning ventures, it may buy in, adapt or adopt courses and programs from other institutions. The networked systems will enable ILRC to respond to the needs of people in a timely fashion.

The training component is the cornerstone of the project. Information and communication technologies are of little use without human resources, that is why the business rationale of the ILRC is training to promote local capacity. After graduation, the trainees will become trainers of trainers (ToTs). For sustainability the project is envisaged to attract some outside funds, but in the long run it has to be prepared to be nationally sustainable. The other stakeholders need to be selflessly involved by committing resources.

The funding of ILRC e-learning strategy

The initial project funded was N$ 40 million for the start of the infrastructures. Given the initial state of lack of resources, more funds came from Ford Foundation to furnish the ILRC, the Regional Outreach Centers (ROC) and the Open and Distance Learning Centers with the latest technology equipment. In addition, a National Trust Fund was established to keep fees for services.

Once the donated funds ends, the ILRC will need to sustain itself. Concerning the stability of funds, the ILRC will depend on the marketing of ILRC Services: fund raising activities and fee for service to cover operational costs.

In the long run when the grants decrease, the cost could be absorbed by the recurrent budget of UNAM and six Regional Outreach Centers (ROC) as well as the Open and Distance Learning Centers. In addition, the ILRC could be sustained by income from tuition and service fees.

ILRC and the competitors:

Given the fact that ILRC is hosted at the University of Namibia, a service institution, and that the equipment are very expensive, local companies who are attempting to sell e-learning strategies may not afford better infrastructures and resources. The likely competent competitors would be other educational institutions in the Southern Africa Region, especially South African distance education institutions that have been aggressively marketing themselves in Namibia. In addition, the commercial e-learning/e-business companies that are trying to venture into distance education may be worth considering as competitors too.

How will the ILRC e-learning efforts be evaluated?

The ILRC need a comprehensive evaluation to minimize the risks of underperformance.

The evaluation will be done by collecting data and analyzing it in both quantitative and qualitative approaches. The focus of the evaluation will be on the successes and shortcomings. There shall be a control mechanism to establish what is working and what is not and why. The learners, instructors, technical programmers and staff from partner institutions will be included in the evaluation process. To avoid complacency, outsiders will also be required to participate in the comprehensive and ongoing evaluation of each component.

The Advisory Board composed of stakeholders from partner institutions will be tasked to do a comprehensive evaluation during the implementation process and also arrange summative evaluation and reviews by outsiders as it is deemed fit.

The challenges in the implementation of the ILRC e-learning strategy

Stability of funding

When the donated money dries up, it will be hard to recover the cost of the project. The rate of return will be slow. The ILRC will need to sustain itself. E-learning has proven to be very expensive for very formidable institutions, therefore it remains a challenge to sustain the ILRC and it is more difficult to run it as a real business under a service institution. There will be a need for money to re-engineer courses and money to pay development teams as well as twenty four hours, 7 days a week technical support to both learners and instructors, including content-related learner support services.

Outsourcing and vendor management

To position ILRC in terms of outsourcing and vendor management, the project has to be viewed from the following spectrum of e-learning:

Focus on end products **Focus on means**

Buy access to a portal or training services	Buy off-shelf courses	Have courses developed externally	Develop your own courses	Develop courses for others	Develop tools for others

Adapted from: Horton, W. (2001). Leading E-Learning. ASTD Publications, Alexandria, VA.

ILRC cannot do it all, however it will be the first project of its kind in Namibia, therefore it may heavily lean on the left: ***focus on end products,*** at the beginning and than later reach a stage where it can focus on developing tools for others.

The distribution of materials might be something to outsource at the very beginning.

The management of vendors needs to be entrusted to those with the right expertise in the e-learning operations. This remains a challenge even for experienced E-Learning companies.

Coordination of e-learning Efforts

The University of Namibia (UNAM) that hosts the ILRC has a Computer Center, the Interactive Multimedia Unit (IMMU), the Improving Teaching and Learning Unit (ITLU), and the African Virtual University (AVU) operations, etc. The ILRC is working in close collaboration with these campus networks. In fact it is the talents/skills that exist in these different units that are being tapped for creating an effective and efficient e-learning center. However, the most important people in this business are being left out, the lecturers/instructors. The ILRC being a newborn baby; some people have not heard about it, some of those who have heard do not understand the vision of the center. Those who are involved do not have a clear vision of where they are heading. Things are not smooth as there is fear of the unknown as well as fear of failure. In the process, there is a lot of competition and envy that may hinder the successful running of the e-learning efforts.

ILRC gap analysis

Gap analysis aims at highlighting the disparities between current and desired situation.

Gap analysis				
Area	**Current**	**Desired**	**Gap Statement**	**Root Causes**
Bandwidth	128 kb	Upgrade to 512 kb	Inadequate bandwidth & Internet problems	Funds

Disparate Systems	a) Isolated systems of ICT, IMMU, ITLU, AVU b) Cottage Industry; writers design their own unique courses	a) An integrated e-learning multimedia unit b) House style in course design with room to be innovative and creative	a) There are different units working towards emerging technologies b) Lack of template in designing e-learning courses	a) These units were established in isolation with donor funds, but without coordination b) Lack of in-house style
Faculty Issues: a) Overload b) Intellectual properties and copyright issues	a) Overloaded instructors b) Ignorance of intellectual properties & copyright related issues	a) Load of instructors to include ICT training opportunities b) Universal understanding on intellectual properties and copyright issues	a) Instructors are overloaded and regard participation in ILRC endeavors as an extra load b) Instructors are not well informed on the issues related to intellectual properties and copyright.	a) Newness of the field and lack of skills in the area b) Lack of policy on human, legal, ethical, copyright and intellectual issues

ILRC force field analysis

Force field analysis is a way to identify factors that may inhibit the closing of the gap and the one that may aid in closing.

Gap statement	**Inhibiting factors**	**Aiding factors**
Inadequate bandwidth	Availability of Funds	Donors, fees for service
Isolated systems created in isolation	Political attitude aspects	A positive desire to work hard so that all UNAM systems can talk to each other
Lack of template in designing e-learning courses	Lack of time to re-engineer courses, limited human resources and money	Extra funds is a huge enabling factor
Instructors are overloaded and regard participation in ILRC training as an extra load	Promotion and career advancement does not measure their contribution to Distance Education (DE)	Reward system or compensation model that value their contributions to e-learning
Instructors are not well informed on the issues related to intellectual properties and copyright.	Ignorance of underlying elements on human, legal, ethical and copyright issues	Incentives for instructors who participate in staff development of the ILRC including copyright issues

SWOT analysis

Strengths**,** refers to what the ILRC is good at.

Weaknesses, refers to areas of underperformance or nonexistent resources that pose a risk
Opportunities, refers to areas where progress could be made
Threats, refers to what might happen if weaknesses overwhelm strengths and opportunities that are not realized

SWOT analysis

Strengths	**Weaknesses**	**Opportunities**	**Threats**
The ILRC is well-equipped with modern technology	Hard to get around the new model of learning (e-learning)	The change of pedagogical approach based on sound Instructional Design Principles	Swimming upstream carrying prejudices, attitudes and opinions against e-learning
Dedicated instructors	Very busy instructors and the ILRC operations are not their priorities (*Priorities are not their own)*	To create the right environment to support the instructors since they are very important for the operations of ILRC	Traditional prejudices against the main stream
Support from top management in the hosting institution and from stakeholders	Lack of a unified understanding and getting around everyone's political will	ILRC to establish itself as an international leader in emerging technologies in Southern Africa	Everybody is too busy to commit their time to ILRC endeavors
Institutional will	Ignorance and prejudices	Ability to change the negative perceptions to the positive ones	E-leaning enemies

E-Learning strategies recommendations

In preparing for e-learning strategies for such complex projects such as the ILRC, the stakeholders must approach the task intelligently. This paper suggests the following in order to deliver e-learning strategies successfully:

a) Since the end-product will be delivered through electronics and computer technology and via the Internet, critical issues need to be noted such as:

- Bandwidth Considerations
- Multimedia considerations
- Browser Considerations
- Authoring Considerations
- Content Considerations
- Multiple-platforms consideration
- Instructional Considerations (Bixler & Spotts, 2001).

These issues determine the type of infrastructures needed for distributing training, learning and instructional materials. All the pros and cons of the media should be carefully considered for relevance and appropriateness to the content and environment.

b) The information, instructional materials that might be bought or adopted should be modified or contextualized to meet the specific needs, provided there is expertise to do so.
c) There will be a need for on-going support, be it technical or content related aspects.

d) It is not advisable to use the Internet or the WWW as the sole modes of delivery because their services may be limited, taking into account pressures from the demands of users.
e) Given the fact that there are so many unanswered pedagogical questions (Shalyefu & Carr-Chellman, 2001), allowance must be made to accommodate different needs and various learning styles.
f) For a program to be designed or adopted, a feasibility study needs to be done to determine the market demand, to define the academic products to be delivered, to design the technical model for delivery, and to develop the partnership needed to implement and support the program.
g) The ILRC project is an attempt to close the gap created by the digital divide, because it increases access and equity.
h) The ILRC could be an answer to the long-standing demand of Science Subjects and also for a remedial program needed for Mathematic Education.
i) The ILRC Library Unit should be able to complement the print-based material with online full-text journals and archived materials that will be available online to learners, academics, communities and the wider public.
j) For the ILRC to achieve success, it is essential that the project be managed by a multi-talented team of innovative professionals with experience in academia, distance learning, networked systems and networked operations management.
k) The ILRC can also offer non-credit programs, seminars for professional development, bridging courses for those who want to obtain entrance qualification to the university through the e-learning resources.
l) All ILRC staff should benefit from e-learning environments offered through hands-on training and also through Learning Management Systems (LMS), Knowledge Management Systems (KMS), Portals, Discussion Boards, etc.
m) Technical Support Services should be able to remotely detect trouble shoots and correct a wide range of operational problems that occur in Distance Education networks.

Reference:

(*For reasons of confidentiality I was reluctant to list some resources).*

Bixler, B. & Spotts, J. (2001). *Instructional Graphics: Revisiting Challenges Presented By the World Wide Web.* (Unpublished Paper).

Hartley, D.E. (2000). *On-Demand Learning: Training in the New Millennium.* Amherst, Massachusetts: HRD Press.

Hartley, D.E. (2001). *Selling E-Learning*. Alexandria, VA: ASTD Publications.

Horton, W. (2001). *Leading E-Learning.* Alexandria, VA: ASTD Publications

Namibian Human Resource Development Project: Preliminary Report on Institutional Management, November 13, 2001, Educational Consulting Services Corp.

Philips J.J. & Pope, C. (2001). *Implementing E-Learning Solutions.* Alexandria, VA: ASTD Publications.

Richey, R.C., Fields, D.C., Foxon, M., Roberts, R.C., Spannaus, T. & Spector, J.M. (2000). *Instructional Design Competencies: The Standards.* Syracuse University, NY

Rosenberg, M.J. (2001). *E-Learning: Building Successful Online Learning in Your Organization*. New York, McGraw Hill.

Shalyefu, R.K. & Carr-Chellman, A. (2001*) The Merits And Demerits Of Web-Based Delivery Of Distance Learning In South Africa in Comparison With Traditional Distance Education Methods.* Paper presented at the "Teach Your Very Best' conference, 1 -3 October 2001, Safari Court Conference Center, Windhoek, Namibia.

Shalyefu, R.K. (2001). *Corporate Critique of Penn State University World Campus.*
(Paper unpublished)

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Global Snapshots of E-Learning: E-Learning Status at METU in Turkey

Tugay Tutkun

Overview of the Country and Education System

Geography

Turkey is located between Europe and Asia continents surrounded by Mediterranean Sea, Black Sea and Aegean Sea. It is counted as a window of Western Culture opening to meet the Eastern Culture. The population of Turkey is 62.8 millions and the most important characteristic of the population is the amount of young population. Turkey is among the fastest urbanizing countries of the world and Turkish is the native tongue of 90 percent of the population in the country.

The Principles of the Turkish National Education

According to the Constitution governing the Republic no one shall be deprived of the right of learning education. Further-more, primary education is compulsory and free in state schools. Except in specially licensed institutions Turkish must be taught as the mother tongue and religions instruction is a compulsory subject in the primary and secondary school curriculum. The following are the constitutional principles underlining the Turkish National Educational system: universality and equality, fulfillment of individual and social needs, freedom of choice, right to education, quality of opportunity, and education for all throughout life, adherence to Ataturk's reform principles including secularism, building of democracy, scientific approach, co-education and school parent cooperation.

Educational Administration

As with the overall administration of the country, educational administration is firmly centralized under the Ministry of National Education. The Ministry is responsible for drawing up curricula, coordinating the work of official, private and voluntary organizations, designing and building schools, developing educational materials and so on. The Supreme Council of National Education discusses and decides on curricula, regulations etc. prepared by the Ministry. Educational affairs in the provinces are organized by the Directors of National Education appointed by the Minister. However, they work under the direction of the provincial governor.

Financing Education

The major source of income of state universities is the funds allocated through the annual state budget. In addition to this, a university has three more sources of income. First, income from the services provided by a university, such as patient care in university hospitals, and contract research, is collected in a revolving fund. Second, student contributions towards highly subsidized services are collected in a separate fund. Third, each university has a research fund made up of a lump sum grant from the state-provided budget plus a portion of the income from the revolving fund and from earmarked projects given by the State Planning Organization.

Higher Education

With limited exceptions, high schools are at large owned by the government and provide free educational opportunities. Graduates of these high schools can attend universities after the university entrance examination. The centralized examination is administrated by the Supreme Council of Higher Education and determines candidates for the enrollment of each university and faculty after evaluating the grades of related subjects, their high school results and their preferences according to the student capacity of each faculty.

To expand the higher education system, preliminary studies were started in 1996 for the design and construction of a nationwide distance education system based on advanced telecommunication and educational technologies. Now, some graduate programs are in some universities are offered through internet after being approved by at he national committee and some undergraduate courses are also offered through internet. Talks are being held with universities abroad to offer joint degrees through internet. Distance education is now being seriously considered as a means to meet the pressing demand for higher education.

Culture

Because of being the homeland of many civilizations in the past Turkey has many different cultures within the Anatolian Peninsula. However, from the Ottoman Empire times this population is mostly sharing the same religion, language and traditions with little differences. These cultures are completely mixed and formed another common culture after the foundation of Turkish Republic in 1923. The official language of the education is Turkish where 99% of people speak Turkish. However some institutions only offer education in English.

Education has a special value in this culture, because unemployment is one of the biggest issues in Turkey and education is viewed as one of the solutions to this issue. Higher education is required to find a good job, however sometimes it is not enough and some additional skills may be needed such as computer skills, second or third language, etc.

Technology

Turkey is investing great amount of money on technology since 1980's. In regard to communication technologies Turkey has made a great attack in terms of catching the contemporary technology with placing two communication satellites on the orbit. Computers are becoming more common day by day. Currently, about 20% of people have computers in their homes and about 9% of these computers are connected to the World Wide Web (State Institute of Statistics (SIS)). Most of these connections are dial-up connections which people could get for a reasonable price from several internet service providers. Other types of connections are also available such as DSL and broadband but, not in every region. These connections types are also more expensive than the dial-up so, people still prefer to be connected from their homes via their phone lines.

METU and E-LEARNING

About METU

Middle East Technical University (METU) is founded under the name of Middle East High Technology Institute on November 15th, 1956 to contribute to the development of Turkey and Middle East countries and especially to train people as to create a skilled workforce in the fields of natural and social sciences. It is located in the capital city of Turkey, Ankara. In the academic year of 2000-2001 METU employed 706 faculty, 260 academic instructors and 1028 research assistants. It offers education to nearly 19.000 students and the language of the instruction is English (http://metu.edu.tr/about/geninfo.pnp).

Culture

Being a developing country, the major problem in Turkish universities is the lack of qualified faculty for many of the disciplines. This realization leaded the Supreme Council of Higher Education and METU to search new methods of transferring knowledge to wider audiences. To meet the pressing demand for higher education with the current human resources it is important for METU and also for the Ministry of National Education to improve and wide spread distance learning. To reach that goal, supported by the ministry, presidency supports and encourages e-learning efforts within the regulations and policy of the university and the Supreme Council of Higher Education. E-learning is a developing concept in the institution and it is strongly supported by authorities.

A couple of strategies described by Rosenberg (2001, pp 185-189.) are used to build support for the e-learning efforts within the community such as providing easy and free access to faculty and students, paying or giving credit for knowledge and integrating learning to work. Access is provided both in and off-campus, however due to the technical difficulties off-campus access is only available by dial-up connection. Faculties also get certificate and increase in their salaries if they participate in e-learning efforts. Online tutorials, information and discussion groups are available within the university's website to encourage people and integrate learning to work. Technical assistance is also provided by the Computer Center and Informatics Institute.

Rosenberg's Criteria and METU's E-learning Efforts

Perception of E-Learning

In general, e-leaning is viewed as one of the medium of distance education. Another university, Anodolu University, has been successfully offering distance learning courses and degrees via TV broadcasting; so, most of the people including faculty, students and also civics are familiar with the concept of distance education. Although e-learning is relatively a new concept in Turkey, the general understanding of distance learning is helping people to understand this emerging technology.

Within the university management, e-learning is viewed as a resource saver; because management people are aware of that they could distribute university's instruction to a wider audience with same resources in terms of instructor and faculty. Faculty views e-learning as a time saver; because they think they will spend less effort for the online instruction than the traditional instruction. However, it seems that both the management and faculty members are not arguing or considering the quality of the instruction. The basic and first goal of these e-learning efforts is seems to be distribution of the instruction to a wider audience with the limited resources of the university. However, Department of Computer Education and Instructional Technology is involved within these efforts to assure and improve the quality of online instruction efforts.

Current E-Learning Strategy

In general, METU's strategy is to allow and encourage or help and support each school within the university. For example, the Distance Interactive Learning (dIL) project offered by Department of Basic English has no relations with the Distance Learning Center which is supporting and managing METU's many other e-learning efforts such as Asynchronous Internet Education and METU Online. dIL uses outsourced management systems while METU Online uses NET-Class management system which is developed by the Computer Center and Informatics Institute. Each department may outsource or develop their e-learning for their audience or use the systems provided by the institution.

The Distance Learning Center established within the institute aims to conduct and coordinate research on distance learning and to monitor and lead current methods used for distance learning at and out of the university. The center promotes an interdisciplinary approach to research and development in distance learning. The aims of the center also include a systematic accumulation of knowledge and experience gained from current applications as well as the dissemination of this "know-how" at the university and to other institutions in a systematic and scientific manner (Distance Learning Center at METU). This center has a "Distance Education Laboratory" in which online programs are developed with the help of faculty from various departments.

Current State of E-Learning

Some graduate programs are offered through internet after being approved by at he national committee and some undergraduate courses are also offered through internet.

Other than departmental programs, Distance Learning Center has 4 different types of courses available online offered for different audiences:

1- *Online Degree Program Courses:* (Informatics Online), These courses are intended for working professionals who need continuing education in anytime, anywhere fashion without the need to come to the METU campus for lectures.
2- *Online Courses: (*METU-Online), These regular online courses are offered for students where their performance could be assessed.
3- *Online Training Courses:* These courses offer only learning resources to the students or instructors to provide a self-paced online learning environment without concerning assessment or any certification.
4- *Online Certification Courses:* These courses are offered for professionals who are in the need of continuing training and education.

Depending on the content and audience courses may have 3 different structures: online support courses, semi-online courses and fully online courses. Online supported courses are where lectures are conducted in face-to-face format with the use of such online communication tools as forum, e-mail and so on. Semi-online courses are those instructions are in both face-to-face and online format, and fully online courses are actual web-based courses where the whole instruction is in online format.

Current Technology

Supported by the government to provide and manage domain names and Internet access of the country, METU has reach resources in terms of technology and workforce. The whole network was installed in 1990 and updated to a fiber optic network in 2000. The network is comprised of a number of departmental networks and various sizes of multi-user hosts around a campus wide backbone network. Each departmental network has multi-user and single user systems that are connected to a departmental network and these are connected to whole network. They have been providing access to this network from outside the campus since 1999. This whole network is running continuously 365 days of the year without any interruption (http://metu.edu.tr/about/geninfo.pnp).

At METU, internet access is provided to students with the computer labs within the departments. Each department has at least one computer lab. Student dormitories also have computer labs with internet connection. Access from outside the campus is also provided via dial-up connection for free to METU students.

Funding

By far, the major source of income of state universities in Turkey is the funds allocated through the annual state budget and METU has the same funding structure. In addition to this, METU has some more sources of income. First, income from the services provided by the university, such as language education, and contract research, is collected in a revolving fund. Second, student contributions towards highly subsidized services are collected in a separate fund. However, only about 1/4 of the income from student contributions goes for education, the rest goes to meals, lodging and medical services provided to the students, and to financing extracurricular activities. Within this structure e-learning efforts are founded from the university budget like any other program. Any income gotten by e-learning programs supported by the Distance Learning Center goes to the university budget first and then the presidency distributes the budget to departments and programs considering the importance of the services and researches provided. However, other separated and stand alone e-learning efforts which are provided by various departments have their own budget to found their selves within the department.

Evaluation

Evaluation is an aching situation. Currently, there are no serious evaluation efforts to assess the successfulness of e-learning efforts. Main criterion is the mass distribution of the instruction. However surveys are being conducted among the faculty, instructor and students to gather their opinions about the online courses. Academic assessment and evaluation mechanisms, eventually leading to a full accreditation system, must be established so that funding can be linked to performance and students or consumers can be properly informed about the alternatives and e-learning efforts.

Coordination

Since a couple of departments are participating in METU's e-learning efforts, coordination between these departments becomes so important. The Distance Learning Center has been founded to manage these coordination tasks. However there are some other e-learning efforts which are completely separated from Distance Learning Center. Those separated efforts bought their management systems from outside while DLC is providing a free management system. This reflects lack of coordination between the departments. In general, METU's various e-learning efforts are not properly coordinated within the institution. Although these separated e-learning efforts are commercial while others are for METU students there is still a need to coordinate these efforts. It may be a good suggestion to coordinate entire efforts as commercials and non-commercials, so that management of these systems becomes easier.

Competition

E-learning is a developing concept in Turkey and education is mostly provided by government institutions. There is a lack of big companies or institutions offering certified online courses or degrees so, METU does not have any serious competitors. METU is basically taking the advantage of being a government supported institution and its reputation which is coming from their successes on traditional courses and certificate programs in the past. On the other hand, since METU is one of the leading universities in Turkey, their certificates are more popular and desired than any company or institution providing e-learning. Most of the companies require METU certificate for employment. They do not need to compete for their non-commercial e-learning products, because they only offer these courses to their students for free; just a replacement of traditional courses.

Instructional Development Capabilities

Within the Faculty of Education METU has the Department of Computer Education and Instructional Technology which is participating in DLC e-learning efforts in terms of providing instructional design knowledge. This department is studying on emerging technologies and their use in education.

On the other hand, The Distance Learning Center is continuously conducting researches on distance learning. They also have connections with the universities abroad in terms of sharing knowledge and technology. Because of being a large university, METU has various resources from many different departments. For example, Computer Center and Informatics Institute is providing technological resources while the Department of Computer Education and Instructional Technology provides instructional resources and knowledge. The entire e-learning efforts within the Distance Learning Center are a collaborative study of the various departments.

Since the e-learning is important to the country The Supreme Council of Higher Education and METU have been sending graduate students abroad in the related fields to come back and work at METU. These returning graduates will not only enhance the current efforts but also help to improve the vision of e-learning. So, the propensity for sustaining e-learning will continue to increase in next decades as long these efforts supported by the authorities.

Conclusions

In general, METU has been successfully offering online courses and degrees. However, there are some areas that needs to be improved, such as perception of e-learning, evaluation of the efforts, coordination and funding. Especially perception of e-learning should change from “a medium to distribute the content to wider audience” to “a medium to offer richer and better instruction to wider audience”. After analyzing the current situation and describing the desired situation that an institution should have I may report a couple of ideas that METU could DO or NOT.

DO’s

- Centralize entire e-learning efforts, which make them easier to manage. In this case it will also save some money, in terms of not paying for the management systems.
- Develop an actual and effective evaluation strategy to continuously improve e-learning efforts.
- Develop a performance based funding strategy, so every department could take what it deserves.
- Improve the coordination between the Distance Learning Center and Departments and also Faculty.
- Continue to improve accessibility of the internet and online courses.
- Continue to follow-up new technologies and knowledge at other universities and companies, which are offering e-learning, around the world.

DO NOT’s

- Do not only focus on reaching more learners, but also quality of the instruction and content.
- Do not let technology to become a barrier between learners and the content.
- Do not expect people to accept and support e-learning, continuously help them to understand the rationale and benefits of e-learning.

References

Distance Learning Center at METU - http://www.ii.metu.edu.tr/DLC/
METU Online Programs - http://www.metu.edu.tr/acadunits/onlineprogs.php
Middle East Technical University – http://www.metu.edu.tr
Ministry of National Education – http://www.meb.gov.tr
Rosenberg, M. J. (1999). E-Learning: Strategies for Delivering Knowledge in the Digital Age. McGraw-Hill.

State Institute Of Statistics (Sis) - http://www.die.gov.tr/ENGLISH/index.html
Supreme Council of Higher Education – http://www.yok.gov.tr

Strategies for building integrated EPSS

Roh Seak-Zoon

Indiana University

Byeong-Min Yu

Seoul National University

Han Sungwook

Indiana University

Abstract

Because the complex link and node structure awaiting users can lead them into becoming lost in hyperspace and cause them cognitive overload, navigating the hypertext system is often not an easy task, especially for novices. They have a difficulty perceiving a structure a structure of entire system, locating specifying information, using navigational aid. This phenomenon can be more expected in the highly structured EPSS. In that point, content providers or designers for web-based integrated EPSS should know how to design interface and information structure based on its content and purpose.

This study analyzed four interface design methods (simple selection menu style, menu with global navigation, menu with global and local navigation, and pull-down menu) and four information structures (linear structure, grid, hierarchy, and network) in terms of the complexity, flexibility, navigation, domain knowledge, and cognitive load. Based on this analysis, guidelines for building the integrated web-based EPSS effectively are provided.

Introduction

Building an effective EPSS has been a major issue not only in business but also in education and government. As more people come to depend on the use of computers and networking to perform their jobs, and as hardware and software technologies continue to advance, the potential for EPSS appears tremendous (Collis & Verwijs, 1995; Malcolm, 1992; Ockerman, Najjar, & Thompson, 1997).

Hypertext and hypermedia system enabled designers and programmers to tile all performance support system elements together in a way that allowed users to follow their own streams of thought in searching for information (Gery, 1991). Hypertext is such a technology that provides a powerful new way of organizing, displaying, and accessing information that could affect all forms of systems (Shneiderman & Kearsley, 1989). Hypertext consists of the associative links between multiple nodes, which are one or more parts of information, forming an interconnected networked (Conklin, 1987; Nelson, 1974). The linking system in the hypertext system allows users to browse through the system utilizing navigational tools (Eklund, 1995). However, navigating the hypertext system is often not an easy task, especially for novices (King, 1996). The potentially complex link and node structure awaiting users can lead them into becoming lost in hyperspace (Nielsen, 1990b) and cause them cognitive overhead (Conklin, 1987). Users have a difficulty perceiving a structure of entire system, locating specifying information, using navigational aid. This phenomenon can be more expected in the highly structured EPSS.

Such problems have prompted research on the manner in which users interact with hypertext system. Usable design guidelines and principles for navigation can maximize coherence of integrated EPSS and minimize users' cognitive overhead and disorientation.

Interface design

When designing an integrated EPSS, two important issues are involved: 1) interface design - how to present link system that provide access to the structure, and 2) information structure - how to incorporate the original structure of the content into the structure of an EPSS.

Interface design is basically concerned with the presentation of text, graphics, and linking system on the screen. It provides a contextual or structural model for the specification of the logical and functional organization of the user interface component, as well as a communication and means between users and system (Laverson, Norman et al. 1987; Norman and Chin 1988; Lai and Waugh 1994; Oliveira, Goncalves et al. 1999). Many researchers has been agreed that interface should be designed to provide users efficient and effective organizational model that can help users understand the entire system and navigate system to find information without getting lost or cognitive overload (Dieberger, 1997; Lai & Waugh, April 1994; Schenkman & Jonsson, 2000; Shneiderman, 1997).

Interface on an EPSS provides three major roles for navigation; 1) presenting links, 2) supporting structural cues, and 3) providing path mechanism. The interface is the most immediately visible part when a system was user-centered (Nielsen, 1990a). The most fundamental function of interface is to display links one the screen so that a user could navigate through a system (Shneiderman, 1998). Selecting the links is frequently difficult to navigate in spite of the fact that a graphical browser provides the easy to navigation method, "point and click." One factor of difficulty in selecting paths for navigation is the presentation of link system. The user navigation performance can be influenced by the design and placement of links (Carlson & Kacmar, 1999).

The second role is to support the user perception of structural cues for an effective navigation. If the interface does not provide appropriate structural information, users cannot perceive where they are and cannot decide where to go. Users also could experience "lost in space" (Dieberger, 1997).

Information is structured by links and users follow paths developed by designer. As a result, if interface design provides the flexible path mechanism that can allow users to jump to the information directly without passing pages that are not necessary to get the information, users could find information fast. However, there is some possibility to increase user's cognitive load without providing structural and navigational cues.

There are four generally used interfaces for navigating the web site: 1) simple selection style, 2) global navigation aid, 3) global and local navigation, and 4) pull-down menu styles.

1) Simple Selection Menu Style

One type of menu style is simple selection menu style, which is much similar to a table of contents for a print book (Chimera & Shneiderman, 1994). In this menu style, a user can go to deeper levels of the web site by selecting links presented in the current web page. The major drawback of this menu style is that a user has a difficulty in perceiving the entire structure of the web site (Chimera, 1994), since when a user moves into lower levels, previous menu is replaced with new level. Another drawback of this menu style is that a user is unable to traverse to beyond below level because a user has to wait for a new below level select link again before moving lower level and select the link below level again. An experienced user is unable to navigate faster than that that of novice and this is inefficient and frustrating for experienced users (Laverson, Norman, & Shneiderman, 1987).

2) Global Navigation Aid Menu Style

The second menu style is persistent menu that has two split parts. The links on the top level remain in the similar area on the left all the time. The content is located in the area on the right and is replaced by its subsequent menu when users move other pages. The advantage of this menu style is that a user can go to each page of the top level by clicking top level links on the left side from any page in the web sit and that it provides the global structural cue to users (Nanard & Nanard, 1991).

3) Global and Local Navigation Menu Style

The third menu style has two parts of navigation link for global level and local level (Nanard & Nanard, 1991). The navigation links of top level pages on the web site usually place on the top of web page and the navigation links of current level pages on the web site usually place on left side. The advantage of this menu style is to provide not only global structure cue with the top level navigation links but also local structure cue with current level navigation links (Furnas, 1997). A user can skip several levels in the web site and it can more efficient than other menu design because a "jump-ahead" capability can reduce the time to navigate and find information (Laverson et al., 1987).

4) Pull-Down Menu Style

Pull-down menu style appears over objects in the interface instead of in static menu area. Pull-down menu allow users with a mouse to access the Web page they want directly. The advantage of the menu style is jump to the any page with mouse move and click. However, users can be disoriented or get lost since this menu can't provide structural cues. This menu style would be useful for experienced users.

Table 1. Summary of Menu Style

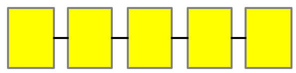
	Use	Complexity	Flexibility	Access Speed	Disorientation
Simple Selection	Easy	Low	Low	Slow	Low
Global Navigation	Easy	Middle	Middle	Middle	Middle
Global & Local Navigation	Hard	High	High	Fast	High
Pull-Down	Middle	Very High	Very High	Very High	Very High

Information Structure

The structure of a hypertext system can take many different forms. Four basic structures are linear, grid, hierarchical, and network structure. However, a web-based integrated EPSS can be designed with more than one structure.

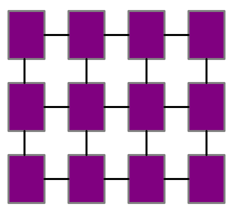
1) Linear Structure

The simplest way to organize information is in a sequence based on chronological or logical orders. Typically it is useful structure to retain the original documentation. Linear structure can be used for guided tour, job aids, tutorials, and demonstration of procedure in Web-based EPSS.



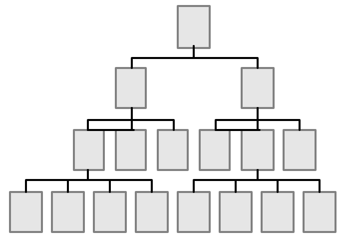
2) Grid

Grid structure organizes multi-dimensional concepts or categorizations. A serous of procedural manuals and list of training courses and materials can be best organized. Grid structure can be organized with one concept or categorization in horizontal axis by vertical axis with other concept or categorization. Unfortunately, grid structure can be difficult not only to organize but also to understand unless the designer or user recognizes the interrelationships between concepts and categorizations of whole information. Therefore, it is best for who already have knowledge on topics and its organization (Lynch & Horton, 1999).



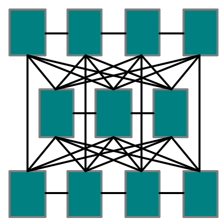
3) Hierarchy

A hierarchical structure bas been used widely in the web site (Lynch & Horton, 1999), on-line documentation (Gloor, 1997), information retrieval system (Rosenfeld & Morville, 1998), and computer-based instructional programs and training (Jonassen, 1986; Lai & Waugh, 1994). Organization of hierarchical structure starts with general concept or topic into specific ones, which are in turn divided into more specific to individual based on precedence and significance (Lynch & Horton, 1999; Norman & Chin, 1988). Users can move from general to specific and back to general through the linking system presented by menu design. The advantage of hierarchical structure is that familiar to most people since it reflects the structure of printed materials (Shneiderman & Kearsley, 1989), it is ubiquitous in everyday life (Sand, 1996), and it is the most natural structures for organizing levels of abstraction (Gloor, 1997). Because of its familiarity and pervasiveness, users can easily and quickly understand web sites and hypertext system (Rosenfeld & Morville, 1998) without heavy cognitive overload. In organized hierarchical information structure, the disorientation problem can be minimized and users can easily navigate among information nodes by following the linking system (Conklin, 1987). They are able to develop a mental mo del of the site’s structure and their location within that structure (Rosenfeld & Morville, 1998).



4) Network

Network structure is composed of associative links that network related concepts and information together. While this structure provides relatively effective navigation mechanism, users can easily get lost or disoriented because it is so hard for users to understand and predict entire. This structure can apply on small size of Web site for high level of training, such as simulation game, strategy training. It would be difficult to manage linking system if size is getting bigger (Lynch & Horton, 1999).



Most complex web sites share aspects of all four types of information structures. Except in sites that rigorously enforce a sequence of pages, users are likely to use any web site in a free-form "web-like" manner, just as most non-fiction or reference books are used. But the nonlinear usage patterns typical of web surfers do not absolve developers of the need to organize their thinking and present it within a clear, consis tent structure that complements design goals for the site. Table 2 shows the characteristics of four basic organization patterns explained above in terms of the complexity, flexibility, easy-to-navigation, domain knowledge, and cognitive load.

Table 2. Summary of Information Structure

	Complexity	Flexibility	Navigation	Domain Knowledge	Cognitive Load
Linear	Low	Low	Very Easy	Low	Low
Grid	High	High	Middle	High	High
Hierarchy	Middle	Middle	Easy	Middle	Middle
Network	Very High	Very High	Hard	Very High	Very High

Depth and Breadth

The most discussed issues in information structure are branching factors, depth (the number of vertical levels or links) and breadth (the number of horizontal documents or links. Much has been known about tradeoff of “depth and breadth”, and “complexity and flexibility issues(Shneiderman, 1997). The previous results generally support that deeper hierarchical structure, the less helpful and less favorable for navigation. Users have to move through more levels to located information in the deeper structure and should need more not only cognitive effort but also physical effort to interact with more displays and links for information searching (Shneiderman & Kearsley, 1989).

Design strategies for building an integrated EPSS

The effective design strategies for building an integrated EPSS can be affected by many factors. These strategies include as follows:

1) Analyzing nature of information or knowledge

In building an effective Web-based integrated EPSS, one of the most important things developers have to keep in mind is to analyze the nature of information or knowledge to be supported by the site as exactly as possible. Depending on the professional knowledge with a complex information structure or the general knowledge with a simple information structure for its delivery, it might be totally different in terms of the interface design, information structure, and the depth and breath of the information.

2) Analyzing users' characteristics

In order to build an effective Web-based integrated EPSS, developers should clearly analyze the characteristics of the target users of the site. That is, the developers need to conduct a more detailed analysis of the target audiences, such as teenagers, professionals of some fields, and so forth. Based on that analysis, the developers can grasp the major concerns of the audiences and predict their preferences. This will lead to providing appropriate functions just in time when such needs arise. If the EPSS is developed without seriously considering the users' characteristics, including their preferences, the site, no matter how well organized or useful, will not appeal to the some portion of the users anymore.

3) Localizing contents and categories

Due to the rapid development and spread of communication technology, traditional borders disappeared in terms of information sharing. In other words, we can share any content as soon as it is developed. Considering the importance of sharing information, this is very desirable. The problem arises for the fact that every country has unique cultural and social context as well as different language. Even in the same country, there can be various cultural groups. Certain problems are expected in the use of certain contents in different countries or cultural groups. For example, item `I', which is categorized as `A' in one country, can be categorized as `B' in another country. There is a need to readjust contents or categories in terms of cultural and social contexts. The easiest solution is to prepare different versions for different groups. Here, the developers may most likely face the effect of tradeoff due to additional cost.

4) Analyzing client system capability

The developers need to be cognizant of the system environment under which the users are learning. This factor is closely associated with analyzing users' characteristics. While the latter is more concerned with physical and affective characteristics of the users, the former is more focused on their learning milieu. With the rapid development of technologies, we have recently seen many products with newly-added features. Even the products marketed in the same year maybe different from one another in terms of system capability. In this vein, the developers need to continue their analysis on the learning environment of the users.

5) Analyzing information accessibility

We cannot overemphasize the importance of information accessibility for building an effective web-based integrated EPSS because the EPSS is delivered via electronic telecommunication technology like Internet. While most users with intent to access to Internet use LAN in their office, they rely on modem at home. So, their major concern is how expeditiously and conveniently they can access the needed information. When they cannot obtain the information they need at their convenience, they will experience inconveniences arising from the use of the site. This will eventually turn the users away from the site. Therefore, high level of information accessibility is very important factor of a successful EPSS.

6) Planning information updatability

Information updatability is another critical issue. In EPSS, this factor is more important than any other fields, because the users want information, which is most recently updated at their convenience. In this regard, two most important issues arise as to how promptly the information can be updated and who will assume the role of updating the information.

7) Harmonizing internal relationships between other information sources

Information in EPSS is sophisticated rather than fragmentary. As seen in Figure 1, even the same types of information can be restored and delivered in various ways. Some information can be delivered by visual formats such as text or graphics or by audible formats such as audio. In this sense, harmonizing internal relationship between other information sources is very important. If the internal relationship is not well organized, the EPSS is just an archive of unrelated, individual information.

8) Integrating external relationships between other EPSS

Finally, integrating external relationships between other EPSS is another important issue. The developers should consider that the EPSS has to be related to external sources at some degree in order to maximize its effectiveness. Just as harmonizing internal relationship between other information sources was important, integrating external relationship between other EPSS in a harmonious way is a very important factor of successful EPSS.

All of these factors impact the way to present and structure the web-based integrated EPSS. In order to maximize the usability of web-based integrated EPSS, therefore, we need to identify and select appropriate menu systems and information structures.

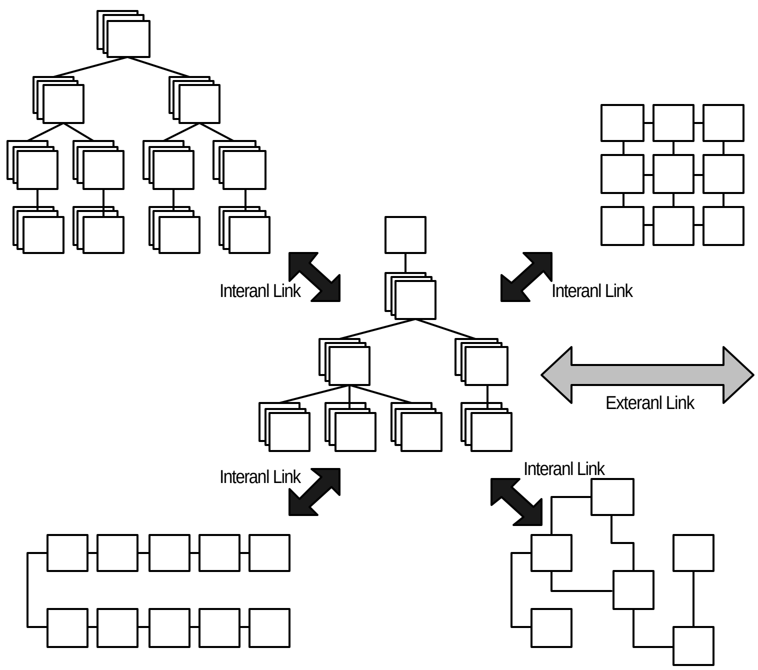


Figure 1. Overall Structure of Web-based Integrated EPSS

References

Carlson, J. R., & Kacmar, C. J. (1999). Increasing link marker effectiveness for WWW and other hypermedia interface: An examination of end-user preferences. *Journal of the American Society for Information Science, 50*(5), 386-398.

Chimera, R., & Shneiderman, B. (1994). An exploratory evaluation of three interfaces for browsing large hierarchical tables of contents. *ACM Transactions on Information Systems, 12*(4), 383-406.

Collis, B. A., & Verwijs, C. (1995). A human approach to electronic performance and learning support systems: Hybrid EPSSs. *Educational Technology, 35*(1), 5-21.

Conklin, J. (1987). Hypertext: An introduction and survey. *IEEE Computer, 20*(9), 17-41.

Dieberger, A. (1997). Supporting social navigation on the World Wide Web. *International Journal of Human Computer Studies, Special issue on innovative applications of the Web, 46*, 805-825.

Eklund, J. (1995). *Cognitive models for structuring hypermedia and implications for learning from the World Wide Web.* Paper presented at the AusWeb95: The First Australian Conference on the World Wide Web, New South Wales, Australia.

Furnas, G. W. (1997). *Effective view navigation*. Paper presented at the CHI 97: Conference on Human Factors in Computing Systems, Atlanta, Georgia.

Gery, G. (1991). *Electronic performance support systems: How and why to remake the workplace through the strategic application of technology*. Boston: Weingarten Publications.

Gloor, P. A. (1997). *Elements of hypermedia design: Techniques for navigation & visualization in cyberspace*. Boston: Birkhauser.

Jonassen, D. H. (1986). Hypertext principles for text and courseware design. *Educational Psychologist, 21*(4), 269-292.

King, K., L. (1996). *Usability of hypertext: Factors affecting the construction of meaning*. New Jersey Institute of Technology, New Jersey.

Lai, Y. R., & Waugh, M. L. (1994). *From information searching to learning: A comparison of contrasting hypertextual menu designs for computer-based instructional documents.* Paper presented at the American Educational Research Association Annual Meeting, New Orleans, LA.

Lai, Y. R., & Waugh, M. L. (April 1994). *From information searching to learning: A comparison of contrasting hypertextual menu designs for computer-based instructional documents.* Paper presented at the American Educational Research Association Annual Meeting, New Orleans, LA.

Laverson, A., Norman, K., & Shneiderman, B. (1987). An evaluation of jump -ahead techniques in menu selection. *Behaviour & Information Technology, 6*(2), 97-108.

Lynch, P. J., & Horton, S. (1999). *Web style guide: Basic design principles for creating web sites*. New Haven: Yale University Press.

Malcolm, S. E. (1992). Reengineering corporate training. *Training, 29*(8), 57-61.

Nanard, J., & Nanard, M. (1991). *Using structured types to incorporate knowledge in hypertext*. Paper presented at the 3rd Annual ACM Conference on Hypertext, San Antonio, TX.

Nelson, T. H. (1974). *Dream machines: New freedoms through computer screens - A minority report*. Chicago, IL: Hugo's Book Service.

Nielsen, J. (1990a). The art of navigating through hypertext. *Communications of the ACM, 23*(3), 296-310.

Nielsen, J. (1990b). *Hypertext and hypermedia*. San Diego: Academic Press.

Norman, K. L., & Chin, J. P. (1988). The effect of tree structure on search in a hierarchical menu selection system. *Behaviour and Information Technology, 7*(1), 51-65.

Ockerman, J. J., Najjar, L. J., & Thompson, J. C. (1997). Evaluation of a wearable computer performance support system. In T. Muldner & T. C. Reeves (Eds.), *Educational multimedia/hypermedia and telecommunications* (pp. 788-793). Charlottesville, VA: Association for the Advancement of Computing in Education.

Rosenfeld, L., & Morville, P. (1998). *Information architecture for the World Wide Web*. Sebastopol, CA: O'Reilly.

Sand, D. (1996). *Designing large-scale web sties*. New York: Wiley Computer Publishing.

Schenkman, B. N., & Jonsson, F. U. (2000). Aesthetics and preferences of web pages. *Behavior & Information Technology, 19*(5), 367-377.

Shneiderman, B. (1997). Designing information-abundant Web site: Issues and recommendations. *International Journal of Human-Computer Studies, Special Issue: World Wide Web Usability, 47*, 5-29.

Shneiderman, B. (1998). *Designing the user interface: Strategies for effective human-computer interaction*. Reading, MA: Addison-Wesley.

Shneiderman, B., & Kearsley, G. (1989). *Hypertext hand-on!: An introduction to a new way of organizing and accessing information*. Reading, MA: Addison-Wesley Publishing Company.

Using Imperceptible Digital Watermarking Technologies to Transform Educational Media: A Prototype

Tammy M. McGraw

Krista Burdette

Virginia B. Seale

John D. Ross

IAETE at AEL

The Institute for the Advancement of Emerging Technologies in Education (IAETE) at AEL recently explored the potential benefits and limitations of traditional print-based textbooks and many e-book alternatives. Having considered these media, IAETE created prototype interactive textbook pages that retain the salient aspects of print media while providing access to unlimited electronic resources. While the prototype appears to be a standard textbook, imperceptible digital watermarks embedded in the graphics act as convenient conduits to electronic access of dynamic content, assessments, applications, and communication tools. IAETE is exploring digital watermarking as an alternative to delivering electronic instructional media.

Traditional Textbooks

Textbooks have long been the mainstay of instructional media in classrooms; however, much has been reported about the inadequacies of widely adopted print-based textbooks. In a review of 12 prominent physical sciences textbooks, nine reviewers (seven of whom are professors in physics departments in various institutions of higher education) determined that none of the books were adequate and most contained hundreds of errors (Hubisz, 2001).

Project 2061, the science, mathematics, and technology education reform initiative of the American Association for the Advancement of Science (AAAS), reported similar findings. A Project 2061 study examined how well middle-grade textbooks help students learn key ideas in earth science, life science, and physical science. Dr. Jo Ellen Roseman, who headed the study and now directs Project 2061, stated, “This study probed beyond the usual superficial alignment by topic heading. Instead, it examined the texts’ quality of instruction, using criteria drawn from the best available research about how students learn” (Project 2061, 1999). The evaluation process was developed by scientists, mathematicians, educators, and curriculum developers, with funding from the National Science Foundation. Review teams included teachers, curriculum specialists, and professors of science education. The review found none of the widely used science textbooks for middle school to be satisfactory (Project 2061, 1999).

Another criticism of traditional print-based textbooks is that they quickly become outdated. Chris Jonson, social studies editor for McDougall Littell (a division of Houghton Mifflin), noted in a National Public Radio interview that production of print-based textbooks immediately stopped following the terrorist hijackings and attacks of September 11, 2001 (National Public Radio, 2001a). Textbook companies understood the importance of including in their textbooks the events of that day and the days that followed. Textbooks without such information are now outdated. Given the limitations of current print-based textbooks and the opportunities created by digital technologies, conditions appear to be favorable for the introduction of electronic alternatives to supplement, if not replace, traditional textbooks.

Electronic Books

Electronic books come in multiple formats, and the term *electronic book* is broadly defined in the industry. Some use *e-book* to refer to the electronic delivery of what was once presented as text printed on paper. The user reads text on a computer display, often a laptop computer or handheld device. Used this way, devices such as

Compaq's iPAQ can be classified as e-books, though, like laptop or desktop computers, they are rarely used solely for this purpose.

Some people use the term *e-book* to refer to specialized electronic devices modeled after the familiar print-based book. These devices, ranging in price from $125 to $600, typically employ proprietary file formats and serve a single purpose.

Adherents of multipurpose, handheld computing devices, such as the Palm handheld or Compaq's iPAQ, think these will be the most prevalent e-books for classroom use. Others propose that software, such as Microsoft Reader or Adobe Acrobat, will form the basis of the most viable electronic book model. In short, promoters of electronic books take many approaches to the production and dissemination of information.

Issues Influencing E-book Development

Perhaps the lack of standardization—or even suitable parameters in e-book technology—and the absence of a clear leader in the market have contributed to a flurry of activity in the publishing industry. Many companies are trying to position themselves to set the standard for others to follow. Certainly standards have been implemented to provide a consistent basis for e-books such as goReader and similar products. The Open eBook Forum (OeBF) was developed by the Association of American Publishers with assistance from companies such as Microsoft and Adobe (http://www.openebook.org). At the core of the OeBF effort has been a concern for safeguarding intellectual property and protecting current economic models (Jensen, 2000). This concern has not necessarily impeded progress. Looney and Sheehan (2001) suggest that digital rights management of software and electronic commerce has been a catalyst for e-book interest.

Although considerable attention focuses on standards that may make e-books more attractive to both users and content creators, other concerns have emerged. For example, Nielsen (2000) suggests that users read approximately 25 percent slower from a computer screen than from a printed page. While handheld devices are proliferating in schools, they are being deployed without regard to such issues. This impact this might have on learners is clearly no small matter. According to Morehead (2001), Kathleen Brantley, director of product development at Market Data Retrieval, suggests that it is still very early to quantify the number of handheld devices currently in use in schools. Yet Palm reports that education is approximately eight percent of its business (Morehead, 2001). While the actual number of handheld devices currently in use in schools is difficult to determine, Zeitchik, Reid, and Nawotka (2001) estimate there are now more than 12 million personal digital assistants in circulation.

Another concern involves the fluidity of e-book content. For example, what appears to be a benefit in the wake of the events of September 11, 2001—the ability to customize content quickly—might also present problems. Gilbert Sewall, director of the American Textbook Council, notes that local pressures could influence how sensitive topics (e.g., evolution or the depiction of Columbus) are presented (Axelson & Hardy, 1999). Customization of content, then, could lead to vast curricular differences among schools, making student transfers, even between schools in the same district, more difficult.

Policy issues have also been raised. Textbooks are typically adopted for a predetermined number of years, and the fact that important events that should be included can and do occur soon after adoption is regrettable but understood. Conversely, one of the most attractive features of electronic books—their ability to be updated regularly and quickly—then creates additional work for personnel responsible for textbook adoption. Furthermore, new funding models (e.g., subscription-based services versus one-time purchases) must be taken into account. It appears that electronic textbooks could save schools money, as traditional text printing and storage costs are significant. However, this benefit may not be immediately apparent. According to Odlyzko (1999), publishers generally encounter additional costs—not savings—to produce electronic publications.

It is difficult to justify eradicating printed textbooks from the options available to schools. Despite inadequacies, McKnight, Dillon, and Richardson (1996) point out that, "We have had nearly 500 years experience of using printed textbooks, and they not only support a wide range of applications, but users also have such a strong mental model of their generic structure and organization that they can successfully adopt an equally wide range of usage strategies" (p. 631). They further suggest that while hypertext can support activities that would be difficult, if not impossible, to accomplish with printed text, we must be sure that these capabilities are used in pursuit of valid learning tasks: "It is not sufficient that we can browse a million pages on our desktop, or link 100 articles together for rapid retrieval at the click of a mouse button: such capabilities are only important in terms of their utility to human learners. Yet there are few signs that most learning scenarios require such support, and little knowledge on how we might best provide it in terms of usability, even if it were required" (p. 631).

In Search of the Best Alternative

It is hard to predict what textbooks might look like in 5 to 10 years. During an interview, Preston Gralla, technology author and executive editor of ZDNet, proposed that education could be a niche market for electronic publishers, regardless of their success or failure in other areas (National Public Radio, 2001b). Indeed, major textbook companies are positioning themselves to take advantage of the surge in portable handheld devices in the education market. Strategies differ from company to company, but three approaches are most common: handheld devices, customized printing, and Web-based delivery.

Handheld Devices

Harcourt College Publishers is partnering with goReader to offer electronic college textbooks, a move that signals their support for the e-book platform (Writers Write, Inc., 2001). McGraw-Hill is partnering with Digital Owl to "mobilize and market digital information through targeted Web sites and handheld devices" (McGraw-Hill Companies, n.d.).

Customized Printing

Classwell Learning Group, in partnership with Kinko's, exemplifies a customized publishing approach. Teachers can access online tools and content supplied by Classwell to create customized workbooks for students. Once complete, the workbooks are electronically delivered to Kinko's, which prints, assembles, and delivers them (Classwell, 2001). Other customizable publishing efforts include McGraw-Hill's Primis Online, which provides access to more than 350,000 pages of content, as well as PowerWeb sites that draw on the Internet's power to provide current information (McGraw-Hill Primis Custom Publishing, n.d.).

Even as customized publishing makes it possible to provide content to meet the individual needs of learners, proposed legislation promises to make textbook content delivery more accessible for all learners. The proposed Instructional Materials Accessibility Act of 2002 would mandate that students who are visually impaired or otherwise impeded by print media have access to instructional materials, including textbooks, in formats they can use (American Foundation for the Blind, 2001). With the establishment of a national clearinghouse to receive, catalog, store, and disseminate electronic files from publishers, the benefits are potentially far-reaching.

Web-based Delivery

Much of the current activity around e-book development focuses on Web-based delivery of content, though approaches vary tremendously. Many of the major publishers, including McGraw-Hill, Pearson, Thomson, and John Wiley, have added multimedia and assessment supplements to their textbooks (Zeitchik, Reid, & Nawotka, 2001). McGraw-Hill's comprehensive approach provides e-text that mirrors the book's print edition and incorporates features such as audio and video clips. To complement this effort, the company has launched the McGraw-Hill Learning Network, offering a number of resources for educators, students, and parents (Trotter, 2001). Houghton Mifflin and netLibrary have launched a digital textbook initiative aimed at bringing Houghton Mifflin's College Division texts to a Web-based platform called MetaText ("Textbooks to Become Interactive," 2001).

The :CueCat bar code technology, another Web-based approach, is being used by Harcourt College Publishers in more than 80 college textbooks. A cat-shaped scanning device is used to swipe bar codes from the printed page and take the reader's computer to a specified Web site. Houghton Mifflin is also piloting the technology in some college-level textbooks ("Harcourt Embraces :CueCat Technology," 2001).

The Interactive Textbook: Combining Old and New

In designing next-generation textbooks, IAETE staff think it only practical to consider what McKnight, Dillon, and Richardson (1996) describe as our most successful information technology—the printed book. To address the inherent limitations of print media, the application and implications of imperceptible digital watermarking technologies were considered in the context of learning environments. Prototype textbook pages were developed using Digimarc MediaBridge software and a widely used middle school science textbook.

The software creates an imperceptible digital watermark consisting of XML-based code embedded in a graphic or other media element. With the aid of an optical reader device, such as a digital camera connected to a computer, the software "reads" the watermark, activates a standard Web browser, and delivers the user to a specified Web site or application. The interactive textbook extends the functionality of print media so that applications now possible on the Web, including discussions with peers or experts, real-time data manipulation, and participation in simulations or virtual environments, are possible within the context of the interactive book.

Static information, such as the definition of a term, is presented in a common textbook format and organizational structure, but information likely to change, such as an assessment tool, is linked to the printed page with an imperceptible digital watermark. The digital watermark feature makes the content highly customizable. Unique identifiers embedded in each image enable a content manager to access or change the referent URL to provide a relevant and timely experience for the user without requiring any change to the printed book.

Embedding a watermark in an image is as easy as applying a filter in Photoshop. The process for transforming a printed textbook into an electronic textbook does not displace well-established textbook production methods and utilizes standard image processing software. It is already adopted by print media and could be easily integrated by the textbook publishing industry.

Figure 1. Prototype pages developed by IAETE at AEL

Prototype pages are presented in Figure 1. An imperceptible digital watermark is embedded in each graphic, delivering users to a specified Web site or application. The resource bar on the left contains five resource links:

1- *Glossary* links users to definitions of terms related to the subject content and can be chapter- or even page-specific.

2- *Ask an Expert* links users to experts who can answer student-generated questions. The expert could be identified by the textbook company or by the teacher, allowing international, national, local, or school-based authorities to share information.

3- *Did You Know* provides a connection to materials designed for differentiated instruction. Students who progress quickly through their work could explore many layers of supplemental content through this link. The activities could be high-interest and require varied skill levels.

4- *Other Resources* presents supplemental, content-related materials, information, and activities.

5- *Check for Understanding* offers opportunities to assess student comprehension through traditional assessments or problem-based assignments.

The tool bar on the right displays nine icons linked to different tools (i.e., Sound Tools, Concept Map, Database, Text Editor, E-mail, Graphics Editor, Presentation, Spreadsheet, and Web). Each icon provides a shortcut to a designated application, giving students instant access through the watermark in the textbook.

The illustrations on the page are also digitally watermarked and serve as a point of departure for activities related to the text. In Figure 1, the digital watermark in the "Mystery Bacteria?" (ear) illustration delivers students to an online virtual lab simulation where they attempt to identify the pictured bacteria. Other possibilities for links include labeled diagrams, enhancements of photographs or maps, and questions related to the illustration.

The adaptive nature of the technology holds promise for highly customizable content in multiple curricular areas. Differentiated instruction is supported by enabling students to "drill down" in content. Real-time, embedded assessments are supported, as is the ability to follow a student's path through the content. Sound tools, concept mapping, and other applications engage students and enable them to interact with the content in whatever way is most appropriate for them. Although the examples above were used in the prototype, different tools and resources could easily be used to support other content areas.

Usability Study and Group Interview

Following the development of the prototype, IAETE conducted a usability study, then a small group interview. Participants included middle school and high school science teachers. The usability study was conducted prior to the focus group to elicit unbiased results. The participants were given five assignments, without instruction, which required participants to access multiple resources and tools. They worked as a group, and a talk-aloud protocol was used. Following the usability study, the group discussed the prototype and identified five key benefits: (1) the availability of real-time information, (2) more efficient computer use, (3) accommodation of multiple modes of learning, (4) standards-based content, and (5) the availability of assistive resources. Four limitations were noted: (1) access to computing device, (2) cost, (3) durability, and (4) the need for additional workspace.

The teachers rated the interface design and the ease of operation of the interactive textbook using a five-point scale, where 1 was the most negative response and 5 was the most positive response. The mean response for interface design was 4.75, and the mean response for ease of operation was 3.5.

During group discussion, the tool bar was the subject of much debate. Some teachers thought it was unnecessary, while others argued that the shortcuts would be helpful for keeping students on task. The teachers brainstormed about the possible layout (e.g., putting the tool bar on the back cover) and potential functions (e.g., using the sound tool to assist ESL students). IAETE will use the results of this study to refine the prototype and prepare for a larger usability study that will include teachers and students.

Summary

At present, e-books appear to be supplementing print media, not replacing them (Ditlea, 2000). This suggests that print-based textbooks are likely to be prevalent in classrooms for some time. This prototype concept, using imperceptible digital watermark technology, demonstrates a realistic and practical method for linking print and digital media. It is likely that the limitations identified through the usability study and focused group interview can easily be addressed as handheld computing devices become more commonplace in classrooms and more suitable optical reader devices become available.

Imagine it—a smaller textbook accompanied by a small, wireless, tablet-like computer and reader device/stylus that is no bigger than a permanent marker. The interactive textbook is a viable model affording students the best aspects of print and electronic media.

References

American Foundation for the Blind. (2001, July 19). *The Instructional Materials Accessibility Act of 2002 (IMAA 2002)*. Retrieved December 17, 2001, from http://www.afb.org/info_document_view.asp?documentid=1572

Axelson, M., & Hardy, L. (1999, June). Learning online: As web-based curriculum grows, are textbooks obsolete? *Electronic School*. Retrieved January 4, 2002, from http://www.electronic-school.com/199906/0699f1.html

Classwell. (2001, January 16). *Classwell Learning Group and Kinko's announce agreement to offer custom classroom publishing to educators*. Retrieved January 4, 2002, from http://www.classwell.com/press_room/press2.html

Ditlea, S. (2000, July/August). The real e-books. *Technology Review, 103*(4).

Harcourt embraces :CueCat technology for textbooks. (2001, June). *The Heller Report, 6*(12), 1-2.

Hubisz, J. (2001, May 21). Don't know much about a science book. *The Industry Standard*. Retrieved August 1, 2001, from http://www.thestandard.com/article/0,1902,24576,00.html

Jensen, M. (2000). E-books and retro glue protect the vested interest of publishing. *The Chronicle of Higher Education, 46*(42), A64.

Looney, M. A., & Sheehan, M. (2001). Digitizing education: A primer on e-books. *Educause Review, 36*(4), 38-46.

McGraw-Hill Companies. (n.d.). DigitalOwl. In *Education—recent partnerships*. Retrieved January 4, 2002, from http://www.mcgrawhill.com/partnerships/education_recent.html

McGraw-Hill Primis Custom Publishing. (n.d.). McGraw-Hill's Primis Online. In *Services overview*. Retrieved January 4, 2002, from http://www.mhhe.com/primis/

McKnight, C., Dillon, A., & Richardson, J. (1996). User centered design of hypertext and hypermedia for education. In D. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 622-633). New York: Macmillan.

Morehead, N. (2001, July 2). Handheld computers earn high marks. *Federal Computer Week*. Retrieved December 14, 2001, from http://www.fcw.com/civic/articles/2001/july/civ-case-07-01.asp

National Public Radio. (2001a). *Textbook changes* [Real Audio]. Retrieved January 4, 2002, from http://www.npr.org/ramfiles/atc/20011022.atc.10.ram (October 22, 2001).

National Public Radio. (2001b). *E-books* [Real Audio]. Retrieved January 4, 2002, from http://www.npr.org/ramfiles/atc/20011220.atc.12.ram (December 20, 2001).

Nielsen, J. (2000). *Designing web usability*. Indianapolis, IN: New Riders Publishing.

Odlyzko, A. (1999). The economics of electronic journals. In R. Ekman & R. Quandt, (Eds.), *Technology and Scholarly Communication*. Berkeley, CA: University of California Press.

Project 2061. (1999, September). *Heavy books light on learning: Not one middle grades science text rated satisfactory by AAAS's Project 2061*. Retrieved February 15, 2002, from http://www.project2061.org/newsinfo/press/rl092899.htm

Textbooks to become interactive. (2001, January). *T.H.E. Journal, 28*(6), 16.

Trotter, A. (2001). Education publisher moves science textbooks online. *Education Week, 20*(20), 11.

Writers Write, Inc. (2001, March 14). *The Write News. GoReader and Harcourt announce e-book agreement.* Retrieved July 24, 2001, from http://www.writenews.com/2001/031401_goreader_harcourt.htm

Zeitchik, S., Reid, C., & Nawotka, E. (2001). Screen time or smokescreen? *Publishers Weekly, 248*(40), 25.

Semiotics Of Digital Media In Education

Melda N. Yildiz

William Paterson University

As we enter the twenty first century, it is essential that the schools be places that help students better understand the complex, symbol-rich culture in which they live in. A new vision of literacy is essential if educators are serious about the broad goals of education: preparing students to function as informed and effective citizens in a democratic society; preparing students to realize personal fulfillment; and preparing students to function effectively in a rapidly changing world that demands new, multiple literacies. Renee Hobbs, 1997

Abstract

Semiotics is one of the approaches to media education and new media literacy. It complements and promotes the ideals of Media Literacy education. It opens a new way to the study of media literacy. We can not only study the alphabet of deaf-mutes, symbolic rites, polite formulas, military signals, and religious symbols but also study the commercials, sit-coms, soap operas, bulletin boards, and now the Internet. In a sense, we all are using, deconstructing, learning, and reading signs even though we never studied Semiotics. We learn new signs everyday as the signs evolves continually in their meaning or significance all the time.

In the millennium, we are going to be surrendered by more and more images from bulletin boards to Internet, from advertisements banners to book covers. Internet and new technologies create new images, icons, symbols, and metaphors to study for us to make sense on the Cyberspace.

Instead of consumers of media, new generations need to be the producers of media. The more they study and experience media, the more likely they see, understand, and interpret media. Len Masterman (1985) considers media literacy education is a crucial step towards "participatory democracy." Masterman adds, "Media Education is both essential to the exercising of our democratic rights and a necessary safeguard against the worst excesses of media manipulation for political purposes."

The focus is to highlight the importance of studying signs, symbols in media education in order to gain different perspectives in our teaching styles and strategies, instead of going into the details of the history of semiotics and media studies.

In conclusion, the main goal of this presentation is to draw on the natural links between semiotics and media education. We will see how a critical approach to the study of media combines knowledge, reflection, and action, promotes educational equity, and prepares new generation to be socially responsible members of a multicultural, democratic society.

Introduction

This paper is based on a comprehensive exam topic entitled, *Semiotics of New Media Literacy*. It was presented in the School of Education at the University of Massachusetts at Amherst. The focus of the paper is to highlight the importance of studying signs in media education in order to gain different perspectives in our teaching styles and strategies, instead of going into the details of the history of semiotics and media studies.

The paper defines "Semiotics" and "Media Literacy," examines digital media and its culture in education from a semiotics perspective, and provides resources and examples for integrating semiotics and new media literacy into the curriculum.

The PowerPoint Presentation of this presentation is online at:
http://euphrates.wpunj.edu/faculty/yildizm/AECT2002.ppt

The web page also includes links to articles, journals, organizations, and various resources on the Internet.

Semiotics

Semiotics, the science of signs, is a type of scientific inquiry that studies virtually everything we do, use to represent the world around us and to make messages about it. Semiotics or semiology is considered a subject, a movement, a philosophy, or science. The example of the color (and the word) red is a sign in semiotics. The semiotician refers to the meaningful location of this specific light-frequency property as context, to its meaning in specific contexts as signification, to the ways in which it generates meaning as a code-based, and to the ways in which a message is understood as interpretation. (Danesi, 1994)

The subject matter and the key concepts of semiotics has always been the 'sign'. Semiotics studies every sign, icon, or symbol from trafic lights to charts and graphics on a newspaper, from commercial advertisements to icons on the web pages, from gestures to dance movements.

Interest in signs is not recent. Aristotle, Hippocrates, Locke and many others have contributed to semiotics. Medieval philosopher John Locke and many others have shown interest in signs and the way they communicate. The etymology of the term semiotics is form Greek word sema- “marks, signs” (singular semeion). It is defined as the science of doctrine of signs. The English philosopher John Locke (1696) first used Greek word ‘seemeiootikee’, in the modern sense. The word *semeiotica* is still used in Italy to refer to the study of symptoms in medical science.

Modern semiotics emerged through the work of two linguistics theorists: Swiss Linguist Ferdinand de Saussure (1857-1913) and American philosopher Charles Saunders Peirce (1839-1914). These two philosophers inspired Charles Morris, Thomas Sebeok, Umberto Eco, and Roland Barthes.

Ferdinand De Saussure published *Course in General Linguistics* in 1915. For Saussure, a sign has two components, the signifier or "sound-image", and the signified, or "concept". The relationship between signifier and the signified is arbitrary. He used the term “semiology” to refer to the systematic study of signs. Nowadays, the term “semiotics” is being used.

The most widely used definition of semiotics comes from Peirce who is considered to be the co-founder of the semiotics along with Saussure. He defines semiotics as the “doctrine” of signs “stands to somebody for something in some respect or capacity.” (Peirce, 1958)

Although semiotics is both a sphere of inquiry and a meta-analytic tool that has been used in philosophy, anthropology, sociology and linguistics, examination of signs in an educational context is a relatively recent phenomenon. (Cassidy, 1982) The field of semiotics became popular since it has been used in theatre, medicine, architecture, puppetry, television, tourism, and now on the Internet. It includes study of how animals communicate (zoo semiotics), of nonverbal communication (kinesics), of aesthetics, of rhetoric, of visual communication, of myths and narratives, of anything that allows us to make meaning and sense of the world. (Danesi, 1994)

Semiotics looks at how the meaning is generated in "texts" (films, television programs, fashion, foods, etc.). The meal with steak, mashed potato, and apple-pie conveys meanings beyond the food. It shows status, taste, sophistication, nationality, and so on. (Berger, 1982)

In his influencial book, *A Theory of Semiotics,* Umberto Eco (1976) defines semiotics as “the discipline studying everything, which can be used in order to lie.” Eco continues, “Semiotics is concerned with everything that can be taken as a sign. A sign is everything which can be taken as significantly substituting for something else." (Eco, 1976)

Culture and Semiotics

Human beings talk, write, blink, wave, and disguise themselves. They put up signposts and erect barriers to communicate messages to other people. They produce and interpret signs. But even if no one intends to communicate anything, sign processes are taking place: A doctor interprets the symptoms of a disease, a dog follows a trail, and a thief triggers an alarm. Then, what is not a sign? Almost every action, object, or image mean something to someone somewhere or sometime. From our gestures to what color dress we wear is a sign that has meaning beyond the object itself.

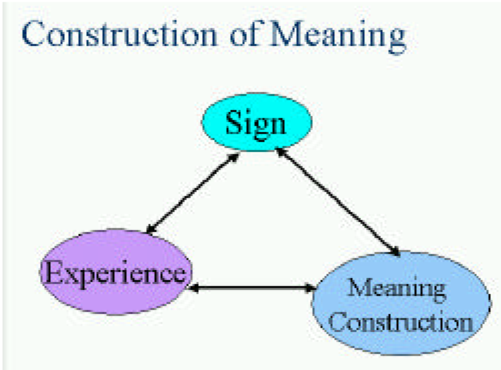


Figure: Construction of Meaning

The meaning of signs or representations is dependent on social, cultural, and historical contexts. We construct meaning based on the physical appearance of the sign; our previous personal and cultural experience; time or era we live in; and context or place it occurs (See the figure above). There is not one meaning or interpretation of an each sign. There are multiple sides and points of view to each sign.

As in James Mangan (1981) doctoral thesis, *Learning through pictures* provides interesting examples to illustrate both cultural and cognitive limitations to the ability to understand pictures. These limitations must be taken into account when designing learning materials not only for rural villagers in Dr. Mangan's study, but the global villagers in the world. Mangan says “Cultural differences in perception is more subtle and numerous than most educators suspect.”

Looking at three different pictures of bears from three different cultures may be a great example. One is a picture of Yogi Bear from Western cartoon that can be seen as a dog if one has never seen the cartoon before. Another bear picture from North American Natives, a picture of a Tsimshian bear does not look like a bear to me. Or a hand drawn picture of a bear, may just be perceived as many lines for someone who has never learned to see the bear picture that way (Mangan, 1981).

The greatest difficulty for international language of signs is that the same denoted sign can have many different connotations. When messages are attempted across cultures -whether based on age, economics, gender, ethnic background, location, it is decoded differently. For example, in many cultures eye contact between two individuals talking to each other is a sign of interest. In other cultures, it may indicate disrespect, insult. One of my advisees had a trouble with a few teachers who asked me why my student never participates in class. As a Korean student, we found out when she was ready to answer. She bowed her head to indicate she was ready for an answer while the teacher assuming she was avoiding the eye contact.

As Lester indicates, “Humans always see and hear through the filter of who they are within a community.” Consequently, the meaning behind any sign must be learned. In other words, for something to be a sign, the viewer must understand its meaning. If you do not understand the meaning behind the orange color of a jacket, it isn't a sign for you. (Lester, 1995)

W. V. Quine’s famous example shows the impossibility of learning a language from scratch.

> Imagine yourself as an adventurous linguist marooned in some unknown territory hosted by a tribe. You are trying to learn their language, and at some point your host points his index towards a rabbit running in the distance and says “gavagai”, what could you deduce from that? That “gavagai” means rabbit? Or “in the distance”? Or “brown-grey”? Or “this is our meal for tonight”? Or that *this* rabbit is called “gavagai”? Or that it means, “Go home!” If the indexical sign is not clearly identified, (and how could it be identified?), this iconic way of learning a language (word meanings by analogy with existing things) cannot work. (Codognet, 1990)

Every single thing has meaning and gives a different message depending on where it is located and who sees it. For instance the color “red” implies different things. Red means stop when it is on a traffic light, stands for blood in medicine. If a woman wears a red dress, or a man wears a red armband, it means something different. In general, red in western culture means usually danger, hot, sexy, embarrassment, left wing or radical. Whereas red brings different things in my mind since I grew up in Turkey. Traditionally, red was the color of the wedding gown. Still in some villages it is possible to see red gowns. Also, during a Festival, the blood of a sacrificed animal can be put on the face for religious purposes. That's why the physical property of red light stands to somebody (a motorist, a pedestrian, a political demonstrator, or a Turkish woman, etc.), for something in some respect or capacity (stop, political perspective, wedding). (Danesi, 1994)

Semiotics in Media and Communication

As Albertson states, just as the introduction of sound into the medium of film brought change in theatrical form, so has the introduction of Internet communication into human discourse influenced semiotic forms throughout world cultures. With the introduction and penetration of new media and computer mediated communication systems, human interactions are changing at rapid speed. This change could possibly be more rapid, "than any other time in history" and instant communication with people all round the world changes the way we perceive space and time. (Albertson, 1997)

Human beings created a world of messages and meanings and continue to create new ones to look for the meaning of life. In order to communicate with each other and leave their stories for the new generation, humans have been using the power of images and symbols since the beginning of the human history. From stone surfaces to animal leathers, from paper to Internet, "the story of humankind has been written, is being written, and will be written upon its virtual walls (Albertson, 1997)." The electronic images now being shared all round the world and the necessity to understand and study these signs are becoming more important.

Philippe Codognet (1990) perceives Semiotics as a "... powerful tool in order to rephrase information theory and computer science and shed a new light on this global phenomenon." In his *Semiotics of the Web* article, Codognet looks at the traces of signs in the history and talks about the importance of images, sculptures, and pictures in churches in order to educate illiterate people from religion to geography. Especially in Western culture, the use of images to represent knowledge and synthesize information has a long background in the history of ideas (Codognet, 1990). Even after the invention of the printing press, the power of images, symbols, and icons stayed the same.

First Internet pages on the World Wide Web had more icons, and pictures. Today, some of the symbols that were created by the programmers stayed as an icon. However, trying to find an icon for every link faded away. Yan's research brings various examples from library web pages. For instance, to signify the library catalog, a button with a picture of a book now just turned into a link with a written library catalog link. (Yan, 1995) As Codognet said "pure iconography is not possible, as icons have to present themselves as such, to display their own icon-ness."

Being limited to ASCII (The American Standard Code for Information Interchange) texts and the expansion of the Internet communication, early Internet users developed a series of nonverbal symbols and signs. Such signs could signal play, emphasis, exaggeration, or shouting. The signs were informal and intended to facilitate communication. These signs are part of the construct, which became known as 'netiquette' (Glister, 1993). For example, : -) ☺ used to describe the happy mood of the author, and abbreviations such as POS to inform the instant message partner "Parent is Over Shoulder".

Although many words in the world of computing sound friendly such as mice, fields, bugs, turtles and they have connotation of the natural world, or some from everyday life queue, address, bus, network, and the audience still will face many obstacles in viewing the web pages. Just being able to read the written text may not be enough to decipher the message on a web page. The pictures, animation, video, and hyperlinks need to be designed for international community. The audience may feel, unjustifiably, that difficulties in use result from their own failure to understand rather than from the failure of the computer specialist or an instructional designer to communicate effectively (Gerver, 1986).

Media Literacy

The definition of literacy has been changing rapidly. As Ernest L. Boyer said "It is no longer enough to simply read and write. Students must also become literate in the understanding of visual images. Our children must learn how to spot a stereotype, isolate a social cliché and distinguish facts from propaganda, analysis from banter, important news from coverage."

Media Literacy was defined at the Aspen Institute in 1989 as "ability to access, analyze, communicate, and produce media in a variety of forms." Media literacy is more than asking students to simply decode information that they experience in the media, but they must be able to talk back and produce media.

Today, gaining Media Literacy skills is becoming more important. Preventing a new generation to see TV or use Internet is not going to solve the violence, hunger, or world problems. The more we learn about TV, use the Internet, the more likely we see and understand the world. As Len Masterman (1985) says, "Media are symbolic systems; not simply reflection of reality which must be accepted, but with languages which need to be actively read, and interrogated."

Stories like Zack written by Alan November in his article entitled, "The Web: Teaching Zack to Think" gives an example of a student who wrote a history paper about how the Holocaust never happened. Zack sited his resource from a university professor's web page. Zack story is a great example of the importance of new media literacy skills. "Just because it's on the Net does not make it true." (November, 2001) Students need to be able to identify who the author, how it is being presented, and whose point of view is being presented.

Glister defines Digital literacy as:

> Ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers... (Not) only must you acquire the skill of finding things, you must also acquire the ability to use those things in your life. Acquiring digital literacy for Internet use involves mastering a set of core competencies. The most essential of these is the ability to make informed judgments about what you find on-line. (Gilster, 1997)

Cornellia Brunner and William Tally (1999) places emphasis on the importance of effective research skills in education and encourges educators to incorportate new media literacy skills into the curriculum. In addition to reading, writing, and aritmetic, Rich Thome (1996) adds another R (research) in his article, *Fourth R is Research*. In the information and communcation age, even though reaching information on the internet seems to be in our finger tips, finding a reliable resource and ability to make informed judgments about what one finds on-line requires new skills." (Gilster, 1997)

Semiotics and Literacy

Semiotics complements and promotes the ideals of Media Literacy education. Semiotics is one of the approaches to media education and new media literacy. It opens a new way to the study of media literacy. We can not only study the alphabet of deaf-mutes, symbolic rites, polite formulas, military signals, and religious symbols but also study the commercials, sit-coms, soap operas, and bulletin boards. In a sense, we all are using, deconstructing, learning, and reading signs even though we never studied Semiotics. We learn new signs everyday as the signs evolves continually in their meaning or significance all the time.

> The aim is to develop awareness about print and the newer technologies of communications so that we can orchestrate them, …. And get the best out of each in the educational process. Without understanding of media languages and grammars, we cannot hope to achieve a contemporary awareness of the world in which we live. (McLuhan, 1967)

Both Carmen Luke (1994) and Marshall McLuhan (1967) talk about "grammar" and "language" of moving images. Musicians use notes and scales to communicate, dancers use movement, and scientists use mathematical notations. Media producers also have a unique system of grammar and language, and learning to read it in all its complexity is crucial to being media literate (Scott & Yildiz, 1996).

Film, TV, commercials, and the Internet are texts and have their own language and grammar. Language is a social institution that gives us the rules and conventions and speaking is the action part that is based on language.

Education and Signification

Kimberly J. Sloan (1995) wrote a reflection piece on her “teachable moment.” While she was working at a juvenile prison, she drew a picture of a crown to represent Prince Hamlet of Denmark. It was interpreted as a gang symbol by the class. By drawing the crown, she had somehow affiliated herself with the Ghetto Boys of Indianapolis. This angered her students who consider themselves members of a rival gang. She used the drawing of the crown on the board to be interpreted as an icon. She wanted to illustrate the power structure of Shakespeare's play Hamlet by mapping the character names on the board to show their relationships in the play. However, some students did not accept the drawn crown as an icon, but instead perceived it as a symbol. To them, the crown was a gang symbol that demonstrated their affiliation to that particular gang.

While I was working as a media specialist in a high school, I had an interesting incident. Teachers were required to save students' progress reports on a floppy disk, and then upload the file to the registrar’s office though a school wide information system. One day, one of the teachers told me that the registrar received her file without any data. She was sure she followed all the directions in the manual and even the computer said “OK.” Except she forgot to upload her file since she saw "0K" next to her name, and the date it was sent. It took us a while to find out which step she missed and why she thought she was right. When she saw "0K" (zero kilobytes), she thought it was "OK" meaning the message transmitted safely to the registrar’s office.

When I attended a presentation given by a dance teacher Luana in National Association of Multicultural Education conference in the fall of 1996. Luana talked about the differences in art and dance among cultures, and gave interesting examples, even encouraged us to dance and present ourselves through dance. Through dance and movement, humans define themselves. In western culture, the dance especially “bale” includes upward movements. The dancers are as if trying to reach to the sky. In Africa, the dancers dance toward the earth. For instance, whirling dervishes (Sufi) try to reach to the sky (God) with one hand and the other hand points to the earth. The movement in dance reflects cultural differences. As one teacher pointed out, African descent students walk as if they are reaching to the ground. Some may interpret this as an attitude towards a system or teacher, but as the speaker points out this is just a movement coming from the student's culture.

The teachers’ role in education is critical and important. For Paulo Freire (1993), “Education must begin with the solution of the teacher-student contradiction, by reconciling the poles of the contradiction so that both are simultaneously teachers and students.” Although it is almost impossible to understand each and every students’ background and culture and their interpretation of the signs and symbols, as Sloan (1995) suggests “We can use our various interpretations of signs as a starting place for discussion of our often opposing value systems, to create interesting juxtapositions, and to investigate others "personal structures" to broaden our own experiences.”

In the millennium, we are going to be surrendered by more and more images from bulletin boards to Internet, from advertisements and banners to book covers. The Internet and new technologies creates new images, icons, symbols, and metaphors to study for us to make sense of the Cyberspace.

> The mass media … play a critical role in the social construction of knowledge concerning race and ethnicity … For the full flourishing of multicultural education, scholars need to develop more sophisticated ways to explore and assess media-based multicultural knowledge construction. (Cortes, 1995)

Since new generation is spending more time with the mass media, their interpretation of the world is mainly based on images they have seen. As writer Walter Lippmann says, “Whether right or wrong ... imagination is shaped by the pictures seen ... Consequently, they can lead to stereotypes that are hard to shake.”

Instead of consumers of media, new generations need to be the producers of media. The more they study and experience media, the more likely they see, understand, and interpret media. Len Masterman (1985) considers media literacy education is a crucial step towards “participatory democracy.” Masterman adds, “Media Education is both essential to the exercising of our democratic rights and a necessary safeguard against the worst excesses of media manipulation for political purposes.”

Works Cited

Albertson, M. E. (1997). Creativity and the Evolution of Semiotics units using Internet Communication. The Claremont Graduate University PhD. Dissertation. ProQuest.

Berger, A. A.(1982). *Media analysis techniques. Vol 10*. Beverly Hills, CA: Sage Publications.

Brunner, C. & Tally, W. (1999). *The new media literacy handbook : an educator's guide to bringing new media into the classroom.* New York: Anchor Books/Doubleday.

Cassidy, M. F. (1982). Toward integration: Education, instructional technology, and semiotics. A Journal of Theory, Research, and Development; v30 n2 p75-89.

Codognet, P. (1990) Ancient Images and New Technologies: The Semiotics of the Web. URL: http://pauillac.inria.fr/~codognet/web.html

Danesi, M. (1994). *Messages and Meaning: An Introduction to Semiotics*. Toronto: Canadian Scholars' Press Inc.

Eco, U. (1976). *A Theory of semiotics.* Bloomington: Indiana University Press.

Freire, P. (1993). *Pedagogy of the oppressed*. New York: Continuum

Gerver, E. (1986). *Humanizing technology computers in community use and adult education*. New York: Plenum Press.

Hobbs, R. (1997). Expanding the concept of literacy. *Media literacy in the Information Age*. New Brunswick: Transaction Publisher. 163-183.

Lester, P. M. (1995). Visual communication: images with messages. Boston: Wadsworth Publishing Company.

Luke, C. (1994) Feminist pedagogy and critical media literacy. *Journal of Communication Inquiry*, special issue on "Critical Media Pedagogy" 18(2), 27-44.

Mangan, J. W. (1981). Learning through pictures: a study of cultural and cognitive aspects of visual images. Thesis (Ed.D.) University of Massachusetts.

Masterman, L. (1985). Teaching Media. London: Comedia Publishing Group.

McLuhan, M. and Fiore, Q.(1967) *The Medium is the Message*. Singapore: HardWired.

November, A. (2001, March). Teaching kids to be web literate. Technology and Learning, vol 21, pp.42-46.

Peirce, C. S. (1958). *Collected Papers*. Cambridge, Mass.: Harvard University Press.

Scott, A., Yildiz M. (1996) Minnie Mouse Meets Paulo Freire: Media Literacy, Praxis, and Multicultural Education, *National Association for Multicultural Education 1996 Proceedings.* 252- 261.

Sloan, K. J. (1995 February 8). Icon or Symbol: A Teacher's Moral Dilemma [On-line]. URL: http://php.indiana.edu/~ccolon/Semiotics/kjsloan1.html

Thome, R. (Oct 1996) The Fourth R is Research. Electronic Learning.

Yan, M. (1995). *A Semiotic Analysis of Icons on the World Wide Web*. International Visual Literacy Conference. Chicago. EDRS.

Usability of Guidelines to Create Constructivist Software by Novice Designers

Murat Ataizi

T.C. Anadolu University, School of Communication Sciences

Abstract

Constructivism, or more precisely constructivist theory talks about the authenticating the learning environments. In order to create the more constructivist and authentic learning environments, designers should fallow the certain characteristics that are given by Jonassen (2002) on his web site (http://www.coe.missouri.edu/~jonassen/courses/CLE). The purpose of this study is to reveal novice software designers' problems within which they are in the process of constructivist computer software design. Qualitative research method will be used to collect and analyze data for this study. Also, this study will proposes recommendations on how to improve the training of novice educational software designers.

Within educational software design, the term constructivism has taken a very important role ever since constructivism became so popular at the beginning of 1990s. Educational technologists and instructional designers have developed many constructivist computer based programs or assimilated constructivist strategies into educational programs . However, despite the continued emphasis on constructivism, good examples of constructivist principles applied to software development are rarely found in programs in Turkey. Perhaps there is a lack of theoretical knowledge among software designers or they may be having some problems during the development process.

Constructivist approach to instruction is different from those traditional methods, so classical methods of instructional design use some inappropriate design tools to create constructivist learning environments. In the heart of constructivism the students situates the learning experience within his or her own experience and that the goal of instruction is not to teach information but to create situations so that the students can interpret information for their own understanding (Heinich, Molenda, Russell, & Smaldino, 1999).

Wilson (1996, p.5) defines a constructivist learning environment; a place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem solving activities. This definition has no universal acceptance for constructivist learning environment but juts a starting point for this study.

Method

This study attempted to examine novice software designers' problems when faced with the task of designing constructivist-based computer software programs. At Anadolu University in Turkey, the Division of Educational Communications and Planning offers a software design course called Learning with Technology. Every spring semester approximately 4-5 graduate students take this courses as an elective. At the end of the course, each student has to develop educational software to be used for instructional purposes in a variety of areas. Some programs are directed at the development of a particular institution's or company's professionals, or are meant to support formal school courses. The research project examines Jonassen's characteristics of meaningful learning to create constructivist learning environments (Jonassen, 2002, http://www.coe.missouri.edu/~jonassen/courses/CLE/index.html). These constructs include addressing active, constructive, collaborative, intentional, complex, contextual, conversational, and reflective characteristics of meaningful learning to provide guidelines to students to help them create software containing these constructs in their own programs. After examining the guidelines each student developed his/her own software based on these guidelines and tried the software out to see if it matched the constructivist learning environments' characteristics.

Hoepfl states that (1997, http://scholar.lib.vt.edu/ejournals/JTE/v9n1/hoepfl.html*)* the ability of qualitative data to more fully describe a phenomenon is an important consideration not only from the researcher's perspective, but from the reader's perspective as well. "If you want people to understand better than they otherwise might, provide them information in the form in which they usually experience it" (Lincoln and Guba, 1985, p. 120). Qualitative research reports, typically rich with detail and insights into participants' experiences of the world, "may be epistemologically in harmony with the reader's experience" (Stake, 1978, p. 5) and thus more meaningful. According to those explanations of qualitative research, the researcher used this method to gather rich and detailed data for this study.

4 graduate students in the course participated in the study. Interviews with the students, and the online discussion group is being used to gather data for this study. Interviews with the students will be all sections of the course such as in the beginning, middle, and the end. In the beginning the instructor and the students discuss the guidelines and converse about their usage for designing instructional software. After beginning the developing process the conversation continues between the instructor and students. At the end of the course the in depth dialogues are analyzed using a content analysis technique. All of the conversation process with the students are collected and coded for analysis.

The second data collection tool is analysis of an online discussion group. The online discussion group consists of the students who are taken the course and willing to participate to the study. All conversations, chats, and e-mails among them are saved to a computer with the intention that they could be used for elaborative data for the research.

Analysis of the data begins with identification of the themes emerging from the raw data. During this coding period the researcher is identifying and naming the conceptual categories into which the phenomena observed will be grouped. As the raw data are broken down into manageable chunks, the researcher is coding the data and translating it into the story line. The results of this research indicate an in depth analysis of the strengths and pitfalls that students encounter when using these constructs in a prescribed setting to design constructivist learning environments in a computer software program.

Novice designers chose statistics as a subject (content) to design a constructivist learning environment. Their target group (learners) was also graduate students who have not any knowledge and experience about the research statistics.

Results and Discussion

Active: In order for the learners' activity, novice designers were embedded some cases into the program. The cases were designed with the collaboration of a statistics practitioner and a full statistics professor. The designer, practitioner and professor were worked together as a development team for the project. The most discrepancies for the team were developing the real life situations in the cases.

Constructive: Learners integrate new ideas with prior knowledge in order to make sense or make meaning or reconcile a discrepancy, curiosity, or puzzlement. They construct their own meaning for the phenomena (Jonassen, 2002). Knowing what the students knew was very painful process for the designers.

Collaborative: Online discussion groups and electronic mail were the collaboration tools for the students. Also, collaborative cases were helped the designers to built collaboration among the students.

Intentional: Learners were encouraged with highly motivated goals such as *after completing this program you will be able to do your future research statistics by yourself* before, during and after the program. It was mostly easy for the designer to indicate this goal for these level students.

Complex: Creating ill structured and a complex learning environment was too difficult for the team. The reason for this all the members of the team were studied in the traditional system. In this system, all refined and oversimplified knowledge were given to them in their all school life. Therefore, they had difficulty to build a complex and ill structured learning environment.

Contextual: A great deal of recent research has shown that learning tasks that are situated in some meaningful real world task or simulated in some case-based or problem based learning environment are not only better understood, but also are more consistently transferred to new situation (Jonassen, 2002). In the cases real life contexts were developed by the designers.

Conversational: In order to socialize the learners online discussion groups and electronic mail were used in the program. Also the cases were designed to make them collaborate with each other.

Reflective: Cases and examples were connected to another situation with which learners can articulate what they are doing, the decision they make, the strategies they use, and the answers that they found.

Designing a constructivist learning environment seems to be too hard for novice designers. Creating a good designing team, and conversation in the all designing process with the novice designers could helped them for better understanding to design and develop a constructivist learning environment.

References

Heinich, R., Molenda, M., Russell, J. D., & Smaldino, S. E. (1999). **Instructional media and technologies for learning.** (5th Ed.), New Jersey: Englewood Cliffs.

Lincoln, Y. S., & Guba, E. G. (1985). **Naturalistic inquiry**. Beverly Hills, CA: Sage Publications, Inc.

Stake, R. E. (1978, February). The case study method in social inquiry. **Educational Researcher**, *7*(2), 5-8. http://www.coe.missouri.edu/~jonassen/courses/CLE/index.html)

Wilson, B. G. (Ed.), (1996). **Constructivist learning environments**. New Jersey: Educational Technology Publications, Inc., Englewood Cliffs.

Creating Community: How a Department Student Organization Can Help

Semiral Öncü

Indiana University

John Keller

Indiana University

Ana Correia

Indiana University

Abstract

This paper outlines the efforts of a departmental student organization in the Instructional Systems Technology department at Indiana University. This organization is named Graduates in IST (GIST). As officers during the 2001-2002 academic year, we focused on addressing academic, professional, and social needs, our work in the department was guided more by the traditions of the department and our own sense of what activities were necessary and valuable for the students in our department—our colleagues than by any systematic attempt at creating a sense of community. A brief glimpse of the past is offered to ground the description of the activities that were offered by the student organization in 2001-2002. After these activities are described, we share a bit about current and future directions for the organization. The paper concludes with a discussion of the difficulties of creating a sense of community and shared culture in a graduate department.

Past

There has been a graduate student organization in the IST department at I.U. even before there was an IST department. The student organization began when the Department of Audio-Visual Instruction was in its heyday at I.U. Professors who have been here for some time agree that the student organization has been around for over 30 years although there is little record of activities or accomplishments of the early years of the organization.

According to one professor, the student organization has ebbed and flowed over the course of the years. Within periods of activity characterized by either recession or advance there was still more fluctuation that seemed to be at least partially explained by changes in leadership of the organization. As GIST is currently organized, there is a two-level membership structure in the organization. All IST students are members; faculty and students can become active members by paying yearly dues. The organization is led by six cabinet-level positions: president, vice-president for professional development, vice president for social activities, vice-president for information services, treasurer, and secretary.

When the 2001-2002 academic year began, there were no officers since elections had not been held the previous spring. Two students formed a nominating committee and soon candidates for cabinet level positions were nominated. After the elections in mid-September, the GIST executive cabinet took up weekly meetings at the end of September 2002. We were excited to carry on the traditions of the department and to forge ahead in new directions.

Present

The description of our organization which follows is organized around four main ideas.

1. GIST as a voice for students
2. GIST as a social organization
3. GIST as a support for professional growth
4. GIST supported by technology

GIST As A Voice For Students

One of the responsibilities of the organization is to be a voice for students. Fulfilling this responsibility has taken a number of forms from advocating increased support for technology learning, to attending faculty meetings on a regular basis, to keeping thorough records of executive meeting minutes.

Advocating Technology Support: Students coming to our program span a range of technology capabilities. The core classes (a group of classes required for the minor, Master's and Ph.D. tracks) are particularly demanding of these skills. The department has experimented with a number of ways of addressing this issue. During the first semester of 2001-2002 the GIST cabinet discussed the possibility of co-sponsoring technology workshops for first year students. We were reluctant to offer too many since we did not feel that it was necessarily our responsibility to train new students on technology and yet saw the need for skill training since all of us had just experienced the demands of the spring production class. We approached the department with a plan in which GIST would sponsor one workshop for every workshop offered by the department. The faculty supported the plan and a number of technology workshops were organized by one of the GIST officers. All of the workshops were directed at helping students achieve success in the spring production class. GIST made the following recommendations to ensure the quality of the workshops and that the workshops could be a stepping stone to a long-term solution to the question of supporting student technology learning:

1. Each workshop should include a high-quality visual aid for those attending. Basic guidelines should be established for these handouts and submitted for review prior to the session. The department should cover copying fees for the handout. A copy of the handout should stay on file with the department.
2. An evaluation crafted jointly between GIST and the department should be formulated for all workshops offered as part of this initiative.

While various workshops were offered and well-received, they were not evaluated in any systematic way and thus little was learned to guide in future technology training decisions within the department. The current GIST executive committee intends to follow-up on this concern for the coming year.

Faculty Meeting Minutes: GIST has been attending the faculty meetings in the Instructional Systems Technology Department at Indiana University since November 02, 2002. Although provision for student representation in departmental meetings had long been part of the GIST charter, a regular student presence in faculty meetings had not been established for some time. The following criteria were set by the GIST executive committee to re-establish GIST's participation in the faculty meetings:

1. In re-establishing this relationship it was decided that two members of the GIST executive committee would attend all faculty meetings.
2. These student attendees have the opportunity to bring issues to the faculty meeting by submitting items to the department chair for the meeting agenda in advance of the meeting.
3. The student representatives compile minutes of the meeting for the purpose of sharing them with students.
4. Prior to being posted on the GIST web site, the notes from these meetings are approved by the department chair, in order to ensure the flow of accurate information.

These minutes are designed to help students get a picture of the workings of the department and to generate thought, discussion and idea sharing among students. Included in the minutes are possible implications for students. These implications are the interpretations of GIST representatives.

We have been warmly received by the faculty in each of the faculty meetings. At times the faculty solicits our opinions, but most often we listen and observe.

GIST Executive Committee Minutes: In order to truly represent students—to be their voice, it was important to strive for transparency. One way that we attempted to accomplish this was through making all of our meeting minutes public. We are not aware of how or if these minutes are used by other students but we do know that they are quite valuable to us since they provide another layer of organization to keep us focused and as we mention later, are part of a valuable documentation of organizational processes.

GIST as a Social Organization

One main goal of GIST is to help IST students feel part of a community and to celebrate each victory and success despite the many challenges of being a graduate student. In an effort to address social needs of the department a number of events were sponsored including, Hallowine, IST lab snacks at Christmas, Portfolio celebrations, and IST Follies. Those activities were developed as an effort to develop this sense of collective identity and to offer a supportive environment to all members of the IST community.

Social functions tend to be associated with fellowship, eating, drinking, and enjoying the company of each other but it is more than that. These times are about taking time off, sharing life's moments, building relationships, and creating a community that cares about its members.

Hallowine: The Halloween party (known among ISTers as Hallowine) was celebrated on the weekend before Halloween. IST students, faculty, families, and significant others were invited to wear costumes and to enjoy a potluck dinner in a Halloween atmosphere. Sixty to eighty people attended the event that took place in the home of a faculty member. Even though Halloween is a traditional American holiday a considerable number of the attendees were international students.

Portfolio Celebration: The portfolio review is done at the end of fall and spring semesters and is the celebration of an important milestone for Master's and Ph.D. students. The portfolio review is a perfect opportunity to bring together the academic, professional, and social facets of IST life for all IST students including first year students who historically were not part of this celebration time. Fifty to sixty people attended the event including faculty, new and older students along with a considerable percentage of students who had submitted the portfolio. Faculty attendance was almost one hundred percent.

IST Follies: IST Follies is a cabaret type theatrical event held late in the spring semester every year since 1996. This year the program consisted of musical and other artistic performances (music and dances from Thailand, China, Turkey, and Mexico, which reflected departmental diversity) and humorous skits, live and recorded, produced by students and faculty. As the name implies, the overall purpose was to celebrate the talents and follies of the department over the past year. In the School of Education auditorium, eighty to hundred people attended the event including students, faculty, and their families. A buffet was served after the show. No admission was charged. IST Follies was an event produced by all the community for family and friends!

GIST As A Ssupport For Professional Growth

Round Talks: Round Talks are held semi-regularly and hosted by someone held in esteem for their expertise in a specific area of concern to IST students. The expert, however, is not designated as the "sage on the stage" and functions as a facilitator of discussion. These gatherings were originally conceived to provide opportunities for interactions not always available in the classroom and in an atmosphere less formal than an instructional setting are important contributions of the Round Talks. Five Round Talks (Technology Toastmasters, What it Means to be a Designer, Demystifying Portfolios, Advice for New Students, and Getting Started With EndNote) have been hosted since their beginning in the 2001-2002 academic year. Three more Round Talks are being planned for January, February, and March 2003.A short evaluation concludes each Round Talk.

It seems evident from early reactions that venues such as Round Talks are one way of addressing a variety of student needs. There is a need for these events to be better promoted so that more students can engage and participate. Some of the topics suggested for future were: publishing, consulting practices, resume design, qualifying exams, the process of conducting research.

IST Conference: This annual conference serves as a forum for the discussion and exchange of information on the research and development on all topics related to Instructional Systems Technology. This is an excellent opportunity to practice presentation skills, to build a portfolio, to become aware of special interests represented in the department, and to extend collegial interactions between students and staff beyond the confines of the classroom. This conference opportunity is not only for presenting ideas but also for generating discussion, conversation and discourse, thereby seeking ways to enhance *interaction and community feeling* among the IST Community.

The conference for 2002 year was scheduled for March 22. Up from five presentations in the first conference (2000-2001), there were 22 presentations given by individuals or by groups. There were some people that participated in more than one presentation.

Topics included:

- 3-D environments for children
- Lessons from an Online Distance Masters Program
- Designing Digital Young-Adult Fiction
- Instructional Theory
- Cryptography
- Peer Support in Graduate Courses

The GIST committee intended to provide feedback on the subject of both the conference organization (conference evaluations) and individual presenter feedback (presenter evaluation). Although we had high rates of returns in presenter evaluations we have not had any feedback about the organization of conference.

The department chair, Professor Elizabeth Boling, opened the conference and the dean of the school of Education, Gerardo González, gave a brief welcome. The keynote speaker was C. Thomas Mitchell who presented on User-Responsive Design: Reducing the Risk of Failure. Faculty compliments regarding the IST conference organization following the conference indicated that the department was in need of and expected such academic events that bring together the IST Community. We hope that the conference can continue to grow and that eventually it will attract presentations from departments at I.U. with interests that intersect with those of our department and that eventually the IST conference at I.U. will attract the attention and attendance of other universities.

GIST Supported By Technology

Technology has played a major role in supporting our efforts as a student organization. Specifically, the GIST web site has been re-organized and structures are in place to provide for more reliable knowledge management for future leaders of GIST and for GIST members.

GIST Web Site: At the beginning of our service as GIST officers, our web site was one of the main concerns. In the past, the website was just a personal file space and it had no significant meaning to the IST Community. It was used as a storage bin and a file sharing portal. We wanted something more for the site—to create a sense of student ownership—a place that would allow our members, and eventually all IST Community, to see the big picture of IST.

The web site we inherited consisted of a home page, mission page, officers page, photo gallery, and the GIST application form. The Homepage was just an entrance where all the links to the different parts of the website could be found. Mission page gave the background information and statement of GIST's objectives. The officers page gave the contact information of past officers, and described their duties. The photo gallery was a repository of pictures from past events. Finally, the GIST Application Form was a pdf file that could be printed and filled by people who are planning to become GIST members.

Some initial reorganization of the web site took place almost immediately including the use of standard fonts and colors, the organization of existing files into directories, and the addition of a page titled "Library" to archive documents and pictures. Even with these changes, more work was needed.

Web Site Redesign: The GIST web site was serving a very narrow focus of archiving pictures and documents with little thought to their organization. The web site offered little in the way of addressing the broader mission of GIST to provide for the social, academic, and professional needs of IST students. In order to address this, a web team was formed from within the GIST membership. This team was charged with analyzing the present needs of students with regard to the GIST web site and with designing a web site to address those needs. A team of analysts, designers, and project managers was formed to develop a survey and to implement the findings of that survey in a redesign of the web site—a good opportunity to apply the skills learned in the classroom.

A web-based survey was developed to assess what students in the department wanted to see on the GIST web site. Since the web site analysis results were returned at the same time as our planning for the IST conference, there was no time to implement the thoughtful responses and suggestions that we did receive. The current GIST executive committee is considering a redesign of the GIST web site based on the feedback from that survey.

Knowledge Management for GIST: Originally, we decided to keep all of our documents from our meetings on the web in an effort to be a transparent and open organization. A Library page was created as mentioned above. Some of the examples of documents in the library include IST Conference documents (call for participation, review guidelines, conference schedule, etc.), meeting minutes (executive committee meetings, public meetings, and faculty meetings), and GIST documents from several social activities (Hallowine report, portfolio celebration report, logo/motto contest, etc.).

In hind sight, the decision to create a virtual library has proven to be an important decision, not necessarily because students are accessing the meeting minutes or frequently visiting the web site, but because it is an effective way of managing the organizational knowledge that is accumulated by each group of GIST executives. We soon realized that our efforts to be transparent were resulting in the preservation of some departmental history. To date, no sustained effort has been made to document the history of the student organization in the department and what records there are exist in somewhat loosely organized binders.

Another important role that the GIST web site will fill is that it will be a way to pass accumulated knowledge about how to organize and operate a student organization. This is particularly challenging since the leadership cycles in this graduate student organization are often only one year, possibly two. Without systematic efforts at preserving the processes that have been found to be useful, each executive committee has to begin at the ground level rather than build on the work of previous cabinets.

Future

The 2001-2002 academic year ended with elections to the GIST executive committee with only one officer seeking re-election. The new officers met at the beginning of summer to get to know one another and to briefly discuss directions for GIST in the coming academic year. The current cabinet is sustaining the innovation begun in 2001-2002. New directions include a monthly e-Newsletter published by GIST and a conference planning position that has recently been filled by a capable candidate (suggested by GIST and funded by the department).

Questions remain after all the efforts of 2001-2002. What is the effect of the student organization on the department? Is it possible that such an organization can contribute to a sense of community? Why is it so difficult to attract students to be active members to the organization? The 2002-2003 GIST cabinet has designed an impact study to probe student thinking about GIST membership and participation in GIST sponsored events. We hope that this will bring some insight into how to make the organization, and ultimately our department, better.

Recently a faculty member familiar with GIST history commented that the idea of community is connected to a sense of professional identity and that few programs in higher education offer examples of strong, culture-building, experiences. As counter examples the senior member of the faculty offered the experiences of Army and Navy academies where ascension through the ranks creates a strong bond and sense of identity among students. In these environments, professional identity is connected to the activities and experiences of the academic setting.

There are certainly challenges to the development of community in a graduate department. The ranks are there, Master's and Ph.D. tracks, but progression from one rank to another is largely an individual affair. The short time that Master's students are in the department makes it particularly difficult to establish a sense of belonging and identification with others as professionals in the sense of community building as described by Lave and Wenger (1991). The challenges for creating community among doctoral students are also many. While their departmental tenure is certainly longer than the Master's students, the intense specialization and program focus along with teaching and family duties may limit if not prevent participation in voluntary departmental events.

Using the logic of the professor mentioned above, it seems that building community in a graduate department, if it can be done, would be best achieved by focusing on the professional development of students. This might be done in a variety of ways but could certainly be helped by accentuating the milestones and rites of passage that students do experience as parts of their respective programs. In our department this might require a greater emphasis on celebration and support of core classes, on portfolio celebration, on passing the qualifying exam or on getting a dissertation proposal approved.

Another real challenge to creating a sense of community is the difficulty of passing along understandings and processes—in a word knowledge management. Because the transient nature of being a student affects GIST officers and members alike, much knowledge is lost in transitions between cabinets. One real boost to this effort has been the commitment of the student organization over the past two years to maintain thorough records of what has been done. The archives available on the web site require constant maintenance and upkeep but are probably one of the supports in place for preserving knowledge and processes that have come by hard work.

In the end, community is a matter of degree. There are strong and week communities. The IST community falls somewhere on that weak to strong continuum and we are reasonably sure that for some people, at least, the GIST activities and efforts are one of a number of factors that contribute to a sense of connectedness among students. We look forward to continuing our community building efforts in the challenging environment of the IST department at I.U. We look forward to addressing the challenges of building the professional identities of very busy and transient students and to developing processes for building departmental culture that can be passed to new generations of students.

Bibliography

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Impact of P3T3 on Faculty Use of Web Course Tool

Hua Bai

Suttichai Chuvessiriporn

James D. Lehman

Purdue University

Abstract

This study explored the impact of P3T3, Purdue's PT3 implementation grant project, on faculty's use of a web course tool, WebCT. Quantitative and qualitative data were collected through online survey and in-depth interviews respectively. Results suggested that WebCT was convenient for faculty to put course materials online and conduct online communications with the students. P3T3's service was effective in training and supporting faculty in using WebCT, through providing workshops, drop-in session and one-on-one assistance.

Introduction

The rapid development of information technology has made computers and computer-related technology an integral part of teaching and learning. According to Glenn (1997), computers have advanced from simple machines with limited functions and capabilities to powerful machines with sophisticated applications and high-speed networking capabilities. Since the mid-1970's, schools and colleges have raced to keep up with the rapid growth and change of technologies. The main goal has been to prepare educators to be able to integrate technology into their classrooms effectively. The implementation of information technology has been closely linked to the evolution of faculty development (Shapiro & Cartwright, 1998). While some faculty members still hesitate, many are making efforts to improve their knowledge in technology and plunging ahead to enhance their teaching using technology.

Although educators are expected to have the knowledge and skills to be able to use technology in their instruction, the use of new technologies in the classroom for teaching and learning has been and is still limited. Brand (1998) pointed out that despite the increased access to computers and related technology, educators often experience difficulty in integrating technology into classroom teaching practice. The main reason is the issue of educators' computer competencies; teachers often are inadequately prepared to use instructional technology. To achieve effective integration of technology into teaching practice, adequate training must be provided for the faculty.

Quick (1999) conducted a case study using personal in-depth interviews to help faculty in a community college articulate their instructional needs related to using technology. The results indicated that the faculty wanted training classes that fit their time schedule and location. Personal tutoring and technical support were suggested. Other researchers (Dusick, 1998; Dusick & Yildirim, 2000; Groves & Zemel, 2000; Matthew, Parker & Wilkinson, 1998) have also confirmed that training and support staff are significant factors in helping faculty to effectively use and integrate technology into the classroom.

Although much literature addresses the importance of helping faculty's use of technology through training or other forms of support, few studies have described in detail the impact of these supports on the development of the faculty's use of technology. This paper reports on a study that was conducted at a midwestern university to explore how a PT3 implementation grant project affected the faculty's development of the use of WebCT, a web based course development and management tool, in their teaching. This paper explores the faculty's use of WebCT and their perceptions of the impact of P3T3 program on their use of this web course tool. The study adds to our growing knowledge of faculty development in the area of classroom integration, and also provides a valuable reference for the other similar projects involving faculty professional development.

Background of the Project

P3T3, Purdue Program for Preparing Tomorrow's Teachers to use Technology, a PT3 implementation grant project, is designed to achieve two goals. One is to prepare pre-service teachers to demonstrate fundamental technology competencies, using technology as a tool for teaching/learning, personal productivity, communication, and reflection on their teaching. The second goal is to prepare teacher education faculty in Education, Science, and Liberal Arts to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. All faculty in Purdue's school of Education as well as selected colleagues in Science and Liberal Arts are participating.

To achieve the second goal, P3T3 provides activities and extended support for faculty members. These include: 1) workshops to train faculty members on various technologies, 2) regular help sessions where faculty may consult with P3T3 graduate staff, 3) brown-bag TechieTalk sessions where faculty share their successful experiences and gain new knowledge, and 4) one-on-one personalized assistance. The workshops provide faculty development in the use of various technologies that can be incorporated into courses, such as PowerPoint, WebCT, graphic imaging, video editing, FrontPage, Dreamweaver, and Flash. The help sessions are available every week. Faculty member can drop in anytime during the help sessions to consult with the P3T3 graduate staff about classroom technology integration. Faculty can also make appointments for one-on-one assistance with P3T3 staff at any other times.

The advantages of online learning drive more and more faculty members to deliver courses online or use the Web to support traditional courses. WebCT is a web based course development and management tool that allows faculty to construct and manage online courses, put materials online to supplement existing courses, create online communication environments, and track students' performance electronically. It is the "standard" platform for web-based courses and course support at Purdue. The easy-to-use features of WebCT make it popular with faculty. To help faculty master the tool, P3T3 offers three workshops that teach, step-by-step, how to design a course using functions available in WebCT. In addition, the P3T3 staff provides assistance for those who have difficulty.

Methodology

To investigate the impact of the P3T3 project on faculty's use of WebCT, both quantitative and qualitative data were collected from those who participated in the P3T3 project and who used WebCT in their teaching for more than one year. A faculty member and two graduate students in Educational Technology conducted the research. They worked together to design the study, develop the research instruments, and analyze the data.

Data were collected from both an online survey and in-depth interviews. To obtain information about general characteristics of the faculty's use of WebCT, an online survey was conducted on WebCT. Twenty-two faculty members from the School of Education participated in the online survey. The faculty's thoughts and experience with the tool and their viewpoints about P3T3's support were explored more extensively using in-depth interviews with 3 faculty members who had been through the WebCT workshops and who used WebCT in their courses.

The survey consisted of 9 multiple choice items concerning P3T3 participation and the use of WebCT, such as "When did you participate in a P3T3 start-up workshop?", "Which features of WebCT do you use? ", and "Have you ever sought assistance of one of the P3T3 drop-in help session?", and so on. Frequencies of responses to survey items were tallied. The interviews with the faculty members took place on campus at the convenience of each individual participant. Data from the interview included in-depth information about faculty's experiences using WebCT and their perceptions of P3T3 work. The participants were asked questions such as "How does WebCT enhance your course(s)?", "What problems have your encountered when using WebCT?", "Can you cite specifics of how P3T3 assistance helped you?" Interviews were tape-recorded and then the content was transcribed. Interview data were combined together and then analyzed by question. The results of both survey and interviews were combined together to comprehensively examine the effect of P3T3's work on the faculty's use of WebCT.

Results

General characteristics of the use of WebCT

Results showed that 77% of the participants had attended P3T3 workshops on WebCT. All participants incorporated WebCT into their teaching. Most (59%) used WebCT for basic content presentation such as putting course notes, syllabi, and assignments online. Many (41%) posted and organized students' grades and used the quizzes/survey feature. WebCT e-mail (71%) and discussion forums (82%) were among the most popular features. Few faculty members had experimented with the WebCT live chat feature. Among those who attended the workshops, 25% continued to seek help from the P3T3 drop in help sessions, and 63% had requested one-on-one assistance. Besides the help from P3T3 staff, several faculty members had sought assistance from friends and peers and from other technical support resources around the university. Overall, participants rated the services from P3T3 high: 50% great, 25% good, 6% ok, and 19% no opinion.

Experience with WebCT

As course instructors, the participants considered WebCT a convenient tool for teaching. One faculty member who had students do practicum in a high school used to visit the school often to learn about how student were going there. Using WebCT, he can get student information via the postings. WebCT cut down the number of his visits to the school, "It saves me time, because in the past, I have had to make many trips to the school. And now, I make only a few". In general, the participants liked WebCT because it helped them better organize course materials for students. One faculty member commented:

> [It allows us] to extend the instruction beyond the classroom. We've been able to put up articles that students can look at and read… outside the regular class. That's been really helpful, really useful.

All three participants mentioned that, because of the features available in WebCT, they could conveniently make all course materials available in one place.

One participant felt that using WebCT took much more time than a regular class, "It does take a lot of time. It needs a lot of support if you going to be successful with it". However, she expressed the opinion that she would definitely use this web course tool again. She expected to develop an entirely online course.

Although they had a positive experience with WebCT, the participants thought that the interface was not intuitive, "Everything is there, but it is not intuitive in terms of how to navigate, how to find way around it".

Perceptions on P3T3 work

Generally speaking, the participants were satisfied with P3T3 work in introducing technology. As one faculty member stated:

> I think that's an excellent program when the School of Education sent around survey to ask what we thought were the outstanding features of the whole school of Education, and I said the P3T3 was one. It has so many important aspects, number one is it insists, or certainly intends that everyone who is preparing teachers be able to use technology on at least a minimum level.

The participants reflected that the P3T3 workshops were very helpful in getting started with WebCT, as one faculty member pointed out "those workshops made me less afraid to work with WebCT". However, one felt that the workshops went too quickly.

The participants were satisfied with the accessibility of the P3T3 graduate assistants. One faculty member commented that help sessions and one-on-one assistance were very helpful and he learned more from the personal help session than from the workshops. Another one who called himself as Technophobe reflected that with the assistance of the graduate staff, he became less afraid to experiment with the use of technology. Another faculty affirmed P3T3 work, but suggested the assistants be more knowledgeable in technology: "The more they learn, the more useful they will become".

As to how to better support faculty's use of WebCT, one faculty member specifically talked about the importance of personal support in managing the materials when building a WebCT site for a class:

> I think it really in some cases most helpful to help faculty is to have somebody available for them to help them (faculty) with actual materials content development, not somebody just help you with questions. I think what to do most helpful for faculty is to have an assistant like, when I am working on WebCT materials, if I could have someone whom I could give some stuff and say "Could you put this for me on WebCT?" I do a lot of things by myself, but I think if I had somebody else who could have helped me, that would be very helpful.

Overall, the participants thought P3T3 had a positive impact on their use of WebCT and expected more support from P3T3 graduate staff. They regarded P3T3 as a good resource in introducing and facilitating their use of technology.

Discussion and Implications

The results of the study indicated that WebCT was a useful tool by faculty members, though the design of the software was not perfect. The interviewed participants used WebCT to support their regular classes, but the experience with WebCT helped them to envision a fully online course delivered through WebCT. At this point, they began to think more of how to integrate technology into teaching.

For the beginners, the WebCT workshops need to be structured to accommodate their pace and progress. After the workshops and while the faculty members are learning to use WebCT to build their courses, more support, especially immediate support, should be provided. This will help to reduce the faculty's frustration with new technology. Faculty expect knowledgeable staff assistance. To better support the faculty's use of technology, the graduate staff should have enough knowledge and skills to provide quality assistance. Further, for those faculty members who need personal support in developing materials for a WebCT course, P3T3 graduate staff need to help with actual materials development instead of just answering technology questions.

This study showed that P3T3, a PT3 implementation grant project, has been helpful in facilitating faculty to use WebCT in their instruction. The results confirm that training and support are important in technology integration. In addition, faculty's technology level and individual needs should be taken into consideration when designing the training activities and providing support.

References

Brand, G. (1998). What research says: Training teachers for using technology [Electronic version]. *Journal of Staff Development*. *19*(1).

Dusick, D. M. (1998). What social cognitive factors influence faculty members' use of computers for training? A literature review. *Journal of Research on Computing in Education*. *31*(2), 123-137.

Dusick, D. M. & Yildirim, S. (2000). Faculty computer use and training: Identifying distinct needs for different populations. *Community College Review*. *27*(4): 33-47.

Glenn, A. D. (1997). Technology and the continuing education of classroom teachers. *Peabody Journal of Edcuation*. *72*(1), 122-128.

Groves, M. M. & Zemel, P. C. (2000). Instructional technology adoption in higher education: An action research case study [Electronic version]. *International Journal of Instructional Media*. *27*(1)

Matthew, K. I., Parker, R., & Wilkinson, L. (1998). *Faculty adoption of technology: Stages of concern*. Washington, DC: SITE 98: Society for Information Technology & Teacher Education International Conference. (ERIC Document Reproduction Service No. ED421129)

Quick, D. (1999). Community college faculty development: Bring technology into instruction. *Community College Journal of Research and Practice. 23*(7). 641-653.

Shapiro, W. L. & Cartwright, G. P. (1998). New ways to link technology and faculty development. *Change*. *30*(5), 50-52.

From Theories to Practices: Ten Guiding Principles for Integrating Technology in College Teaching

Mei-Yau Shih

University of Massachusetts Amherst

Abstract

Faculty Developer, Administrator, IT professional, and Faculty members will have an understanding of the guiding principles for helping faculty integrating IT for teaching on a college campus, and how to create an ongoing dialogue between campus technology services providers and faculty, as well as among services providers. Each campus should identify the priorities for planning steps and implementation guidelines, which are shaped profoundly by the campus culture and politics.

Introduction

The rapid growth of information technology (IT) and pressures for its use in education demand a substantial investment by the university. The students and faculty of every discipline of the university community should benefit from planned improvements in IT infrastructure and a pedagogical-oriented instructional technology support system. The need for information technology (IT) infrastructure has become fundamental to the advancement of the academic enterprise and requires a holistic strategic planning to define the ideal instructional technology support model for university.

This session described an institutional effort to recognize and resolve a significant problem in the implementation of new instructional technologies. At a research I public university, the Instructional Technology Council consisting of faculty members and technology services providers was charged to identify what are the appropriate developments necessary to provide faculty with a seamless teaching environment which includes technology based instruction both on the campus and at a distance.

The issues were discussed thoroughly throughout the year among the council and faculty members. As a result, ten guidelines were identified and forwarded to the Dean's Council for its consideration of formulating a plan to implement. This is a fist step of a holistic strategic planning to help faculty integrating technology in their teaching. This plan calls for a collaboration among campus offices and units to support faculty in their endeavors and recognize their needs for an easy transition of adapting technological changes in teaching and doing research.

Ten guiding principles

The ten guiding principles for integrating technologies in teaching are as follows:

1. Definitions of scope, students, and technologies for the implementation

   To prevent repeated efforts or revamping the same technologies, the focus should be on one or two IT areas to develop at a time identify the target students who will benefit from the initiatives then devise a plan to achieve the objectives.
2. Identify the supports to faculty
   - *Offer both technological and pedagogical support*
   - Develop local (departmental) support
   - Create users' forum
   - Provide timely support (continuous availability)
   - Supports that meet the expectations
3. Address issues of standardization

   Appropriate hardware needed by each faculty member and the students they teach may not be consistent with a common solution for the entire campus. A flexible approach to providing the technology to different disciplines must be combined with an understanding that all disciplines must be served by any mandate to increase IT.

4. Provide faculty equipment
   Some teaching pedagogy requires substantial investments in university owned and maintained equipment such as digital projectors and information servers, and in faculty training. Improvements in equipment may put economic pressures on some segments of our student body and may require special mechanisms to maintain equity.

5. Establish intellectual property policy
   Lack of a universal policy on intellectual property policy caused unnecessary confusions and disputes between students and faculty among the use of classroom materials and sharing of students work on open public platform. A set of policy needs to be formulated and enforced encourage an open learning atmosphere and creative teaching and learning.

6. Develop easy Web tools for course Web development
   An easy web tool that is intuitive for faculty to generate and publish course materials on the Web is helpful. A standard temple available to faculty will substantially ease the anxiety of creating individual tools and design.

7. Realize not all subjects are suitable for distance learning
   University needs to realize there is no one size fits all solution when it comes to learning and teaching. It is imperative to be aware of the types of technologies available for on campus teaching as well as for off campus, and its implication for instructional design and development for different settings.

8. Re-structure faculty workload, compensation
   Timely recognition of time and energy that faculty members have invested in teaching with technology is essential factor for faculty rewarding. The compensation mechanism needs to reflect the efforts of scholarship of teaching and development of innovative pedagogy for both traditional and non-traditional classes to maintain equity and morale.

9. Strengthen teaching environment (less set up time)
   The current emphasis on maintaining support for focused IT programs need to be broadened to include an emphasis on increasing the number of IT-ready classrooms and providing a revenue stream that will provide appropriate computer equipment and training for all faculty and students. IT use on campus varies depending upon the equipment available in existing classrooms, the Internet connectivity, the training of the faculty and students, and the equipment available on faculty and student desktops. The slow increase in the number of well-equipped classrooms is a bottleneck to the general faculty's progress in developing pedagogy.

10. Establish course administration policy and assessment standards.
    Administration policy and assessment procedures on technology-based courses should be in place and communicated on campus. Assessment practices need to address the nature of technology use and subsequently, the learning outcomes of various teaching/learning experiences derive from the new paradigm.

Conclusion

The definitive goals of creating a set of guiding principles for IT development are two folds; one is to formulate a systematic plan that is guided by the best practices and pragmatic preparation which are shaped profoundly by each campus's culture and politics; also it leads to an ongoing dialogue between campus technology services providers and faculty, and among services providers to examine the approaches that each campus has taken. It is our hope that individual campus will apply these ten principles and to conduct similar needs assessment on their own campuses to identify the priorities for planning steps, establish the strategies and implementation guidelines.

What Should Instructional Technologists Know about Human Performance Technology?

Eric J. Fox

James D. Klein

Arizona State University

Abstract

Human performance technology (HPT) is having a significant impact on the field of instructional design and technology (IDT), and many IDT graduate programs now offer training in HPT to their students. Some IDT programs may be struggling with the extent to which they should incorporate the principles and techniques of HPT into their courses, however. To provide some determination of which specific skills and competencies in HPT graduates of IDT programs should have, an online survey was administered to 24 IDT faculty members and 45 members of local chapters of the International Society for Performance Improvement and the American Society for Training and Development. Respondents rated the importance of HPT competencies for graduates of IDT programs. Results suggest strong support for the inclusion of HPT concepts in the curricula of IDT graduate programs. Implications of these results for IDT graduate programs, as well as for distinguishing HPT as a field of specialization separate from IDT, are discussed.

What Should Instructional Technologists

Know about Human Performance Technology?

Human performance technology (HPT) can be defined as "…a process of selection, analysis, design, development, implementation, and evaluation of programs to most cost-effectively influence human behavior and accomplishment" (International Society for Performance Improvement, 2002). It is an approach descended from systems theory, behavioral psychology, and instructional systems design (Rosenberg, Coscarelli, & Hutchison, 1999). The advocates of HPT encourage those working in the field of instructional design and technology (IDT) to conduct broader analyses of performance and organizational systems. From the perspective of HPT, instruction or training is but one of many solutions available to improve human performance, and analysts should thus be prepared to consider, design, implement, and evaluate an increasingly varied array of non-instructional performance interventions.

The HPT movement is having a significant impact on IDT (Reiser, 2001), and many IDT graduate programs have begun offering courses, special concentrations, or certificate programs in HPT. Indeed, a web-based review of the degree requirements and course offerings at 11 well-established IDT graduate programs (including Arizona State University, Boise State University, Florida State University, Indiana University, Pennsylvania State University, San Diego State University, Syracuse University, University of Georgia, University of Northern Colorado, Utah State University, and Wayne State University) reveals that eight of them offer at least one course specifically on HPT, and three offer more than one HPT course. In some programs, even the core instructional design courses have assumed an HPT orientation (Dick & Wager, 1998). Although most of the HPT courses offered by IDT programs are electives (only one of the programs listed above required an HPT course for its doctoral students, and only one required such a course for its masters students), it is clear that IDT faculty consider it important to offer some training in HPT to their students.

The increased emphasis on HPT concepts and principles in IDT graduate programs is not surprising, considering the strong relationship and obvious similarities between the two fields. Given their traditional focus on training solutions, however, some IDT programs may be struggling with the extent to which they should expand their curricula to focus on HPT (Dick & Wager, 1998). Further, while the desired knowledge and skill sets of HPT practitioners has received some attention (e.g., Stolovitch, Keeps, & Rodrigue, 1999), as have the IDT competencies for instructional designers and trainers (e.g., International Board of Standards for Training, Performance, &

Instruction, 2002), it is less clear which specific skills in HPT graduates of IDT programs should have. Concerns about the level of HPT knowledge needed by instructional designers and technologists, the degree to which a program can provide adequate training in both IDT and HPT, and the wisdom of broadening the field's scope to include issues addressed by several other disciplines (such as human resources development, business management, and industrial/organizational psychology) are likely shared by many IDT faculty members. These are difficult and important issues, and how they are addressed will help shape the future of both IDT and HPT.

The present study was conducted to provide a better understanding of what instructional designers and technologists should know about HPT. Such knowledge could provide guidance to IDT graduate programs seeking to prepare their graduates for the modern workplace and illuminate issues relevant to how professionals in both HPT and IDT are trained. To achieve these goals, a survey was developed to assess the attitudes and beliefs of professionals in the two fields about the HPT competencies graduates of IDT programs should have. The survey was administered to faculty members at IDT graduate programs throughout the United States, as well as members of local chapters of HPT and IDT professional societies.

Method

Participants

IDT faculty members. One hundred one faculty members from the well-established IDT graduate programs listed earlier were invited via email to complete the web-based survey. Twenty-four faculty from nine different universities responded to the request, indicating a 24% response rate. Thirteen of these respondents were male (54%), 10 were female (42%), and one did not indicate his or her gender. Most (83%) of the faculty members indicated that they had more than 10 years of experience in IDT, and the vast majority (92%) rated their knowledge of IDT as "advanced." Only 10 (42%) of the faculty respondents had more than 10 years of experience in HPT, and another 10 (42%) reported having 5 or fewer years of experience. Most rated their knowledge of HPT as either intermediate (50%) or advanced (46%).

Members of ISPI and ASTD. Members of the central Arizona chapters of the International Society for Performance Improvement (ISPI) and the American Society for Training and Development (ASTD) were also asked via email to complete the survey. Forty-five members of these organizations responded to the request. The overall return rate for this group cannot be calculated because contact was initiated via a listerv email message, and the total number of subscribers to the listserv was not available. It was estimated by a representative from the ISPI chapter, however, that several hundred members subscribe to the listserv. Of the 45 respondents, 29 were female (64%) and 16 were male (36%). Most rated their knowledge of IDT to be intermediate (31%) or advanced (51%), and their knowledge of HPT to also be intermediate (38%) or advanced (44%). Members varied widely in their professional experience. With regard to years of experience in IDT, 11% reported having no experience, 22% reported 5 or fewer years, 18% reported 6-10 years, 22% reported 11-15 years, 16% reported 16-20 years, and 11% reported 20 or more years. For years of experience in HPT, 11% reported having no experience, 31% reported 5 or fewer years, 20% reported 6-10 years, 18% reported 11-15 years, 11% reported 16-20 years, and 9% reported 20 or more years.

Survey Instrument

The HPT Competencies for Instructional Technologists Survey was a web-based instrument consisting of 44 Likert-type items and one open-ended question. Respondents received the following directions at the beginning of the survey: "Please rate how important you believe it is for graduates of instructional systems/design/technology graduate programs to have each of the competencies listed below." Each Likert-type item consisted of a skill or competency for which respondents were asked to choose a rating from *not important* (scored as a 0) to *very important* (scored as a 4). The open-ended question asked respondents to provide any additional skills or competencies in HPT (not addressed on the survey) that they believed instructional technology graduates should have.

The competencies listed on the survey were based primarily on a document analysis of the major topics and themes in the *Handbook of Human Performance Technology* (Stolovitch & Keeps, 1999) and the content and competencies of the syllabi for HPT courses offered by several IDT programs. Rather than list the dozens and dozens of possible performance interventions on the survey, some of the general intervention categories presented by

Hutchison and Stein (1998) were used in constructing the competencies. For each intervention category, two items were written: one addressing knowledge of and familiarity with interventions in that category, and the other addressing skill in developing and implementing the interventions in that category. This distinction between knowledge and skill was made because interviews with faculty members revealed that some believe it is important to be aware of a wide range of performance interventions, but that skill in actually developing and implementing all of the interventions is not necessary.

Results

Respondents to the HPT Competencies for Instructional Technologists Survey deemed most of the competencies to be at least "somewhat important" for graduates of instructional technology programs, and the two respondent groups (ISPI/ASTD members and IDT faculty) rated most of the items similarly. Table 1 displays the means scores for each of the survey items, listed in order of highest to lowest overall mean, with scores calculated using the Likert-type scale: 4 for a rating of *very important*, 3 for a rating of *important*, 2 for a rating of *somewhat important*, and 1 for a rating of *not important*.

Table 1
HPT Competencies for Instructional Technologists Survey Mean Ratings

Rank Number	Item Statement	ISPI/ASTD Members (n=45)	IDT Faculty (n=24)	Overall Mean (n=69)
1	Distinguish between performance problems requiring instructional solutions and those requiring non-instructional solutions	3.87	3.96	3.90
2	Conduct a performance analysis for a specific situation to identify how and where performance needs to change (the performance gap)	3.82	3.79	3.81
3	Evaluate a performance improvement intervention to determine whether or not it solved the performance problem	3.86	3.63	3.78
4	Conduct a cause analysis for a specific situation to identify factors that contribute to the performance gap	3.78	3.64	3.74
5	Select a range of possible performance interventions that would best meet the need(s) revealed by the performance and cause analyses	3.76	3.63	3.72
6	Assess the value of a performance improvement solution (in terms of return on investment, attitudes of workers involved, client feedback, etc.)	3.74	3.54	3.67
7	Define and describe human performance technology	3.58	3.75	3.64
8	Identify and implement procedures and/or systems to support and maintain performance improvement interventions	3.60	3.38	3.52

9	Describe and be familiar with (NOT imp lement) a variety of performance interventions in the area of measurement and evaluation	3.59	3.35	3.51
10	Develop and implement a variety of performance interventions in the area of measurement and evaluation	3.53	3.42	3.49
11	Describe the general model of human performance technology (the systematic combination of performance analysis, cause analysis, and interventions selection)	3.49	3.42	3.46
12	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of instructional technology	3.40	3.46	3.42
13	Develop and implement a variety of performance interventions in the area of instructional technology	3.40	3.46	3.42
14	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of feedback	3.33	3.38	3.34
15	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of job and workflow	3.40	2.92	3.22
16	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of organizational design and development	3.25	3.17	3.22
17	Develop and implement a variety of performance interventions in the area of feedback	3.33	3.04	3.22
18	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of communication	3.23	3.08	3.18
19	Develop and implement a variety of performance interventions in the area of organizational design and development	3.26	3.00	3.16
20	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of quality improvement	3.24	2.96	3.14
21	a Develop and implement a variety of performance interventions in the area of job and workflow	3.35	2.67	3.10
22	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of reward/recognition	3.17	2.78	3.03

23	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of information	3.05	3.00	3.03
24	Develop and implement a variety of performance interventions in the area of quality improvement	3.14	2.71	2.98
25	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of documentation and standards	3.09	2.75	2.97
26	Develop and implement a variety of performance interventions in the area of communication	3.12	2.61	2.94
27	Develop and implement a variety of performance interventions in the area of information	2.98	2.87	2.94
28	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of human development	3.05	2.67	2.91
29	Describe the history and conceptual underpinnings of human performance technology	2.62	3.13	2.80
30	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of management science	2.90	2.59	2.80
31	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of resource systems	2.91	2.59	2.80
32	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of selection	3.02	2.42	2.80
33	Develop and implement a variety of performance interventions in the area of documentation and standards	3.02	2.42	2.80
34	Develop and implement a variety of performance interventions in the area of reward/recognition	3.00	2.33	2.75
35	Identify the similarities and differences among a variety of specific performance technology models	2.82	2.54	2.72
36	Describe a variety of specific performance technology models (e.g., those of Mager, Harless, Rummler & Brache, Tosti & Jackson, Langdon, etc.)	2.70	2.71	2.71
37	Develop and implement a variety of performance interventions in the area of human development	2.88	2.42	2.71

38	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of career development	2.73	2.30	2.58
39	Develop and implement a variety of performance interventions in the area of management science	2.66	2.43	2.58
40	Describe and be familiar with (NOT implement) a variety of performance interventions in the area of ergonomics	2.60	2.52	2.57
41	Develop and implement a variety of performance interventions in the area of selection	2.82	2.13	2.56
42	Develop and implement a variety of performance interventions in the area of resource systems	2.73	2.22	2.55
43	a Develop and implement a variety of performance interventions in the area of career development	2.62	1.88	2.35
44	Develop and implement a variety of performance interventions in the area of ergonomics	2.32	1.96	2.18

Note. 4 = very important, 3 = important, 2 = somewhat important, 1 = not important

[a] Ratings of ISPI/ASTD members are significantly higher than the ratings of IDT faculty.

Independent t-tests were conducted on each of the 44 survey items to test for significant differences between the two respondent groups. With an alpha level of .05 and using the Bonferroni correction procedure to compensate for the large number of comparisons, significant differences between the two groups were found for only 2 of the 44 items. The competencies for which significant differences were found include “develop and implement of a variety of performance interventions in the area of career development” and “develop and implement a variety of performance interventions in the area of job and workflow.” The members of ISPI and ASTD rated both of these items as more important (M = 2.6 and M = 3.3, respectively) than did the IDT faculty (M = 1.9 and M = 2.7, respectively). Due to the largely similar responses of the two groups, only the means of the combined scores of the two groups will be examined hereafter.

All of the items received an overall mean score of at least 2.0, corresponding to a ranking of *somewhat important*. In addition, 23 of the 44 competencies received an overall mean score of 3.0 or higher, indicating an average ranking between *important* and *very important*. The competency rated the most important overall was “distinguish between performance problems requiring instructional solutions and those requiring non-instructional solutions” (overall M = 3.90), followed by “conduct a performance analysis for a specific situation to identify how and where performance needs to change (the performance gap)” (overall M = 3.81). The remaining highly-rated competencies cover all phases of the performance improvement process, including performance analysis, cause analysis, intervention selection, intervention implementation, and performance evaluation. The two lowest-rated items were “develop and implement a variety of performance interventions in the area of ergonomics” (overall M = 2.18) and “develop and implement a variety of performance interventions in the area of career development” (overall M = 2.35). Interestingly, the competencies associated with knowledge of different HPT models (“describe a variety of specific performance technology models” and “identify the similarities and differences among a variety of specific performance technology models”) did not receive mean scores above 3.0 (although the means for both did rank somewhere between *somewhat important* and *important*).

Only 28 of the 69 total respondents provided an answer to the survey item asking if there were any additional skills or competencies in HPT they believed instructional technologists should have, and there was a great deal of variability in their answers. A number of them listed skills which were relatively vague and did not seem to be specific to HPT, such as “interpersonal skills,” “organizational and diplomatic skills,” and “cultural sensitivity.”

General topic areas that were mentioned by several of the respondents included communication and writing, project management, the systems approach, computer technology, and needs assessment.

Discussion

Overall, this sample of professionals and academics in the fields of IDT and HPT felt that graduates of IDT programs should have a broad knowledge of HPT and the performance improvement process. Every single competency listed on the survey received an overall mean rating of at least *somewhat important*, and over half of the items were rated as *important* or higher. These results indicate strong support for the incorporation of HPT concepts and techniques into the curricula of IDT graduate programs.

Many of the highly-rated competencies reflect skills and knowledge that are likely already addressed in most IDT programs. The two highest-rated competencies, for example, are both closely related to traditional training needs assessment, a staple of most IDT curricula. Some of the highly-rated competencies, however, probably do not receive extensive coverage in most IDT programs. Competencies such as “select a range of possible performance interventions that would best meet the need(s) revealed by the performance and cause analyses” and “identify and implement procedures and/or systems to support and maintain performance improvement interventions” may not be emphasized in many IDT programs, particularly in those that do not offer HPT courses. In addition, many of the competencies related to specific performance interventions are probably not covered outside of courses focusing specifically on HPT. Given that most IDT programs do not require HPT courses of their students, there may be numerous discrepancies between the curricula being offered by these programs and the competencies the respondents to this survey consider important.

Not surprisingly, the lowest-rated competencies were those involving the development and implementation of specific performance interventions, such as ergonomics or career development. Most professionals recognize that “practitioners are not expected to be experts in all categories and subcategories of interventions” (Van Tiem, Moseley, & Dessinger, 2000, p. 64), and that the expertise of other members of an organization will often be called upon to implement interventions. Nevertheless, the relatively high ratings for all of the survey items indicates that those working in IDT and HPT consider it important for instructional designers and technologists to be at least familiar with a variety of performance improvement interventions.

Despite its limited sample size, the present study clearly reveals some support in both academia and industry for training IDT students in the principles and methods of HPT. These findings also contribute to the confusion that frequently surfaces in distinguishing HPT from other fields, such as IDT (Stolovoitch, Keeps, & Rodrigue, 1999). If IDT programs continue incorporating more and more of the HPT perspective into their curricula, and if IDT programs are one of the primary sources for graduate-level training in HPT, is it truly useful to view HPT as a separate field of specialization from IDT? Is it more appropriate to speak of IDT as a subset of HPT, as some suggest (Hutchison, 1990)? The present results also lend weight to the concerns of Dick and Wager (1998), who wonder whether IDT programs can handle the additional responsibilities of teaching HPT or if such programs will need to be split into more specialized areas. And if IDT programs do *not* expand their curricula to include more extensive coverage of HPT, where will individuals receive professional training in HPT? Future research extended to a larger sample of the professional population, as well as a more detailed analysis of the degree to which HPT is currently covered in the curricula of IDT programs, may provide answers to some of these questions. Only time will tell, however, if HPT is best viewed as a new field that revolted against the limited scope and focus of IDT, or simply a new perspective that evolved within IDT.

References

Dick, W., & Wager, W. (1998). Preparing performance technologists: The role of a university. In P. J. Dean & D. E. Ripley (Eds.), *Performance improvement interventions: Performance technologies in the workplace* (pp. 239-251). Washington, DC: The International Society for Performance Improvement.

Hutchison, C. S. (1990). What’s a nice P.T. like you doing? *Performance and Instruction, 29* (9), 1-5.

Hutchison, C. S. & Stein, F. (1998). A whole new world of interventions: The performance technologist as integrating generalist. *Performance Improvement, 37*(5), 18-25.

International Board of Standards for Training, Performance, & Instruction (2002). *IBSTPI web site*. Retrieved November 12, 2002, from http://www.ibstpi.org/id_competencies.htm.

International Society for Performance Improvement (2002). *ISPI web site*. Retrieved November 12, 2002, from http://www.ispi.org/about.htm.

Reiser, R. A. (2001). A history of instructional design and technology: Part II: A history of instructional design. *Educational Technology Research and Development, 49* (2), 57-67.

Rosenberg, M. J, Coscarelli, W. C., & Hutchison, C. S. (1999). The origins and evolution of the field. In H. Stolovitch & E. J. Keeps (Eds.), *Handbook of human performance technology: Improving individual and organizational performance worldwide* (2nd ed., pp. 24-46). San Francisco: Jossey-Bass/Pfeiffer.

Stolovitch, H. D., & Keeps, E. J. (Eds.). (1999). *Handbook of human performance technology: Improving individual and organizational performance worldwide* (2nd ed.). San Francisco: Jossey-Bass/Pfeiffer.

Stolovitch, H. D., Keeps, E. J., & Rodrique, D. (1999). Skill sets, characteristics, and values for the human performance technologist. In H. Stolovitch & E. J. Keeps (Eds.), *Handbook of human performance technology: Improving individual and organizational performance worldwide* (2nd ed., pp. 651-697). San Francisco: Jossey-Bass/Pfeiffer.

Van Tiem, D. M., Moseley, J. L., & Dessinger, J. C. (2000). *Fundamentals of performance technology: A guide to improving people, process, and performance*. Wasghington, DC: Intemational Society for Performance Improvement.

The Virtual Factory Teaching System (VFTS)

E .J. Kazlauskas

M M. Dessouky

J. Rickel

W. L. Johnson

University of Southern California

Abstract

The Virtual Factory Teaching System (VFTS) project is a web-based, multi-media collaborative learning network. The system allows students, working alone or in teams, to build factories, forecast demand for products, plan production, establish release rules for new work into the factory, and set scheduling rules for workstations. This paper provides a system description and a discussion of the evaluation component involving three different campuses. Evaluation results cover demographic descriptions, self-assessment results, performance results, attitudinal responses, and usability. In addition, instructor observations and course project output is also examined as components of the VFTS evaluation effort. It is believed through the analysis that the VFTS is an excellent instructional method to teach students the integration of the different modules in operations planning.

Background

Traditional pedagogical tools for transferring hands-on learning to students are ill-equipped to handle the complexity that surrounds the modern factory. Manufacturing education tools have traditionally required physical laboratories (e.g., machine shops). However, factory experimentation through full-scale on-campus laboratories is an infeasible alternative due to the high expense associated with development and maintenance, and the inability to cover the entire manufacturing spectrum. Additionally they can serve only a single site, inhibiting the creation of teams whose members are not co-located, i.e., "virtual" teams which are increasingly becoming a requirement for engineers.

A web-based, multi-media collaborative learning network, referred to as a Virtual Factory Teaching System (VFTS), was developed under two National Science Foundation (NSF) grants (Dessouky, et. al 1998; Dessouky, et. al. 2001; Kazlauskas, et. al. 2000; Kazlauskas, 2001).The first grant was a planning and demonstration grant with a full implementation and evaluation the essence of the second grant. This tool is currently being used by engineering students from the University of Southern California, San Jose State University, the University of Virginia, and most recently North Carolina Agricultural and Technical State University. The overall aims of the project are:

- To provide, disseminate, and evaluate a manufacturing education pedagogical tool that promotes student understanding of complex factory dynamics.
- To improve student skills in communication, persuasion, negotiation, and management, as well as in the technical arenas of production planning, forecasting, simulation, scheduling, and integration.
- To provide a forum in which engineering and business school students can participate in virtual teams that cut across universities.

The research plan of the project is aimed at exploring the interface between virtual factories, engineering education, intelligent agents, and the Internet for new ways of teaching modern manufacturing problems, practices, theory, and techniques to engineering and business undergraduate students. In addition, it is aimed at examining its potential for use as an information vehicle on the topic of manufacturing for K-12 students. Various research questions are addressed, such as: how students perform when using new technology-enhanced modes of learning; what are the effects on attitudes; how intelligent agents might assume tutoring and participative roles; and how team performance, hampered by geographical separation, might be enhanced via advanced communication technologies.

The project timetable consisted of the following: a Baseline period to provide an understanding of the Industrial Engineering courses (with scheduling content) using traditional instructional methodologies, i.e. without the VFTS; the use of the VFTS to provide an understanding of the Industrial Engineering courses (with scheduling content) offered at the various institutions; then the use of an expanded version of the VFTS at the same institutions with pedagogical agents and use of virtual teaming included. The following presents an overview of the features of the VFTS; a description of the evaluation approaches; and three-year project results.

System Description

The architecture of the VFTS was kept simple and modular. There are three layers in the design: AweSim Server, VFTS Java Server and Clients. Clients, which are students in our case, use standard WWW browsers like Microsoft Internet Explorer, to connect to the VFTS Java Server using its Web Page. Most of the communication between the clients and the server takes place using Java applets. The Java-Server functions as a mediator between the AweSim factory servers and the clients. The Awesim Server is responsible for factory knowledge and simulation. The layers interface using a message protocol set up to minimize bandwidth requirements. Other components of the VFTS include the use of Ptolemy, a graphing package, and Drasys, an Operations Research (OR) package.

The system allows students, working alone or in teams, to build factories, forecast demand for products, plan production, establish release rules for new work into the factory, and set scheduling rules for workstations. They can run simulations where an animated panel displays jobs progressing through their factory, with queue counts, finished goods counts, graphs, and reporting functions all available. Students access via the VFTS, using computers in university computer labs, or in their dorms or homes, a virtual representation of the factory. The professor posts assignments related to this factory over the Internet, “unfreezing” parameters as necessary so students may experiment without redefining the entire factory. Students observe the effects of their decisions, and student teams assume factory roles to solve problems; if they reach an impasse, intelligent agents provide guidance. Selective information may be given based on student roles; for example, the production supervisor may have equipment information, the engineer new technology information, etc. Students sort out strategies and can discuss options via e-mail and electronic chat rooms. Since this course is a common one found in many universities, collaboration among universities is feasible. Faculty members virtually “team teach” the course. Intelligent agents are incorporated into the VFTS to monitor student progress and provide immediate feedback.

The latest version of the VFTS software includes support for user account management, adding security to allow students within a group to share data while preventing access to it from students outside the group, a more easy to use interface, instrumentation so that the software will gather data on student usage patterns, on-line help, on-line documentation and an on-line tutorial to help for students and faculty learn how to use the VFTS, and an introductory homework exercise to help students learn how to integrate the VFTS into the course. A project that uses the VFTS was developed to complement the students' classroom learning and was integrated into the courses at the participating universities. The latest version also includes a pedagogical agent that monitors students' use of the VFTS and provide guidance. This required integrating the pedagogical agent software (ALI) into the VFTS, adding the ability for ALI to maintain a persistent model of each student's knowledge across sessions, extending ALI to include more sophisticated explanation capabilities, adding VFTS-specific knowledge to allow ALI to understand the instructional objectives of the VFTS and provide appropriate support to students, and instrumenting ALI to maintain a log of interactions with students to aid our evaluation.

The current version VFTS is available at http://vfts.isi.edu.

Project Tasks

The VFTS project included a large set of tasks involving design, development, usage, evaluation, and dissemination. The various tasks associated with the VFTS project are as follows:

- Define instructional objectives and complete evaluation design.
- Develop and/or acquire evaluation instruments.
- Solicit feedback on the instructional objectives, evaluation design, and VFTS use from each university.
- Gather evaluation data for control group (engineering classes without the VFTS).
- Analyze evaluation results for control groups.
- Complete instrumentation of the software to support evaluation

- Teach engineering classes with the VFTS and gather evaluation data.
- Analyze evaluation results for experimental group and compare to control group.
- Use the evaluation results to revise and refine the VFTS and its use in the engineering curricula, its instrumentation, and the pedagogical agents.
- Teach engineering classes with the VFTS, including the use of virtual teams that span multiple universities, and gather evaluation data for this final experimental group.
- Analyze summative evaluation results.
- Make final revisions to the VFTS software based on evaluation results.

Evaluation

In the preceding list of project tasks, it should be noted that considerable emphasis is placed on the design and implementation of an extensive, multi-university evaluation, which is a central component of the VFTS project. The initial evaluation efforts were used a) to check to make sure each project step was implemented according to plan and that milestones are being met; and b) to consider project modification. This evaluation, formative in nature, assisted in modifying the design and development of the evaluation, as well as of the overall design of the web-based VFTS. For example, a Computer Competencies Multiple Domains instrument that was used initially to determine the level of entering competency in such areas as spreadsheets and statistical packages was dropped. It was determine through initial surveys that the learners were homogeneous in terms of a high level of computer competencies. Through the evaluation process, it was decided to gather more data on such issues on the ease of use and operation of the web-based VFTS, and to modify the actual design by changing the opening screen, and by including more tutorial help.

An emphasis of this project is to evaluate learner outcomes, attitudes, and learning. This effort includes the use of various instruments and examination of student work.

The following are the instruments that are presently being used in evaluation:

- Student Pre-course and Post-course Survey instruments which are used to gather data on student demographics and student self-rated assessment of entering/post-course knowledge of operations scheduling, such as the skills, knowledge, and abilities in the use of gantt charts and regression and time series models.
- Computer Competencies Multiple Domains instrument which is used to determine the level of entering competency in such areas as spreadsheets and statistical packages.
- Operations Scheduling Pre-test/Post-test instruments which are used measure course content before and after instruction and use of the VFTS.
- Affective-Level/Attitudes Instrument (VFTS Participant Opinion Survey) Pre-test/Post-test instrument which are used to measure reactions to the use of the VFTS, such as reactions to use of simulations, working collaboratively, and relevance to future career.
- Usability Evaluation instrument which is used to gather data on such issues on the ease of use and operation of the web-based VFTS.

The VFTS Studies

Various studies were conducted in the VFTS Project. The first of these was the Baseline evaluation conducted at the various universities, to provide an understanding of the Industrial Engineering courses (with scheduling content) using traditional instructional methodologies. The second of these was an investigation of the use of the VFTS at the same universities, to provide an understanding of the Industrial Engineering courses (with scheduling content). A second usage of the VFTS occurred, an enhanced version with teaming and pedagogical agency. The following represents the findings from these investigations at three universities to-date since data are still being collected at one of the institutions.

The following represents a review of the comparisons among the various institutions involved in the Baseline, VFTS, and enhance version of the VFTS with agency and teaming.

- The number of subjects in the courses at two institutions varied from 15 to 44, whereas a third institution had a larger number of subjects (high 60's) for the Baseline yet a low number (6) for the first round of the

VFTS. For the most part, there was minimal leakage of students from the class or in survey response numbers.

- The courses were all taught by experienced, tenured faculty but the course was a new offering for each of the faculty at two institutions.

- Most students were in the 21-22 age category. However, the age distributions at two institutions were more typical of a ‘traditional’ undergraduate student, whereas the students at one institution were older.

- Students were mostly seniors.

- The majority of students at all three campuses were male. A Chi-Square test on the gender variable was performed to determine if there is a significant difference between the groups. There is no significant difference on this variable.

- The primary language at all three institutions was English but 19 other languages represented approximately 40%to 60% of the students at two institutions. The students at a third institution were predominately English-speaking. The assumption is made that there are more international students at institutions #1 and #2.

- Students at all three institutions had a moderate level of interest in the course. They rated themselves low in knowledge of course content. The results of a corresponding post-course self-assessment of content knowledge indicated gains in most areas but not quite to the significance level. Note that there was no post-self assessment survey at institution #3. Results of a self-assessment indicated a high-level of student computer competency at all three institutions. The results of an initial course opinion survey indicated fairly high ratings on interest, importance, confidence, usefulness and similar scales on such topics as simulation, and collaboration. There was no significant change on post-course opinion survey. Note that there was no post-self opinion survey at institution #3.

- With a few exceptions, one can support the general statement that students know little, if anything, about the content of the course but think that it will help them in a more general way. Students at two institutions indicated that they did see the course assisting in developing fundamentals, e.g. improving skills in modeling-building and analysis and assisting in working better with fellow students, whereas one institution did not have this self-assessment.

- The Computer Competencies Multiple Domains instrument indicates a very high level of skill with computer technology. The only questions that did not reflect this generalization deal with some programming skills and statistical analysis. Due to the high self-assessment and the homogeneity of the students, the use of this instrument was dropped.

- The gains from a course content pretest to posttest were significant at all three institutions. The mean pretest to posttest scores at institution #1 for VFTS Year 1 were 12.95 to 41.52, and 16.9 to 45.9 for VFTS Year 2; the scores at institution #2 for VFTS Year 1 were 8.00 to 20.86, and 8.8 to 25.5 for VFTS Year 2; and the scores at institution #3 were 10.4 to 87.6. Separate final examinations were administered at two institutions. Only at institution #3 was the posttest a component of the final grade. The mean at institution #1 was 85.55 for Year 1 and 85.4 for Year 2 out of a score of 110; the mean at institution #3 was 83.5 for Year 1 and 81.1 for Year 2 out of 100. It should be noted that the institution #1 final covered more than machine scheduling content. The grade distribution at this institution indicated that 50% of the students received a grade of B or better; slightly less that 50% received B or better at institution #2. No grades were provided for institution #3.

- Results of the usability assessment indicated that the forecasting, planning, and scheduling modules were fairly well-received as was the factory simulation. The online documentation and tutorials were not used or found of limited value. Initially, the software was not seen as particularly "user friendly" with problems associated with crashing systems, and slow response. But, it was determined that the initial criticism from the students in regards to using the VFTS were not tool-related but Internet-related, e.g. the server was not available or too slow. Such issues have been addressed. Students were somewhat neutral to positive towards use of agents, and negative towards use of virtual teams.

- Comments from instructors noted that the VFTS was instrumental in facilitating the students' understanding of the integration between the models for forecasting, production planning, material planning, inventory planning, and scheduling. This was illustrated by the fact that students clearly spent a good part of their time testing many different scenarios, and students were able to see the impact of changing a parameter on the output. It is suggested that a more complex system can be modeled than otherwise. Instructors also noted that due to the VFTS the class was able to work on a more comprehensive project (when compared to class not using the VFTS) that illustrates an integrated dynamic factory.

The result of various analyses on the data from the 1) Baseline to VFTS1 Pre-Course Instrument Comparison for the three universities; 2) Baseline to VFTS2 Pre-Course Instrument Comparison for institutions #1 and #2; 3) VFTS1 to VFTS2 Pre-Course Instrument Comparison for institutions #1 and #2; 4) Post Course VFTS Instrument Comparison for institutions #1 and #2; 5) Pre-Test and Post-Test Operations Scheduling Comparisons for all three institutions; and 6) Final Examination Comparisons for institutions #1 and #2 indicated a number of patterns. A pattern of significant differences exists between the results on the Pretest for institutions #1 and #2 Baseline and the pretests for both institutions for the VFTS1 as well as VFTS2. The institution #3 Baseline posttest and VFTS1 was significant. We can draw some general findings from these analyses. First, there is no significant difference in the final examination scores at institutions #1 and #2 between the baseline and the VFTS scores. This result might be somewhat expected since the final examination was based on standard planning and scheduling questions and concepts that might not require a dynamic simulation model to illustrate the material. Since the final examination is a large portion of the final grade, the study team did not want to provide any examination questions that would be a disadvantage in terms of grade to the baseline group. Second, the baseline group scored higher on the pre-test at both institutions #1 and #2 than their counterparts in the VFTS group, particularly at institution #1. However, since both groups had the same final examination scores, this could imply that the less strong content-knowledge groups, using the VFTS, performed equivalent to the stronger content-knowledge groups. The VFTS might have some overall effect on final examination performance.. Third, within all groups, students scored higher on the post-test as compared to the pre-test, which is expected since the post-test was administered after the scheduling material was covered. Fourth, the post-test scores are significantly higher at institution #3 than at the other universities. We remark that at only this institution was the post-test a component of the student's final grade. In fact, it was treated as the final examination so in this case the students took it much more seriously, where they most likely studied for the examination. As a result, the only baseline group in which the post-test was administered was at institution #3. A comparison of the post-test scores between the baseline and VFTS groups at the institution #3 shows a significant gain for the VFTS group, although for a much smaller class size.

Other Results

The NSF funding for this project has supported five graduate students at the University of Southern California. These students have gained valuable experience in Web-based software development, user interface principles, pedagogical agent technology, educational materials development, and educational evaluation. A VFTS competition workshop among various institutions in the southwest was also held and students commented positively on the learning experience. But perhaps the most valuable training for all the students is the close multidisciplinary collaboration between computer scientists, engineering educators, and educational researchers and educators. These students will have a much broader perspective on research than typical graduate students that work closely with others only in their own field.

Conclusion

The VFTS was instrumental in facilitating students' understanding of the integration between the models for forecasting, production planning, material planning, inventory planning, and scheduling.

It was demonstrated through an analysis of project reports that students had a better understanding of the integration between the different modules. This was illustrated by the fact that students clearly spent a good part of their time, with the VFTS, in testing many different scenarios, and students were able to see the impact of changing a parameter on the output. It is suggested that another major benefit of the VFTS is that a more complex system can be modeled than otherwise. Thus, it was seen that students had a more realistic project than their counterparts in the Baseline groups. To summarize, it is believed through the analysis that the VFTS is an excellent instructional method to teach students the integration of the different modules in operations planning.

References

Desouky, M. Bailey, D., Verma, S, Adiga, S. Beckey, G and Kazlauskas, E. (1998) A virtual factory teaching system in support of manufacturing education. *Journal of Engineering Education. 459-467*.

Dessouky, M., Verma, S., Bailey, D.E., Rickel, J. (2001). Methodology for Developing a Web-based Factory Simulator for Manufacturing Education. *IIE Transactions,* 33(3), 167-180.

Kazlauskas, E.J., Desoukky, M., Rickel, J & Johnson, L. (2000) A Web-based Factory Teaching System: Design and Development. *Proceedings of WebNet2000: World Conference of the WWW and Internet.* San Antonio TX. October 30- November 4, 2000.

Kazlauskas, E.J. (2001). Integrating University-based Technology Projects into Education Programs. In Lee, C. (Ed.) Enhancement of Quality Learning through Information and Communication Technology. The 9th Annual International Conference on Computers in Education. Seoul, Korea: ICCE, 269-275.

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An Instructional Theory for Personalized Online Learning for Adult Learners

Kyong-Jee Kim

Indiana University

Byoung-Min Yu

Seoul National University

Abstract

Customizing instruction to meet individual needs is one of the foundational cornerstones of today's learner-centered paradigms. Adult learners have a wide range of differences in their backgrounds, interests, abilities, and learning styles; instruction, therefore, needs to be designed in such a way as to meet the highly diverse needs of adult education settings. The World Wide Web presents enormous potential for providing a technological environment for the optimal delivery of personalized instruction for individual learners. Some argue, however, that most Web-based instruction fails to effectively customize instructions for individual learners. Therefore, we are in need of an ongoing refinement and creativity in our generation and treatment of theories of instruction geared towards the generation of personalized learning environments.

Here, the attempt has been made to develop an instructional theory for personalized learning for online adult learners, with a special focus on the question of solving ill-structured problems. Theory, on a general level, is discussed insofar as it has emerged from the goals, preconditions, and values of instruction, with an eye to the methods of instruction that are optimal for achieving the goals. These theoretical frameworks serve as a basis for fostering problem solving skills in ill-structured domains in online learning environments, as seen in the literature on teaching problem-solving skills concerned with constructive and interactive learning environments and the use animated pedagogical agents. Goal-setting activities, engaging in the task, performing the task, and reviewing and reflecting upon the output of the task are referred to as the 'methods' of this instructional-design theory. In addition, some caveats in implementing this instructional-design theory and ways to evaluate and improve it are described in the conclusion.

Introduction

Customizing instruction to address the individual difference in learning needs is one of the key markers of the learning-focused paradigms of today's education and training. Reigeluth (1999) has convincingly argued that social changes in the information age call for fundamental changes in the current paradigms of education and training. Thus, he claims that one of the key markers of the industrial age was standardization for mass production and it is shifting toward customization in the information age (Reigeluth, 1997). Therefore, "customization" of instruction is a key characteristic of the new paradigms of instruction in the information age, wherein the goal of instruction is to help individual learners reach their full potential.

In particular, adult learners have a great volume and different quality of experience throughout their lives with a wide range of differences in their backgrounds, interests, abilities, and learning styles (Knowles, 1984). Therefore, an emphasis needs to be placed on adult learners to provide them with personalized instruction that addresses individual differences in their learning needs (Boud, 1992; Dunn, 1984; Martinez, 2000). Adult learners also need flexible learning environments to accommodate their learning with their busy schedules and multiple commitments at work, home, and the community. Personalized instruction allows more flexibility in the pace of learning than do group-based approaches such as lectures or small-group teaching (Boud, 1992).

Web-based instruction seems fit the needs of the flexible learning environment for adult learners (Digilio, 1998), and due to this, more adults are turning to online learning for their learning needs to keep up with rapidly changing knowledge and skills in the information age (Jarvis, 1999, 2001). Also, research suggests that Web-based instruction permits learners to control their own learning (Bonk & Cummings, 1998; Yong, 1998), adapt to different individual learning styles (Muir, 2001), and make pedagogical choices (Arnone, 2002). Therefore, the Web presents enormous potential for the optimal delivery of personalized instruction for individual learners (Digilio, 1998; Martinez, 2000).

Despite the potential of the Web for the optimal delivery of personalized instruction, the authors would like to claim that most Web-based instruction, or online courses, offered nowadays are not effectively designed to provide instruction customized for individual learners. They are often designed from the personalized instruction approach in the sense that they provide self-paced instruction in which the learner can skip some of the units that s/he has already mastered prior to instruction. However, current online courses do not provide learners the locus of control – i.e., All the learners are given instruction with the same learning goals and the same methods to achieve them. Thus, this instructional approach does not adequately address the issue of personalizing instruction for the individual learner. In addition, Arnone (2002) and Martinez (2001) argue that current Web-based instructions are not addressing the issue of differences in individual learning styles and preferences (Arnone, 2002; Martinez, 2001).

In providing personalized instruction for adult learners, two factors need to be taken into account. First, theories of adult learning inform us that adult learners make sense of what they learn based on their experiences (Knowles, 1996). Also important is the relevance of learning to the learner which influences learner motivation (Keller, 1983). Therefore, the goals of learning for adult learners need to be closely related to their needs in real-world situations in order for them to actively engage in meaningful learning. Second, as mentioned earlier, differences in learning styles and preferences of individual learners need to be considered in designing personalized instruction. Thus, learners need to have control of how to learn in order to provide instruction that meets individual learning needs.

In this paper, an instructional-design theory for personalized learning in online learning environments for adult learners is proposed. According to the instructional-design theories introduced in Reigeluth (1999), the initial step in the development of an instructional theory is to identify its goals/purposes, preconditions and values, which are discussed in the following.

Goals / Purposes

The primary purpose of this theory is to identify the conditions and methods that are necessary for personalized learning in online settings for adult learners, and how it can be best facilitated. This instructional theory is centered on fostering higher-order thinking skills, in particular ill-structured problems are of major focus of this theory. Today's workforce often deals with ill-structured problems that are not clearly defined and new solutions need to be created. As Fred Nickols (Gordon & Zemke, 2000) suggests, in the new economy more and more jobs are shifting from "preconfigured work," where the job is clearly laid out to "configured work," where it has to be made up as it goes along. Therefore, instructional theories to teach problem solving skills on ill-defined problems are warranted in order to facilitate the development of competent knowledge workers.

Preconditions

Preconditions of an instructional theory refer to the instructional conditions that need to be met in order for the theory to be applied in real instructional situations. Those conditions include (1) the nature of the learning domain to be learned, (2) the nature of the learner, (3) the learning environment, and (4) any constraints for instructional development (Reigeluth, 1999). It is important to identify preconditions of an instructional theory since an instructional method which works well under one condition may not work well under another, which Reigeluth (1997) refers to as "conditionality." Therefore, identifying conditions under which an instructional theory can work well is important to make the theory more likely to be useful (Reigeluth, 1997).

It is suggested that the following preconditions need to be taken account to make a decision whether the instructional theory suggested here is suited for the instruction that you plan to design or teach;

- Its methods are for individualized instruction especially in online learning environments - not intended for group instruction in a traditional classroom setting.
- This theory is targeted for teaching cognitive domains, in particular problem-solving skills for relatively ill-structured problems. Therefore, it is not suited for other kinds of learning domains – i.e., psychomotor or affective domains.
- An animated pedagogical agent is available for social interactions with the learner.
- A learning management system (LMS) is available to help learners to manage their learning process.

- Learning objects are available for individualized and just-in-time access to knowledge to be acquired to go through the learning process.

Values Reflected in This Theory

According to the systems design theory by Banathy (1991), the design of an educational system is grounded on the values that are shared by the stakeholders and end users. Reigeluth (1997) also argues that values play at least two important roles in designing an instruction – i.e., values make an influence on the learning goals that are selected and they also influence the means for attaining a given goal, therefore laying a ground for the criteria against alternative means to accomplish a goal.

The following values are identified as the criteria for the goals and instructional approaches that are adopted in this instructional theory.

1. Learners should be able to learn at their own pace, at any time and at any place.
2. Learners should be active, self-directing in pursuing their learning goals.
3. Learners are motivated to learn when they experience in their life situation "a need to know or be able to do in order to perform more effectively and satisfyingly" (Knowles, 1996. p.256).
4. Learners should be taught in a way that they could link new knowledge to their prior knowledge/experiences.
5. The learners should be taught in a way that they could transfer knowledge into their real-life situations.
6. Learners need to explore cross-disciplinary subjects in order to acquire knowledge and skills for solving real-world problems.
7. Learners have options to choose the methods of their instruction – "students as designer" (Reigeluth & Nelson, 1997).
8. Instructors need to act as mentor or guide to the learners helping them become self-directed learners.

Theoretical Framework

Before we discuss the methods that are employed to develop a new instructional theory for teaching solving ill-defined problems, it is important to address the theoretical framework upon which the methods are developed. Those theoretical frameworks are discussed here with a focus on the theories of instructional strategies for guiding and coaching individual learners to promote their problem solving skills.

Definition and Characteristics of Ill-Structured Problems

Jonassen (1997) defines well-structured problems as "constrained problems with convergent solutions that engage the application of a limited number of rules and principles within well-defined parameters" (p.65). In contrast, ill-structured problems "possess multiple solutions, solution paths, fewer parameters which are less manipulable, and contain uncertainty about which concepts, rules, and principles are necessary for the solution or how they are organized and which solution is best" (Jonassen, 1997, p.65). Ill-structured problems are typically situated and emerged from a specific context that is encountered from everyday practice (Jonassen, 1997). In situated problems, the problem situations are not well specified, the problems are not clearly described or well defined and the information needed to solve them is not contained in the problem statement (Chi & Glaser, 1985). Also, ill-structured problems are unstable and different solutions may be appropriate depending on the constraints faced by the problem solver (Petragia, 1998).

Theories of Teaching and Learning for Problem-Solving Skills

Several researchers suggest that constructivist and situated cognition theories of learning are effective approaches to solving ill-structured problems. Jonassen (1997) claims that problem solving has moved slowly away from information-processing theory as its conceptual base for the past two decades. He claims that traditional methods of problem-solving did not transfer to solving the problems situated in the real context. Also, Voss (1988) posits that it is necessary to develop an authentic task environment to teach ill-structured problem-solving skills because they are more context-dependent than well-structured problems.

Jonassen (1997) suggests an instructional design model for solving ill-structured problems situated in the real world based on constructivist and situated cognition approaches to learning. In his design model, the learners frame the design problem, recognize the divergent perspectives, collect evidence to support or reject the alternative proposals and ultimately synthesize their own understanding of the situation rather than find a solution for a prescribed problem, wherein learners must monitor the performance of the chosen solution and adapt it through an iterative process.

The instructional model that is centered on authentic contexts can be an appropriate approach to providing the learner with a meaningful and authentic learning environment for problem solving. In order to provide authentic learning environments, it is important to design learning environments which support; (1) the construction of knowledge based on internal and social negotiation, articulation and reflection, (2) a meaningful and authentic context for learning and using the constructed knowledge, and (3) collaboration among learners and with the teacher, whose role is to coach or mentor the learners' construction of knowledge (Jonassen, 1994).

Constructivists also emphasize learning through context-rich, experience-based activities for the learner' construction of knowledge (Duffy & Jonassen, 1992). To make learning more authentic, learners need to be presented with thick problems, which are rich in information, similar to what we can encounter in everyday problems. Two examples of learning approaches in which thick problems are presented are anchored instruction and goal-based scenarios (Petragia, 1998). Anchored instruction is a teaching technique to provide the learner with authentic problem-solving environments using multimedia technology (CTGV, 1990). A goal-based scenario is a learning-by-doing simulation in which students pursue a goal by practicing and using relevant knowledge and skills to achieve their goal (Campbell & Monson, 1994).

The constructivist approach to designing instruction focuses more on designing learning environments that foster the construction of knowledge on the part of the learner rather than controlling its process by sequencing the information presented to the learner. Jonassen (1994) suggests an instructional design model from the constructivist perspective. In his design model, he suggests a learning environment which supports the construction of knowledge, a meaningful, authentic contexts, and collaboration with the instructor and among the learner. In such a learning environment, the instructor plays a role of coach or mentor. Similarly, Savery and Duffy (1995) suggest theoretical principles for problem-based learning as follows:

- Learning should be relevant
- Instructional goals should be consistent with the learner's goals
- Cognitive demands and tasks in the learning environment should be consistent with cognitive demands and tasks for which the learner is being prepared
- Teacher's role is to challenge student's thinking
- Students' ideas should be tested against alternate views through social negotiation and collaborative learning groups
- Encourage reflection on the learning process (p.137).

Animated Pedagogical Agents

An animated pedagogical agent is a computer-mediated character that provides social interactions with students to create rich, knowledge-based learning environments for the learner (Johnson, Rickel, & Lester, 2000). Animated pedagogical agents can provide such human-computer interaction as interactive demonstrations, navigational guidance, attention guides (gaze and gesture), nonverbal feedback (e.g. a nod of approval, shaking head to indicate disapproval), conversational signals, conveying and eliciting emotion, and virtual teammates (Johnson, Rickel, & Lester, 2000).

In a pedagogical sense, animated pedagogical agents provide learners with "scaffolding in the form of highly contextualized problem-solving advice that is customized to each learner" (Moreno, Mayer, & Lester, 2000). Research indicates that animated pedagogical agents increase the learner's motivation to engage in learning activities in the online environment. Learners also pay higher attention to the task than they do without such an agent (Johnson, Rickel, & Lester, 2000). Also, Moreno and et al. (2000) have found that some aspects of animated pedagogical agents (e.g. auditory presence, dialogic language style) help students learn in the context of social interactions with the animated social agent produce better learning outcomes than the students who learn in a text-based computer context without such a presence.

Methods

In this section, the ways to support and facilitate personalized learning for adult learners in online environments are discussed. The methods are broken into four components and each component is detailed below.

1. Goal-Setting Activities

In this first step of the instruction, the learner chooses a set of subjects that matches his/her learning needs. To do so, the learner's prior knowledge and experience level will be measured to provide prerequisite instructions and to gauge the appropriate level of authenticity of the learning activities for the individual learner. Also, the learner will set his/her own expectations and goals of his/her learning, which will result in individualized learning objectives and methods to produce learning outcomes that meet individual needs. More detailed procedures of the goal-setting activities are as follows.

(1) The learner chooses the subject areas of his/her interest and needs.

- The animated pedagogical agent (henceforth, agent) provides the learner with a list of learning domains. The learner can choose learning domains that match his/her problem areas (e.g. economy, management, marketing, etc.).
- Since real-world problems often contain learning domains from multiple disciplines, more than one learning domain can be selected.

(2) Measure the learner's prior knowledge and experience level.

- The purpose of measuring the learner's prior knowledge is to determine the level of complexity in the task that s/he will be engaged in and to provide supplemental instruction to the learner as needed before s/he begins working on the task.
- A pretest is given to assess the learner's entry knowledge or the learner can rate his/her own knowledge/skill level.
- In addition to the learner's prior knowledge, the learner also rates his/her experience level in the subject in order to determine the level of complexity in his/her learning task that s/he will be engaged in.
- For the learner in the training setting, the peer and supervisor's feedback on their performance can be also taken into account for measuring the learner's entry level.

(3) The learner sets his/her expectations and the goals of learning with guidance from instructor.

- To set the learning goals that meet individual learning needs and also to guide the learner into self-regulated learning, the learner sets his/her own learning goal with guidance from the instructor.
- The learner posts his/her expectations and goals of the instruction at the LMS and the instructor gives feedback on it regarding its clarity, plausibility, and the appropriateness of the anticipated learning outcomes.
- To give guidance on how to write goals and expectations to the learner, the instructor posts some examples of such statements on the LMS.
- The learner sets criteria that deem meaningful to him/her to evaluate his/her learning to facilitate self-regulated learning (Corno & Randi, 1999).

2. Engaging in the Learning Task

In this step, the learner interacts with the agent to choose a task that s/he will be engaged in throughout the learning process in a problem-centered learning approach. Also, the learner acquires necessary prerequisite knowledge/skills and is given resources needed to perform the task in a just-in-time fashion.

(1) The learner chooses the context s/he is interested in for his/her learning task.

- The agent presents the learner a variety of contexts that the learner can choose from (e.g. business, education, technical, …)
- The learner selects a context that s/he wants to be engaged in based on his/her own learning need and interest.

(2) The learner selects a learning task in the context of his/her choice.

- The agent presents multiple forms of tasks that the learner can choose from (e.g. scenarios, cases, projects, etc.).
    - The tasks are provided in the context of his/her choice.
    - The tasks should be authentic that address real world issues.

    - The level of complexity of the task should be suited for the learner's entry level, as identified in the previous step. It should also be novel enough to represent a real-world situation.
- The learner selects a task of his/her choice from the list of tasks presented by the agent.
    - The expected duration of each task is given to help the learner's choice of the task.
    - The learner chooses the format of the task based on his/her preference.
    - The learner can control the expected duration of the learning at his/her pace.
- The learner can choose the format of the learning output (e.g., project report, presentation, action plans) by selecting a form of task, which leads to creating a product that s/he can use in their real life or work settings.

(3) For the concepts or skills the learner needs to acquire as the prerequisites for performing the task, relevant modules are selected from the learning objects and are presented to the learner.

- The agent presents the prerequisites based on the results of the pretest conducted at the goal-setting phase.
- The modules are chosen from the learning objects.
- The learner learns the prerequisites through tutorial using a generality-examples-practice with feedback approach.
- When the learner explores the tutorial at his/her own pace and when s/he reaches the mastery level, the tutoring system guides him/her to move on to the task.
- The instructor answers any questions that the learner encounters while learning through learning objects.

(4) The learner is given additional resources on the task to be performed.

- Use visualization tools (e.g., video, charts, graphs) to present the task (Jonassen, 1999).
- Give worked examples to present a model for the learning (Jonassen, 1999).
- The instructor is available as a facilitator to provide further information on how to perform the task.
- Provide the learner with resources for exploring relevant information in a just-time-time fashion.
    - All the necessary resources should be readily accessible via online for just-in-time access.
    - The resources need to provide rich information to support the learner who copes with authentic problems.
    - Use a variety of formats to present the information (text, graphics, animations, etc.).

3. Performing the Task

In this step, the individual learner engages in the task with assistance from the agent. The instructor also provides guidance to promote the constructivist learning environment.

(1) The learner performs the task exploring the information resources described earlier.

(2) The agent guides the learner to perform the task.

- The agent provides templates that the learner can use to perform the task.
- It also guides the learner to the module in the learning objects system when the learner has questions about a subject.

(3) Online communication with the instructor to foster the learner's cognitive development.

- The instructor can use a variety of modeling, coaching and scaffolding techniques, as suggested by Jonassen (1999), to promote a constructivist learning environment. Those techniques are as follows;
    - Modeling: model performance, articulate reasoning
    - Coaching: provide motivational prompts, monitor and regulate the learner's performance, provoke reflection, perturb learner's models
    - Scaffolding: adjust task difficulty, restructure a task to supplant knowledge, provide alternative assessments (pp.231-236)
- Also, the instructor guides the learner on the process of his/her learning (e.g., what needs to be done and how s/he can do it).
- The instructor provides the list of online learning communities that the learner can participate to discuss with others on the problems/tasks s/he is engaged in.

(4) Reflection and feedback on the process and the output of learning

- While working on the task, the learner reflects on what worked and what didn't work in his/her approach to solving the problem and posts it regularly on the LMS.
- The instructor gives prompt feedback on the learner's reflection and provides appropriate coaching and scaffolding to the learner.

4. Evaluating and Reflecting on the Task

Instructor's evaluation, reflective self-evaluation, and peer evaluation are conducted to evaluate the result of learning.

- The learner posts the output of his/her learning task on the LMS.
- The learner also posts his/her reflection on the learning process.
- The instructor and the learner evaluate the output and the process of learning according to the preset evaluation criteria.
- The output is also posted in the learning community in which the learner's has been engaged and receives feedback from the participants.

Conclusions

In conclusion, the learning-focused paradigms in this instructional theory are discussed. Also, considerations in applying and improving the theory are discussed in what follows.

New Paradigms in This Theory

Some learning-focused paradigms are adopted in this instructional theory. Those new paradigms are the instructor's role as a guide of learning, the incorporation of technology to provide individualized learning, and the use of a learning management system to foster self-regulated learning. First, in this instructional theory, the learner takes initiative for the whole learning process and the instructor plays the role of guide or mentor - e.g., giving guidance to the learner to help him/her become a self-regulated learner. Second, this theory of instruction guides the learner to set individualized learning goals and instructional methods using computer technology (e.g. animated pedagogical agent, learning objects system, and learning management system). Finally, most learning management systems in current Web-based instruction are used to control the learner - e.g., to make sure the learner is doing his/her assignment on time - not to facilitate learning. The LMS in this instruction is used as a tool to foster the learner's self-regulated learning and communication with the instructor rather than controlling their learning.

Considerations in Implementing the Theory

It is important to consider the limitations of an instructional theory in terms of under what circumstances it can or cannot work. As mentioned earlier, this instructional theory is developed for teaching higher-order thinking skills in ill-defined domains; hence, the methods in this instructional theory are intended to require a lot of effort from the learners to set their own learning goals and plan on their own learning process to facilitate highly complex thinking skills. However, applying this approach to teaching cognitive skills in relatively well-defined domains, for which the learning goals and methods can be defined more easily, might cause too much exertion of the learner's time and effort. Thus, it is suggested that this instructional theory might not be an efficient approach to teaching cognitive skills in well-defined domains.

In addition, particular attention needs to be paid to the instructor's role in this individualized learning environment. The instructor needs to play the role of a guide or facilitator of the learning environment in which the learner is provided with feedback and guidance on the learning process based on their personal learning needs. For this, the instructor can provide information on the learning resources and provide prompt feedback on the learner output in each step of the learning process. Most of all, guidance to the learner for him/her to become a self-directed learner is warranted. One way to achieve this goal is to help the learner reflect on his/her learning process.

Evaluating and Improving the Theory

You will need to evaluate the plausibility of this instructional theory in the actual context that you will be applying it to in order to make sure this theory works well in your situation. Reigeluth (1983, 1999) has suggested that an instructional theory can be evaluated based on the criteria of effectiveness, efficiency and appeal of an instruction designed from the theory. Effectiveness is the extent to which the application of the theory attains the goal in a given situation. Efficiency is the extent to which resources (costs in terms of time, money, etc.) are warranted for theory implementation. Appeal refers to how enjoyable the resulting instructions are designed from the theory. Frick and Reigeluth (1999) also suggest that these three criteria may be valued differently in different situations according to the needs or wants of the stakeholders. Therefore, you need to consider what criteria are more meaningful and critical for your learners when you evaluate this instructional theory.

Also, no instructional theory is perfect, as the main concern for developing and testing an instructional theory is preferability - i.e., does this method attain the goals in a given situation than any others? - rather than validity (Reigeluth & Frick, 1999). Therefore, it needs to go through formative research for it to become more preferable. The underling logic or purpose of conducting formative research on an instructional theory is to apply the instructional theory in a real instructional setting and identify weaknesses found in the application of the theory which may reflect ways to improve it (Reigeluth & Frick, 1999). The methodological procedures for conducting formative research are described by Reigeluth and Frick (1999).

Since the instructional theory presented in this paper has not gone any field testing nor has been studied for its weaknesses, formative research is highly recommended to improve this theory so that it can better serve the purpose of the theory and attain desired outcomes.

References

Arnone, M. (2002, March 4). Online education must capitalize on students' unique approaches to learning, scholar says. The Chronicle of Higher Education.

Banathy, B. H. (1992). A systems view of education: Concepts and principles for effective practice. Englewood Cliffs, NJ: Educational Technology Publications.

Bonk, C. J, & Cummings, J. A. (1998). A dozen recommendations for placing the student at the center of Web-based learning. Educational Media International, 35(2), 82-89.

Boud, D. J. (1992). Individualized learning systems: Individualized instruction in higher education. In M. Eraut (Ed.), The international encyclopedia of educational technology. NY: Perganon Press.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42.

Campbell, R., & Monson, D. (1994). Building a goal-based scenario learning environment. Educational Technology, 34(9), 9-14.

Chi, M. T. H., & Glaser, R. (1985). Problem solving ability. In R. J. Stenberg (Ed.), Advances in the psychology of human intelligence (pp.7-77). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cognition and Technology Group at Vanderbilt. (1990). Anchored instruction and its relationship to situated cognition. Educational Researcher, 19(6), 2-10.

Corno, L. & Randi, J. (1999). A design theory for classroom instruction in self-regulated learning? In C. M. Reigeluth (Ed.), Instructional-design theories and models: A new paradigm of instructional theory (Vol. 2, pp. 293-318). Mahwah, NJ: Lawrence Erlbaum Associates.

Digilio, A. H. (1998). Web-based instruction adjusts to the individual needs of adult learners. Journal of Instruction Delivery Systems, 12(4), 26-28.

Duffy, T. M., & Jonassen, D. H. (1992). Constructivism; New implications for instructional technology. In T. M. Duffy & D. H. Jonassen (Eds.), Constructivism and the technology of instruction: A conversation (pp.1-16). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dunn, T. G. (1984). Learning hierarchies and cognitive psychology: An important link for instructional psychology. Educational Psychologist, 19(2), 75-93.

Gibbons, H. S., Wentworth, G. P. (2001). Androgogical and pedagogical training differences for online Instructors. Online Journal of Distance Learning Education, 4(3).

Gordon, J., & Zemke, R. (2000, April). The attack on ISD. Training, 42-53.

Jarvis, P. (1999). Global trends in lifelong learning and the response of the universities. Comparative Education, 35(2), 249-257.

Jarvis, P. (2001). The age of learning: Education and the knowledge society. London: Kogan Page.

Johnson, W. L., Rickel, J. W., & Lester, J. C. (2000). Animated pedagogical agents: Face-to-face interaction in interactive learning environments. International Journal of Artificial Intelligence in Education, 11, 47-78.

Jonassen, D. H. (1994). Thinking technology: Toward a constructivist design model. Educational Technology, 34(4), 34-37.

Jonassen, D. H. (1997). Instructional design models for well-structured and ill-structured problem-solving learning outcomes. Educational Technology Research and Development, 45(1), 65-94.

Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), Instructional-design theories and models: A new paradigm of instructional theory (Vol. 2, pp. 215-239). Mahwah, NJ: Lawrence Erlbaum Associates.

Keller, J. M. (1983). Motivational design of instruction. In C. M. Reigeluth (Ed.), Instructional-design theories and models: An overview of their current status (pp. 383-434). Mahwah, NJ: Lawrence Erlbaum Associates.

Knowles, M. (1984). The adult learner: A neglected species (3rd ed.). Houston, TX: Gulf Publishing.

Knowles, M. (1996). Adult learning. In Robert L. Craig (Ed.), The ASTD training and development handbook (4th ed., pp. 253-265). New York: McGraw-Hill.

Martinez, M. (2000). Successful Web learning environments: New design guidelines. (ERIC Document Reproduction Service No. ED 446 745)

Martinez, M. (2001). Mass customization: Designing for Successful Learning. International Journal of Educational Technology, 2(2).

Moreno, R., Mayer, R. E., & Lester, J. C. (2000). Life-like pedagogical agents in constructivist multimedia environments: Cognitive consequences of their interaction. Paper presented at the annual meeting of the World Conference on Educational Multimedia, Hypermedia and Telecommunications. Montreal, Canada.

Muir, D. J. (2001). Adapting online education to different learning styles. In Proceedings of the National Educational Computing Conference. Chicago, IL.

Petragia, J. (1998). The real world on a short leash: The (mis)application of constructivism to the design of educational technology. Educational Technology Research & Development, 46(3), 53-66.

Reigeluth, C. M. (1983). Instructional design: What is it and why is it? In C. M. Reigeluth (Ed.), Instructional-design theories and models: An overview of their current status (pp. 3-36). Mahwah, NJ: Lawrence Erlbaum Associates.

Reigeluth, C. M. (1997). Instructional theory, practitioner needs, and new directions: Some reflections. Educational Technology, 37(1), 42-47.

Reigeluth, C. M. (1999). What is instructional-design theory and how is it changing? In C. M. Reigeluth (Ed.), Instructional-design theories and models: A new paradigm of instructional theory (pp. 5-29). Mahwah, NJ: Lawrence Erlbaum Associates.

Reigeluth, C. M., & Frick, T. W. (1999). Formative research: A methodology for creating and improving design theories. In C. M. Reigeluth (Ed.), Instructional-design theories and models: A new paradigm of instructional theory (pp. 5-29). Mahwah, NJ: Lawrence Erlbaum Associates.

Reigeluth, C. M., & Nelson, L. M. (1997). A new paradigm of ISD? Educational Media and Technology Yearbook, 22, 24-35.

Savery, J. R., & Duff, T. M. (1995). Problem based learning: An instructional model and its constructivist framework. In B. G. Wilson (Ed.), Constructivist learning environment: Case studies in instructional design (pp.135-150). Englewood Cliffs, NJ: Educational Technology Publications.

Voss, J. F. (1988). Learning and transfer in subject-matter learning: A problem solving model. International Journal of Educational Research, 11(6), 607-622.

Yong, Y. (1998). Learners' perceptions on learning through the Web. Journal of Instruction Delivery Systems, 12(1), 23-26.

Adding Interactivity to Neuroanatomy Slide Images Using Layers, Image Maps, and JavaScript Behaviors

Taeyeol Park

Georgetown University Medical Center

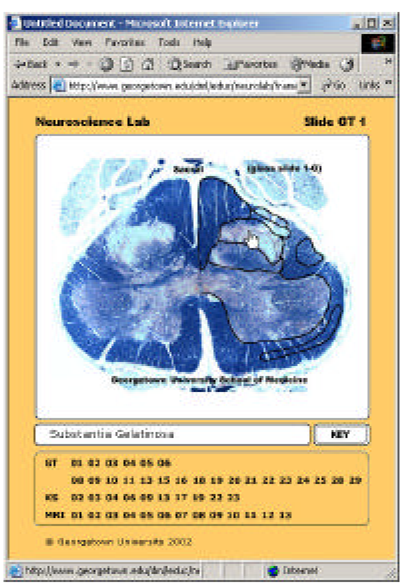
Abstract

The Department of Neuroscience and the Faculty and Curriculum Support (FACS) Center at the Georgetown University Medical Center developed an online interactive learning tool to help students understand brain structures and memorize their elements with neuroanatomy slide collections. Each slide page was designed to show students a key when they move a cursor over a particular region of an image. The interactive learning tool was created with Macromedia Dreamweaver by using its layers, image maps, and behaviors features that are easy to use and learn. The learning tool for neuroanatomy slide collections product was launched and overwhelmingly successful with the faculty and students.

Background

The Faculty and Curriculum Support (FACS) Center of the Dahlgren Memorial Library and the Department of Neuroscience at the Georgetown University Medical Center previously provided first year medical students with 35mm slides and web based slide collections as an education resource to complement the neuroscience course requirement. Most of the scanned slide images and text for describing the images were static web pages. The web based slide collections did not have any interactivity and were not complete since some were still in 35 mm slides. Although some other courses in the school have already used online digital slide collections as their course supplements, they were the collections of images just for delivering information without involving interactions between students and learning materials.

Since neuroanatomy is best learned through repetition, students needed a tool that allows them to review high quality, labeled images of brain and spinal cord often and at the same time, test their knowledge of the neuroanatomy. Faculty in the Neuroscience department required a tool to help first year medical and physiology graduate students understand brain structures in relation to pathways and function and memorize their elements with labels by using digitized human anatomical specimens. They wanted a learning tool that was interactive as well as online.



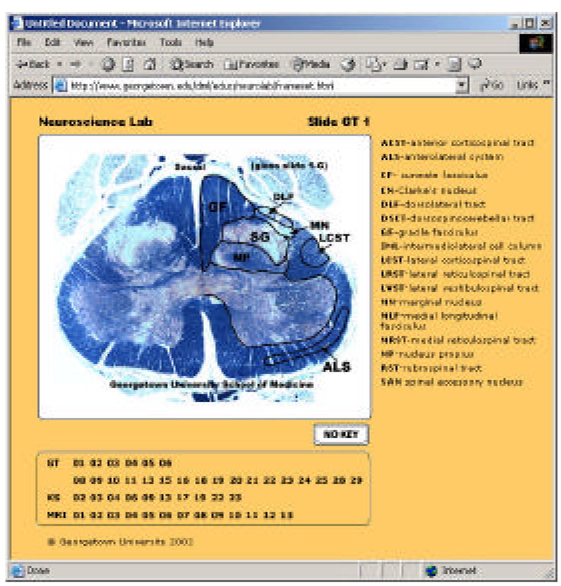


Figure 1. The Neuroscience Lab pages

The project focused on two main issues, pedagogy and technology. The pedagogical issue was how to create the interactive learning tool with the slide images. Although some other courses have already used online digital slide collections as their course supplements, they were the collections of images just for delivering information without involving a student's interaction except navigational activities. The project was to create a tool more than just for collecting and presenting information online. It wanted a learning tool to let students relate keys to areas in a slide image through their interactions with the graphic image.

The technological issue was how to create the tool with a limited level of technology that does not require advanced skills or complicated methods so that a non-technician can easily expand its contents and maintain it. For this purpose, the instructional technology support staff of the FACS center selected Dreamweaver and used its built-in functions for making layers, image maps, and behaviors to create the learning interactions with graphical interface.

Method

Based on the notion that instructional materials with higher interaction level lead to more engagement and elaboration of learning, the FACS center developed a tool more than just for collecting and presenting information online. The online interactive learning tool for neuroscience slide collections project was designed to help students understand brain structure elements and memorize their labels and locations in the slide images through the interactions with the images. Each slide page was designed to show students a key (anatomical label) when they move a cursor over a particular region of an image. This new interactive learning tool was created with Macromedia Dreamweaver 4.0 by using its layers, image maps, and behaviors (events and actions) features.

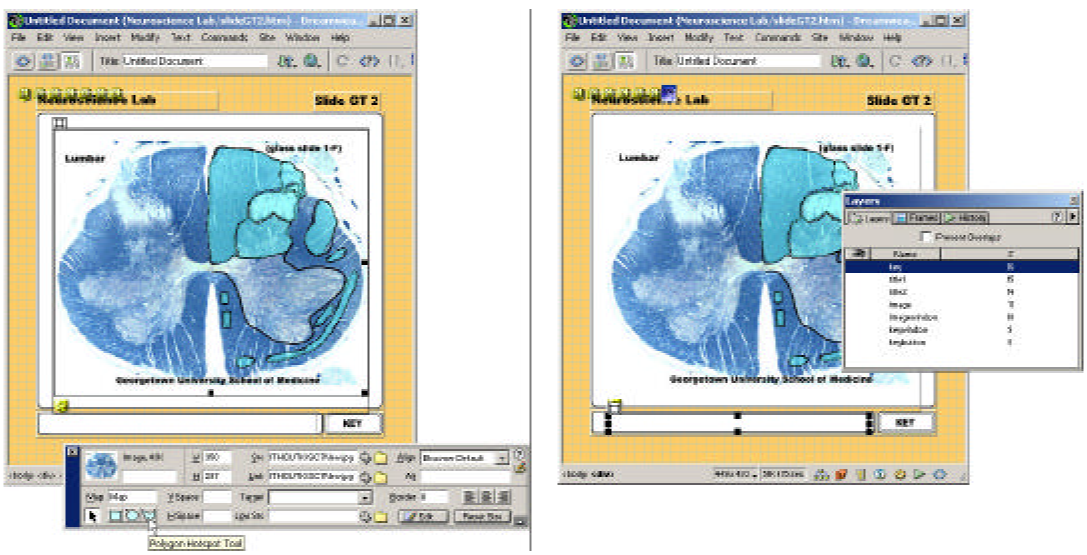


Figure 2. Creating an image map for a target area and a layer for displaying text

The project's second goal was to create the tool with a limited level of technology that does not require advanced skills or complicated methods so that a non-technician can easily expand its contents and maintain it. To achieve the goal, the FACS staff selected Dreamweaver, a web authoring application, and used its built-in functions for making layers, image maps, and JavaScript behaviors to create learning interactions and graphical interface. The techniques were so easy that the department staff who had no background in web page design could learn them without any difficulty after a one-on-one training session.

The department staff scanned the slide images and put all labels on the images using layers in Adobe Photoshop. After the FACS staff designed a frame-based main web page for the slide images and learning interactions as a template, the department staff completed all the page designs using the template. The FACS staff created a typical page for a slide image and a web page frame structure as a template including all the learning interactions. The department staff scanned the slide images and put all labels for the keys on the slide images using layers in Photoshop. The department staff completed all the web page design for the interactive learning using the template with her skills trained by the FACS staff.

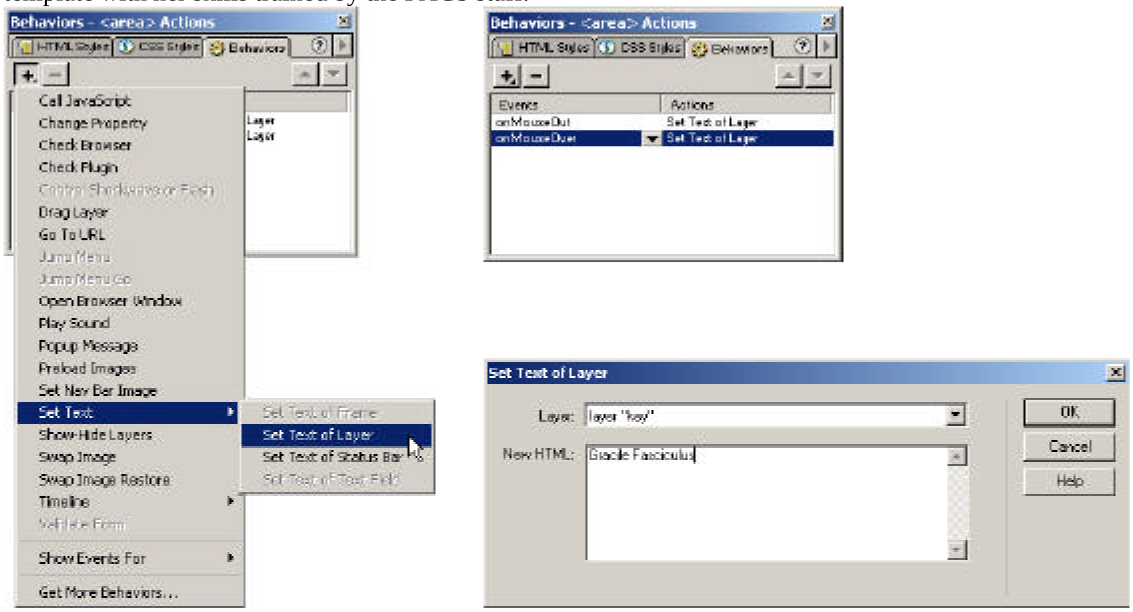


Figure 3. Assigning behavior (events and actions) to an image map

Evaluation

The online interactive learning tool for neuroanatomy slide collections product was launched and overwhelmingly successful with the faculty and students. After the initial trial of the site in a Neuroscience class, the department received several very good reviews of the product and is expected to expand the product in the next semester. The FACS center has received qualitative analysis data from instructors of the course.

Conclusion

All reactions to the site from both students and instructors have been positive. The students are finding the images to be very helpful for studying and request that we expand the site to encompass more materials that is used in the class. The project prototypes were also valuable resources and could be used as templates for future related educational projects. They could be extensively applied for other courses dealing with graphic images and learning interactions using web and multimedia. The project became an excellent example of inter-departmental collaborative work in the online multimedia course material development in a medical school curriculum.

Diversity Training for the Hospitality Industry: An investigation on the effectiveness of applying structured-writing principles to facilitate diversity training.

Doris Choy

Purdue University

Tristan Johnson

Learning Systems Institute

Florida State University

Abstract

Hospitality industry needs high quality diversity training materials that could explicate the complicated diversity issues and educate the employees effectively because of the diverse nature of the industry. Structured-writing principles are known for analyzing complicated information into organized content that facilitate learning. Structured-writing principles are comprised of techniques for formulating, designing, and writing text to improve comprehension and retrieval.The purpose of the study is to investigate if the implementation of structured-writing principles to the development of effective diversity training materials would create high quality materials that improve learners' performance and thus is beneficial to the industry.

Introduction

Diversity training is becoming increasingly important in United States as the population is becoming more diverse. By the year 2050, according to LaVecchia (1998), half of the population in the United States will consistof people that are currently considered as "minorities." Moreover, the aging of the population in general create new challenges in how to utilize the aging population as well as how to market to this audience effectively. Like many other industries, the hospitality industry started to pay attention to various diversity issues since the creation of the Equal Employment Opportunity Commission (EEOC) in 1965 (EEOC, 2001). The mission of the EEOC is to eradicate employment discrimination at workplace so that individuals can be hired, promoted, and compensated based on their abilities and qualifications.

Review of Literature

Overview of the importance of diversity training for the hospitality industry

Within the EEOC, major federal statutes that affect the hospitality industry included: the Equal Pay Act of 1963, which prohibit sex-based wage discrimination between men and women in the same organization with similar job responsibilities. Title VII of the Civil Rights Act of 1964, which prohibits unfair employment discrimination based on race, color, sex, religion, and nation origin (Woods, 1997). The Civil Rights Act of 1991 provided guidelines on penalties in cases of intentional employment discrimination and clarified the legislations related to disparate impact ("The Civil Rights Act of 1991," 1991). The Age Discrimination in Employment Act of 1967, which prohibits employment discrimination against employees and applicants who are older than 40 years of age. As the population is aging, this problem becomes more apparent. Age discrimination affects the economy as increasing number of older workers are unemployed and thus unable to live with economic independence ("The Age Discrimination in Employment Act of 1967," 1967). The Americans with Disabilities Act of 1990 (ADA) prohibits employment discrimination against qualified individuals with disabilities (Woods & Kavanaugh, 1992). Diversity issues are complicated, difficult to understand, and many hospitality operators feel that the federal statutes are tricky (Nolo.com, 2001). Therefore, it is necessary to develop effective diversity trainings for the employers and the management of the hospitality industry in order to educate their employees and comply with the legislations.

However, diversity issues are not limited to complying with the legislations anymore due to the constant interactions between the diverse workforce, the international customers and multinational corporations.. In the service-oriented hospitality industry, potential problems such as workplace hostility, negative customer relations and bad reputation of the industry would arise if efficient and effective diversity trainings are not provided to the employees. Diversity training becomes essential for the productivity, competitiveness, harmony, and the success of the hospitality industry (Lee & Chon, 2000).

Diversity in human resources translates into providing equal opportunities to employees in recruiting, training, promotion and compensation. In order to create the openness at the workplace and promote diversity, it becomes an organization's responsibility to demonstrate their respects on individual's differences and encourage all employees to develop themselves in the organization (Groschl & Doherty, 1999). While many diversity training programs addressed issues such as increase in sensitivity and appreciate cultural differences, other important issues such as developing technical skills in dealing with diversity and facilitating cross-cultural skills were not addressed in many diversity trainings (Lee & Chon, 2000). Effective diversity training should include: clear training objective, follow-up assessment of trainees in how the training impact them and evaluation in how the trainees apply their diversity training in their workplace (Cox, 1996).

The purchasing power of minority groups is increasingly at a fast pace. It is projected that African Americans' purchasing power will rise 72 percent in this decade, whereas the purchasing power of the general population is projected to be 56 percent (Whitford & Higley, 1998). Therefore, it is vital to provide diversity trainings to employees about the importance of providing inclusive and high quality services to all customers. Minority markets such as African Americans and Asian Americans are having more purchasing power (Nigro, 1998) and marketing effectively to the specific customers can have a significant impact to the success of the hospitality industry.

The ultimate goal of effective diversity training is to help your employees to develop a sense of common goals of serving customers and providing high quality of services (Rousseau, 1997). While the differences among employees and customers are being addressed, employees should understand that all of them work as a team towards a common goal. Their differences and uniqueness are essential for the success of the organization. Moreover, owners and managers need to continuously emphasize the importance of common goals and help employees to develop the "diversity lens", where everyone in the organization will view everything with the "diversity lens". In the long run, the organization will be able to foster a mutual respect environment. This can only be achieved if the work environment and employees at all levels respect the differences among co-workers and value each others' uniqueness.

As a result, one can understand that diversity training consists of complicated information such as different statutes and legislations; perception changes of the employees related to interacting with different people; personal development within employees; maintaining a positive work environment that focus on a team's common goal as well as individual's uniqueness. Therefore, it is not difficult to understand why the hospitality industry had not yet developed some high quality diversity trainings for their employees.

Overview of Structured-Writing Principles

In order to develop effective diversity training materials for the hospitality industry, structured-writing principles are selected to be implemented to the development of diversity training materials. Structured-writing principles have been implemented to various instructional materials. It is believed that structured-writing would be able to improve the quality of diversity training materials and thus increase the effectiveness of the material.

Locating and retrieving information effectively becomes a challenging task with all the information available to people. In the past, people worried that they cannot receive enough information. Nowadays, people worry about being flooded with unlimited information and are having difficulties in sorting through all of them effectively. However, few researchers called attention to the different writing and reading requirements, even though the world of business and technology is growing so complex and information is changing faster than we could learn it (Horn, 1993).

Structured-writing has been developed as one of the instructional strategies to address many of the perennial problems most people have when working on a complex written communication task (Horn, 1998). Many terms are used to describe the techniques employed in text design. One that is used often is "Information Mapping", which was developed by Horn. The phrase “Information Mapping” is a registered trademark of Information Mapping, Inc. Several similar terms have been developed such as “information simplification”, “mapping”, “message design,” and ‘structured-writing.”

Structured-writing seems to describe most accurately the techniques for formulating, designing, and writing text to improve comprehension and retrieval. The techniques chunk information into domains called information blocks, which can precisely describe complex information (Horn, 1999). Each information block is a small chunk of information and consists of similar content with strong relationships with each other. Structured-writing is a tool for writers, instructional designers, teachers, and anyone who try to disseminate information to effectively organize and visually present almost any type of raw information so readers can grasp its significance more quickly (Whiteside & Whiteside, 1993). Balan (1989) suggested that by carefully structuring text and applying typographical cues, the learner spend less time processing text and more time learning new material. Hence, it improves the instructional value of any instructional material.

What is Structured-Writing? Principles of Structure-Writing Strategies

Structured-writing can be defined as the strategies for formulating, designing, and writing text to improve comprehension and retrieval of information by the readers (Whiteside & Whiteside, 1993). It provides a systematic way to analyze and design information in written documents. It was first developed in trying to make reading and learning easier and quicker for readers in a complex information rich environment. There are four major principles in structured-writing, they include: information blocks, information maps, labeling, and formatting.

Information Blocks

First, the content is analyzed thoroughly to discover the underlying structure of the subject matter. Content analysis helps to specify what key information is missing and help to simplify the following content development stages as writers can identify the missing pieces early. The content of the subject matter is broken down into the smallest practical unit of meaning for writing documents and formed the basic units. These units are essential to the ability in teaching others with great uniformity to sort sentences of the subject matter into an easily understood taxonomy (Horn, 1992). Thus, the content is being categorized into basic units called “information blocks” according to the underlying structure through the process of “chunking”. The four basic principles of information blocks are chunking — group all information into small units; labeling — name the blocks according to the content and key concepts; relevance — keep one key point within each block; and consistency — use similar wordings, terminologies, formats, and organizations (Horn, 1998).

Information Maps

A large number of information blocks gathered without organization would fail to provide readers with logical ways to cluster important concepts, procedures (Horn, 1993), and hinder the readers’ abilities to search or retrieve information from the content. In order to solve this problem, a number of information blocks would be arranged into an “information map”. An information map consists of one to nine information blocks with related content. It provides an important intermediate level of specification (Horn, 1993) of the content. All the blocks related to similar key points could be clustered into information map and label appropriately.

Information has a topography like geographical terrain with peaks and valleys, cities and countryside, and roads to connect them (Horn, 1992). Information maps should act like a geographical map that guides the readers to read, search, and understand the content of the subject matter and bring the readers to their desired destinations effectively and efficiently.

Labeling

During the chunking process, the content has been formulated into information blocks. Each block has been labeled appropriately based on the key points. However, after the information blocks are organized into information maps, additional labeling is required to represent the main ideas clearly.

In order to distinguish the differences in labeling information maps and information blocks, the headings of information maps are called “map titles” and the labels of information blocks are called “block labels”. The purpose of both types of labels is to help describe the specific content of the subject matter, the functions of the block or the map, and combinations of these two types (Horn, 1993). The importance of labeling enables the readers to read the content of the subject matter quickly and understand the structure of the document; to locate the important points that readers are looking for; to manage information gathering and analysis; and to retrieve information from the content efficiently.

Consistent Formatting

Consistent use of information blocks, block labels, and map titles in the formatting of structured-writing enhance readers' ability in scanning documents efficiently. Readers will be able to locate the content easily, scan the important information and skip the details when time is limited. While the formats were initially developed to aid the reference and rapid scanning modes of use, these similar formats also aid learners to pre-organize and size up their learning tasks during the learning process (Horn, 1993).

Consistent map titles provide essential information to orient the readers while block labels provide basic description of the information blocks. Readers immediately recognize how easy it is to scan and skip to what they want to read. They recognized the rapid access that the formats provide on every page. Therefore, they begin to have confidence in the document and in their ability to understand what it contains (Horn, 1993). Implementing structured-writing principles to diversity training will be helpful because complicated diversity issues can be broken down into information blocks and then being constructed into information maps that would be easy to scan and understanding, which would improve the instructional value of the diversity training material.

Advantages of structured-writing included but not limited to: easy-to-scan; better information retrieval and understanding; effective writing techniques; decrease in reading time and the difficulties; reduction in time needed to prepare textual materials; and assist in the development of just-in-time training.

Structured-writing strategies consist of strengths that could enhance learning in an educational environment. However, as the concept was originally developed for the business and industry, additional studies are necessary to investigate the pros and cons in implementing structured-writing strategies in classrooms and also what kind of alterations could be done to make it a better fit for teachers as well as students.

The simplicity and clarity in structured-writing principles is beneficial to the development of diversity training because it is a complex subject matter. In general, hospitality employees perceived diversity training as confusing and difficult to understand. Moreover, many of the employees of the industry do not have high education level or reading abilities. Thus, presenting information clearly and in an easy to read format is essential in motivating the employees to learn. As a result, implementing structured-writing principles to diversity training material could be a potential solution to solve the acute need of high quality effective diversity training material of the hospitality industry.

Purpose of the Study

The goal of this research study was to implement structured-writing principles in the development of efficient and effective diversity training materials for hospitality front line employees. The purpose of the study is to determine if the application of structured-writing principles to the developmental process of diversity training materials for the hospitality employees facilitated training and improved learners' performance in recalling the information. As a result, it is hypothesized that structured writing principles would improve the learners recall abilities when they learn about basic diversity issues.

Research Questions

Based on the purpose of the study, a posttest only experimental design was developed to answer the following research questions:

- Question 1: Are structured-writing principles an effective instructional strategy for diversity training?
- Question 2: Can the implementation of structured-writing principles to diversity training materials for the hospitality industry improve learners' learning when compared to traditional prose-writing format?
- Question 3: Can structured-writing principles improve the learners' recall abilities in diversity training?

Methodology

In order to solve the problem, the researcher used an approach that has been shown effective in other areas to analyze and organize many perennial problems — structured-writing (Horn, 1993). The goal of the study was to implement structured-writing principles in order to design and develop efficient and effective diversity training materials for hospitality hourly employees.

There are three hypotheses in this research study:

H1: The participants who received the original structurally written training material (SW 1) will perform better than those who received prose written training material (P).

H2: The participants who received the revised form of structurally written training material (SW 2) will perform better than those who received the original structurally written training material (SW 1).

H3: The participants who received the revised form of structurally written training material (SW 2) will perform better than those who received prose written training material (P).

The prose written material (P), original structurally written material (SW 1) and the revised version of structurally written training material (SW 2) will be discussed in detail in the procedure section.

Sample/ sampling method

The participants of the study were undergraduate students in an introductory course of the Department of Hospitality and Tourism Management. This is the largest course offered by the department once a year. The average enrollment of the course is about 200 students. According to previous enrollment data, a vast majority of the students in this course are in their freshmen or sophomore years. Their demographics are similar to the hourly employees in the hospitality industry. In fact, many of them work at local restaurants and hotels as hourly employees. These participants were chosen to represent the hospitality hourly employees because they have diverse backgrounds and limited knowledge about diversity, which are similar to hospitality hourly employees. The class was randomly divided into three groups. Each group received different formats of training materials and the same posttest after they learned from the materials.

Procedure

There were two main stages in the data collecting process: the developmental stage and the implementation stage. The developmental stage mainly focuses on the design and development of the instructional materials and posttest. The implementation stage focuses on data collection of the participants.

Developmental stage

Stage One: The development of prose-written material — traditional prose-written instructional material was developed by reviewing textbooks related to diversity training. Sections in different textbooks were selected as the foundation to create the prose-written material. This was the control in the study — the traditional prose-written material.

Stage Two: The development of the original version structurally written material (SW 1) — the content in the prose-written material was analyzed thoroughly to develop the original version of the structurally written material. It was created based on the principles of structured-writing. As a result of these principles, information blocks become far more usable text to scan, to read and to memorize (Horn, 1998).

Stage Three: The development of revised version structurally written material (SW 2) — the revised version of structurally written material was developed by incorporating students' feedbacks in how to improve the original version of structurally written material. As Horn (1993) pointed out, structured-writing principles were developed for effective business communications. Some of the structured-writing principles may not be as valuable in classroom settings. Therefore, a preliminary study was conducted with a small number of undergraduate students (about 15) from Hospitality and Tourism Management. The students were asked to review the original version of the structurally written material and take the posttest. After that, the students were asked to fill out a questionnaire consisting of open-ended questions such as, "how do you think the training material could be change to help you learn the content?" Changes were made to the original structurally written material based on their recommendations and the revised version of structurally written material was developed.

The posttest material was developed based on the content of the diversity training materials in the prose written material and the original structurally written material. Since the content was consistent across different versions of instructional materials, it was not a major concern that the test was being developed prior to the completion of all instructional materials.

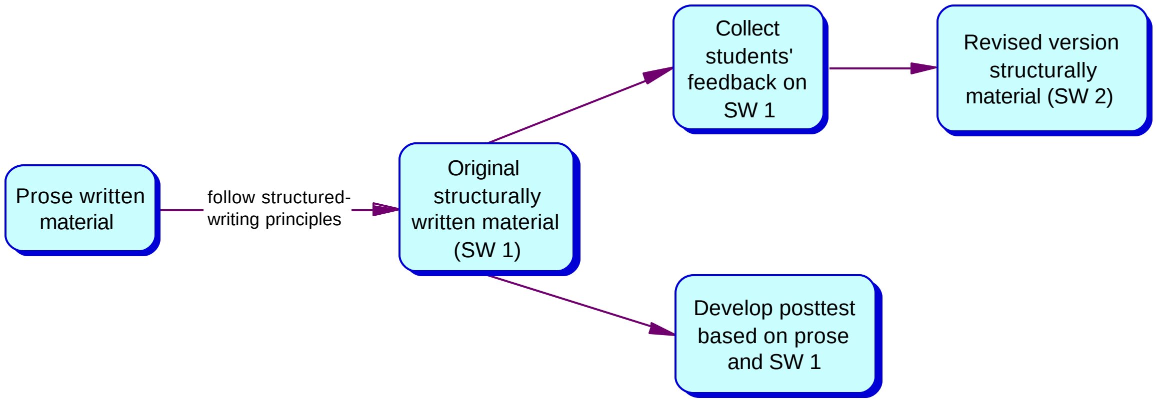


Figure 1: Developmental stage of prose written material, original structurally written material, revised version of structurally written material, and posttest.

Implementation Stage

This is the actual treatment and test administration stage. As there are a large number of participants, it was crucial to plan the process carefully in order to collect the data efficiently. The participants were randomly assigned to the three treatments: prose-written (P), original structurally written (SW 1) and revised structurally written materials (SW 2). Participants received one of the instructional materials to learn about the diversity-related content. They were given 20 minutes to review the materials. Then, they returned the instructional materials and received the posttest. They had about 20 minutes to complete the posttest. The researcher collected the posttests at the end of the limited time period.

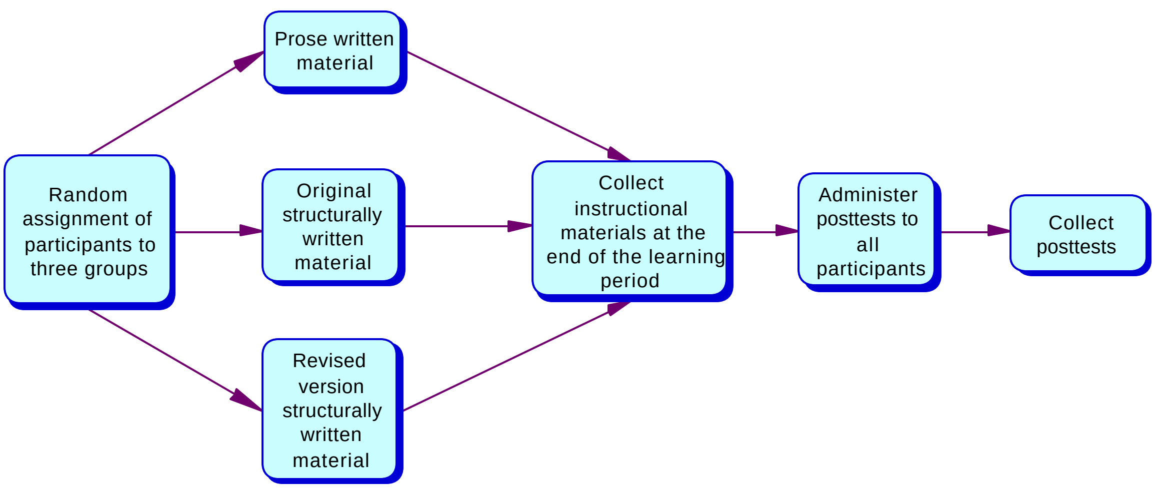


Figure 2: Implementation stage of the data collection process

Research design — Posttest only experimental design

The study was a posttest only experimental design. The experiment was administered without a pretest because the participants were randomly assigned to three different control and treatment groups. Therefore, the treatment and control groups were not systematically different from each other. As a large number of participants were available, random assignment was effective in dividing them into equivalent groups. Thus, systematic differences or biases in assigning participants to the control and treatment groups were minimized. As there were no systematic differences, there was no need to conduct a pretest. An additional advantage of not conducting a pretest was that there was no need to worry about testing effect where the participants may learn about the test in the pretest and therefore able to perform better in the posttest.

Methods of data analysis

One-way Analysis of Variance was used to analyze the data because the participants were divided into more than two groups. After that, the Tukey's Honestly Significant Difference test was used to determine the significant differences among the individual group means.

ANOVA was used to analyze the data among the three groups on their posttest scores, which measured their abilities in understanding and recalling the content of the instructional materials. Statistical analysis calculated the F ratio of the participants' posttest scores in different treatment groups. The F ratio was able to see if the differences between the three treatment groups were significantly larger than the variations within individual groups.

The statistical analysis of ANOVA will only produce an F ratio claiming there are significant differences among the three groups. However, F ratio cannot explain which group is significantly different from what other groups. Therefore, after conducting ANOVA, Tukey's Honestly Significant Difference test was performed to analyze which individual group was significantly different from which group.

The purpose of the study was to investigate the effectiveness of implementing structured-writing principles to diversity training materials for hospitality hourly employees. The results of this research will benefit future instructional designers by increasing their understandings of structured-writing principles and how to effectively implement the principles in future instructional development projects.

Preliminary Data Results

A pilot study was conducted in the summer session prior to the full scale data collection. The results of the pilot study showed that participants learned from the original version structurally written material (SW 1) group performed significantly better that participants learned from the prose written training material (P). Their means are 29.375 and 19.75 respectively (p-value = 0.02). The Cronbach alpha was estimated by using the data of the pilot study to examine the reliability of the testing instrument. The preliminary Cronbach alpha was 0.89. After deleting two items from the posttest, the reliability was boosted to 0.90. Therefore, the pilot data showed that the posttest is a reliable testing instrument to be used for the study.

Discussions

Structured-writing principles have been applied to learning in many different domains. However, there are no previous research studies that attempt to apply structured-writing principles to the design and development of diversity training for the hospitality industry. Therefore, this study adopted the structured-writing principles to develop diversity training materials that could facilitate learners in understanding diversity. By utilizing various structured-writing principles, the instructional designers were able to effectively organize, visually present (Whiteside & Whiteside, 1993) and simplify the complex diversity issues into usable information for the hourly hospitality employees. The learners are able to learn about complicated diversity issues and the implementation of structured-writing facilitates their recall abilities. This paper presented some preliminary results of the study which showed significant differences between the performances of participants from the two groups. Therefore, it is projected that the results of the full scale study would be similar to the results of the preliminary data collection.

Future research studies can try to investigate the effectiveness of implementing structured-writing principles into different content areas. In this study, structured-writing was implemented on paper-based instructional materials. As computer-assisted instructions are increasingly popular, researchers can also try to examine the possibility and the effectiveness of implementing structured-writing principles in computer-based textual information.

Conclusion

The purpose of the study is to examine the implementation of structured-writing principles to diversity training materials for the hospitality employees and find out if the principles can help to facilitate training and improve learners' performance in recalling the information when compare to learners who learned from traditional prose written training materials. As a result, it is hypothesized that structured writing principles would improve the learners recall abilities when they learn about basic diversity issues.

Structured-writing principles are originally developed to help improve the effectiveness of business communications in the business settings because of the large amount of information. As we are transferring more and more information to our learners in the instructional and educational settings, we need to look for more effective methods in communicating the information to the learners. Structured-writing has been widely adopted in the business settings for its efficiency and effectiveness. However, limited studies had been conducted in the instructional settings that are related to structured-writing principles. Therefore, this study is conducted to evaluate the possibility of implement the principles in an instructional environment. In the long run, the instructional designers will benefit from the results of the study as they can learn more about the effectiveness of implementing structured-writing principles to the development of various instructional materials.

Reference

The Age Discrimination in Employment Act of 1967, 29 U.S.C. 621 (1967).

Balan, P. (1989). Improving Instructional Print Materials through Text Design. *Performance and Instruction, 28*(7), 19-18.

The Civil Rights Act of 1991, (1991).

Cox, S. (1996). Building a new paradigm for managing workforce diversity. *Hospitality & Tourism Educator, 8*(1), 31-36.

EEOC. (2001, July 25). *U. S. Equal Employment Opportunity Commission: An Overview* [Web page]. EEOC. Retrieved December 13, 2001, from the World Wide Web: http://www.eeoc.gov/overview.html

Groschl, S., & Doherty, L. (1999). Diversity management in practice. *International journal of contemporary hospitality management, 11*(6), 262-268.

Horn, R. E. (1992). Opinion: Clarifying Two Controversies about Information Mapping's Method. *Educational & Training Technology International*, *29*(2), 109-117.

Horn, R. E. (1993). Structure Writing at Twenty-five. *Performance and Instruction, 32*(2), 11-17.

Horn, R. E. (1998). Structure Writing as a Paradigm. In C. Dills (Ed.), *Instructional Development: State of the Art*. Eaglewood Cliffs, NJ: Educational Technology Publications.

Horn, R. E. (1999). Information Design: Emergence of a New Profession. In R. Jacobson (Ed.), *Information Design*. Cambridge, MA: MIT Press.

LaVecchia, G. (1998). America's changing face. *Restaurant Hospitality, 82*(10), 51-60.

Lee, C., & Chon, K. S. (2000). An Investigation of Multicultural Training Practices in the Restaurant Industry. *International journal of contemporary hospitality management, 12*(2-3), 126-134.

Nigro, D. (1998). Diversities initiatives: How major hotels are responding to NAACP ratings? *Meeting and Conventions*, *33*(6), 73-77.

Nolo.com. (2001). *How to comply with the Americans with Disabilities Act when hiring new employees*. Nolo.com. Retrieved December 23, 2001, from the World Wide Web: http://www.nolo.com/lawcenter/ency/article.cfm/objectID/70980BA4-7332-4847-B5C3FA3837DC4E26#questions

Rousseau, R. (1997). Employing the new America: Part II: Staff. *Restaurant & Institutions, 107*(7), 40-52.

Whiteside, M. F., & Whiteside, J. A. (1993). *Structure Writing Techniques for Information Brokers*.Unpublished manuscript.

Whitford, M., & Higley, J. (1998). NAACP's latest card targets three giants. *Hotel and Motel Management, 213*(10), 1, 25.

Woods, R. (1997). *Managing Hospitality Human Resources* (2nd ed.). Lansing, Michigan: Educational Institute of the American Hotel & Motel Association.

Woods, R., & Kavanaugh, R. (1992). Here comes the ADA - Are you Ready? (Part I). *Cornell Hotel & Restaurant Administration Quarterly*, *33*(1), 24-32.

Structured-writing strategies: Improving the instructional values of training materials.

Doris Choy

Purdue University

Tristan Johnson

Learning Systems Institute

Florida State University

Abstract

Structured-writing strategies consisted of analyzing, organizing, sequencing, and displaying the various units of information. The major components of structured writing included: information blocks, information map, labeling and consistent formatting. Advantages of implementing structured writing strategies are easiness to scan information, enhance information recall and retrieval, improvement of writing techniques and applicable to develop effective just-in-time training. Some challenges of applying structured writing strategies would be difficulty to analyze the increasingly complex and rapidly changing information, resistance of readers to learn new reading techniques, and lack of motivational strategies in the development of structurally written document.

Introduction

Locating and retrieving information effectively becomes a challenging task with all the information available to people. In the past, people worried that they cannot receive enough information. Nowadays, people worry about being flooded with unlimited information and are having difficulties in sorting through all of them effectively. Even though the world of business and technology is growing so complex and information is changing faster than we could learn it, few researchers called attention to the different writing and reading strategies (Horn, 1993).

Structured writing has been developed to address many of the perennial problems most people have when working on a complex written communication task (Horn, 1998). Many terms are used to describe the techniques employed in text design. One that is used often is "Information Mapping", which was developed by Horn. Other terms have been developed such as "information simplification", "mapping", "message design," and 'structured-writing."

Structured-writing seems to describe most accurately the techniques for formulating, design, and writing text to improve comprehension and retrieval. The techniques are to chunk information into domains called information blocks, which can precisely describe complex information (Horn, 1999). Information blocks are small chunks of information that are similar in that cluster sentences have strong relationship with each other. Structured-writing is a tool for writers, instructional designers, teachers, and anyone who try to disseminate information. It helps to effectively organize and visually present almost any type of raw information so readers can grasp its significance more quickly (Whiteside & Whiteside, 1993). Balan (1989) suggested that by carefully structuring text and applying typographical cues, the learner spend less time processing text and more time learning new material. Hence, it improves the instructional value of any instructional material.

Horn (1999) explained that structured-writing provides a systematic way of analyzing any subject matter to be conveyed into a written document. It consists of a set of techniques for analyzing, organizing, sequencing, and displaying the various units of information. Thus, the method can be said to capture and sort the "core" sentences of the subject matter. It clusters them into meaningful units for further refinement in the writing phase of documentation and training materials (Horn, 1993). The structured-writing techniques help to analyze and organize complex knowledge into easy-to-access information for readers, who can choose to read in detail or scan through it quickly to grasp the key points (Information Mapping, 2001).

This paper presents four major sections: the principles of structured-writing strategies; the advantages of structured-writing; the challenges of structured-writing; and the application of structured-writing in education.

Principles of Structure-Writing Strategies

Structured-writing is defined as the techniques for formulating, designing, and writing text to improve comprehension and retrieval of information by the readers (Whiteside & Whiteside, 1993). It provides a systematic way to analyze and design information in written documents. It was first developed in trying to make reading and learning easier and quicker for readers in a complex information environment. There are four major principles in structured-writing, they include: information blocks, information maps, labeling, and consistent formatting.

Information Blocks

At the first stage, the content is analyzed thoroughly to discover the underlying structure of the subject matter. Content analysis helps to specify what key information is missing and help to simplify the content development stages as writers can identify the missing pieces early. The content of the subject matter is being break down into the smallest practical unit of meaning for writing documents and formed the basic units. These units are essential to the ability in teaching others easily and with great uniformity to sort sentences of the subject matter into an easily understood taxonomy (Horn, 1992). Thus, the content is being categorized into basic units called "information blocks" according to the underlying structure through the process of "chunking".

The four basic principles of information blocks are: (1) chunking: group all information into small units; (2) labeling: name the blocks according to the content and key concepts; (3) relevance: keep one key point within each block; and (4) consistency: use similar wordings, terminologies, formats, and organizations (Horn, 1998).

To ensure consistency in similar content, consistent wording, labels, formats, organizations, and sequences should be used in the block (Horn, 1998). Information in each information block should only be representing one main point for the relevance purpose. If there is other information that is important for the readers to know but irrelevant to this main point, it should be placed in another block to avoid readers' confusion (Horn, 1998).

Information Maps

A large number of information blocks gathered together without organization or management would fail to provide readers logical ways to cluster important concepts, procedures, (Horn, 1993) and hinder the readers' abilities to search or retrieve information from the content. In order to solve this problem, a number of information blocks would be arranged into an "information map". An information map consists of one to nine information blocks with related content. It provides an important intermediate level of specification (Horn, 1993) of the content. All the blocks related to similar key points could be clustered into information map and label appropriately.

Information has a topography like geographical terrain with peaks and valleys, cities and countryside, and roads to connect them (Horn, 1992). Information maps should act like a geographical map that guides the readers to read, search, and understand the content of the subject matter and bring the readers to their desired destinations effectively and efficiently.

Labeling

During the chunking process, the content has been formulated into information blocks. Each block has been labeled appropriately based on the key points. However, after the information blocks are organized into information maps, additional labeling is required to represent the main ideas clearly.

In order to distinguish the differences in labeling information maps and information blocks, the headings of information maps are called "map titles" and the labels of information blocks are called "block labels". The purpose of both types of labels is to help describe the specific content of the subject matter, the functions of the block or the map, and combinations of these two types (Horn, 1993). The importance of labeling enables the readers to read the content of the subject matter quickly and understand the structure of the document; to find the important points that readers are looking for; to manage intermediate stages of information gathering and analysis in a more efficient way; and to retrieve information from the content efficiently. Further revisions of block labels may be necessary after the blocks are formulated into information map. This addition stage is to ensure the consistency in labeling between information blocks and the overall logic of the information map.

Consistent Formatting

Consistent use of information blocks, block labels, and map titles in the formatting of structured-writing enhance readers' ability in scanning documents efficiently. Readers will be able to locate the content easily, scan the important information and skip the details when time is limited. While the formats were initially developed to aid the reference and rapid scanning modes of use, these similar formats also aid learners to pre-organize and size up their learning tasks during the learning process (Horn, 1993). Consistent map titles provide essential information to orient the readers while block titles provide basic description of the information blocks. Readers immediately recognize how easy it is to scan and skip to what they want to read. They recognized the rapid access that the formats provide on every page. Therefore, they begin to have confidence in the document and in their ability to understand what it contains (Horn, 1993).

Advantages of Structure-Writing Strategies

There are a number of advantages in applying structured-writing strategies in developing textual information, which includes: easiness to scan, better information retrieval and recall, effective writing techniques and useful in designing just-in-time training.

Easy to scan

As the originator of structured-writing, Horn claims that structured-writing strategies are capable of first-pass sorting of 80 percent or more of the content of every subject matter that it has been applied to (Horn, 1993). Therefore, utilizing various structured-writing strategies can effectively organize, visually present (Whiteside & Whiteside, 1993) and simplify the complex information into usable models. Balan (1989) also agreed with Horn in that effective text design can grab the attention of readers and help readers to access, process and recall information. Balan created a number of text layout examples in her article to demonstrate to the readers the differences in using different cues such as listing; side-by-side text; justified vs. unjustified text; verbal cues such as summaries and analogies; and typographical cues such as boldface, italics, and underlining. Although scientific research was not performed, the examples have provided readers with clear illustrations of the importance in utilizing different cues in textual materials. Whiteside and Whiteside (1993) suggested that structured-writing aids the readers' comprehension, retention, retrieval, and focus on the information.

The development of structured-writing materials needs to go through a series of analyzing, chunking, labeling, and organizing versus the development writing conventional paragraph-written materials go through a simpler production process. Thus, it is not difficult to understand why structured-writing produces high-quality instructional materials, enhances the information processing skills and eventually improves learning and understanding of readers.

Better information retrieval and learning

Jonassen (1981) conducted a research study in comparing the abilities of students to recall (close-book) and retrieve (open-book) information between the programmed instructional materials and the structurally-written materials. The participants were 41 graduate and undergraduate students in an introductory media course. The results of the study suggested that both programmed instructions and structured-writing materials produced significant amounts of learning (recall) and there were no differences between the effectiveness. However, there was a very significant difference between the effectiveness of programmed instructions and structured-writing materials in the retrieval task. The participants in the structured-writing group performed significantly better than the programmed instruction group in the retrieval examination. The average test score for the structured-writing group in the retrieval examination is 33.9 and the average score for the programmed instructions group is 22.94, with a more than 10 points differences ($t = 4.14$, $p<0.001$).

Additional studies have shown the effectiveness of structured-writing techniques in teaching. Fields (1982) conducted a study on a Master of Business Administration course about critical path method. It demonstrated that the participants regarded it favorably as a teaching method. The objective of the study is to analyze the responses of the participants and see whether significant learning took place. The study consisted of a pre-test and a post-test questionnaire, the percentage of participants that responded correctly increase from 29 percent in the pre-test to 78 percent in the post-test, with a statistical significance at the 0.001 level. Therefore, the study concluded that there was a significant gain in the average participants' knowledge as a result of studying the structurally written text. Therefore, Fields concluded that besides that being a significant overall increase in the proportion of correct answers in the post-test, the level of knowledge of the participants had also been brought to a more uniform level.

Effective writing techniques

Structured-writing assists writers to develop various textual materials more efficiently as the techniques help to significantly decrease the length of any textual materials. Studies have been done to conclude that forty information blocks can be used to sort 80 percent of the sentences found in writing about most relatively stable subject matters such as sentences found in textbooks. This ability to provide such precise functional descriptions has been used in the design of various training and reference documents (Horn, 1999).

Just-in-Time training

Before the introduction of structured-writing techniques, few practitioners distinguished clearly between the initial instructional materials for learners during training and the reference materials that learners need in their performance context (Horn, 1993). However, it is increasingly difficult for readers to comprehend all the information around them. This effect is inevitable as readers are bombarded by excessive information, which changes faster than they could learn it. Therefore, just-in-time trainings emerge and gain importance because they [referant? training?] could provide quick revisions to learners after the initial training and before performing the skills in real-life.

Structured-writing techniques can be applied to analyze and organize current trainings and transform them into just-in-time training. The techniques enable instructional designers to analyze and present all the information of the initial training precisely in a short and easy-to-read format for learners to use as reference. Information may include but not limited to: the prerequisite skills needed, objectives of the training, procedures that learners need to remember and pay attention to, safety notes, and even evaluation criteria so the learners can perform self-assessments.

Other advantages of structured-writing techniques

Improvements in reading speed — in a user survey administered to the US Air Force Reserve asked if structured-writing helped to improve their reading speed, 85 percent of the respondents agreed and perceived that their reading time decreased when reading structurally written materials. Another study was conducted to compare the US Army Officers in reading structurally written materials versus conventional, paragraph-written text materials; there was a 12 to 21 percent of improvement in reading speed when they were reading the structurally written materials (Information Mapping, 1999).

Reduction in time in preparing materials — as writers apply structured-writing techniques in developing and writing textual materials, the time needed is reduced because the number of words used to write by applying structured-writing techniques is less than the conventional method. In a study of two separate US Army training and maintenance manuals, the word count was decreased by 39 and 53 percent for structurally written material when compared to conventionally written document on the same topic.

Challenges of Structured-Writing

After describing many advantages in utilizing structured-writing techniques in analyzing and organizing textual information, some researchers had pointed out some challenges of creating and using structured-writing. In order to have a better understanding of the techniques, it is important to acknowledge these challenges as well.

To authors and writers

As information is changing faster than ever, authors are going to encounter a lot of challenges. Some of the general challenges include: the increasing complex information to would need to be analyzed and organized efficiently using the structured-writing techniques; the authors will be responsible to construct structurally written materials for an ever-widening audience and they need to ensure that all the readers can understand the complex information easily; and the authors will need to be able to apply the structured-writing strategies to various delivery media such as papers and computers (Information Mapping, 1998).

To users and readers

Resistance to new techniques — Hartley (1982) suggested that it would be challenging for readers to accept structured-writing as the new strategy in disseminating information because readers must learn the new reading technique. He suggested that readers could be hesitant to change their reading method at the beginning. Moreover, he pointed out that people might be "suspicious of once-for-all solutions."

Lack of motivational strategies — In addition, structured-writing does not specifically address motivational issues specifically for readers. This may be due to the fact that when Horn developed the structured-writing techniques, the target audience is executives and employees in a business environment. Therefore, it can be safely assumed that they will be motivated to learn (Fields, 1982). However, when trying to apply the techniques to students or the academic environment, it cannot be assumed that the students will be motivated to learn at the beginning. The failure to deal with the motivational issues could become a potential weakness for applying structured-writing strategies in an academic environment.

Not focus on disseminating detailed information — Fields (1982) also pointed out that structured-writing focused on the clarity in organizing textual information but pay little attention of the depth of the information. From the standpoint of business and industry, it is understandable that people try to communicate in short and clear messages. However, in academic settings, the lack of depth could be a serious defect. For most of the subjects, students should learn more than a general idea or concept and be able to explore details in order to master the skills and understand the knowledge.

Applications of Structure-Writing Strategies in Education

During the development of structured-writing materials, teachers have to conduct a throughout content analysis. It required a considerable effort in clarifying any ambiguities in identifying and filling any "missing information" between each main point. These gaps might not be as obvious in a conventional paragraph-written materials (Fields, 1982), but could be easily identified by in structured-writing because of the information block format with one key point in each block. The format forced the teachers to recognize the disconnections between key points. Therefore, teachers would be able to produce high quality educational materials, teach smoothly and avoid discontinuities in classes. In order to examine the force of this claim, Fields carried out a simple test to himself by trying to produce a structurally written text on the battle of Waterloo, which he had almost no subject matter expertise. Upon the completion of the test, he concluded that structured-writing constituted a significant aid to the teachers in clarifying their ideas (Fields, 1983). However, he mentioned that the only doubt is whether it always has this assisting effect and whether there are alternatives that might help teachers even more.

Conclusion

Structured-writing has been developed to analyze and organize complex information into easy-to-read information blocks and information maps. Horn (1999) explained that structured-writing provides a systematic way of analyzing any subject matter to be conveyed into a written document. Information blocks are small chunks of information that are similar in that cluster sentences have strong relationship with each other. Forty such information blocks can be used to sort 80 percent of the sentences found in writing about most relatively stable subject matters such as sentences found in textbooks (Horn, 1999). This ability to provide such precise functional descriptions has been used in the design of various training and reference documents (Horn, 1999).

The four basic principles of information blocks are: chunking — group all information into small units; labeling — name the blocks according to the content and key concepts; relevance — keep one key point within each block; and consistency — use similar wordings, terminologies, formats, and organizations. As a result of these principles, information blocks become far more usable text to scan, to read, and to memorize (Horn, 1998). Balan (1989) suggested that by carefully structuring text and applying typographical cues, the learner spend less time processing text and more time learning new material. Hence, improves the instructional value of a training material.

Advantages of structured-writing included but not limited to: easy-to-scan; better information retrieval and understanding; effective writing techniques; decrease in reading time; reduction of time needed to prepare textual materials; and assist in the development of just-in-time training. Some of the challenges included: increasing in complexity of information that needs to be presented; meeting the needs of a wider range of readers; resistance from readers to adopt a new reading technique; that motivational issues are not addressed; and lack of attention in incorporating detailed information.

Executive Summary of Structured-Writing

Definition	• Structured-writing is a technique in formulating, designing, and writing text to improve comprehension and retrieval of information. • Even though the world of business and technology is growing so complex and information is changing faster than we could learn it provides a systematic way to analyze, organize and design information in written documents.
Principles	• Information Blocks — the smallest unit in structured-writing and each block consist of one key concept. • Information Map — a collection of one to nine information blocks with related concepts that group together in disseminating information clearly to the readers. • Labeling — each information block and information map is labeled to describe the main points. • Consistent formatting — the wording, formats, and labeling in the information blocks and maps should be consistent throughout the text to assist readers to locate the information efficiently.
Advantages	• Easy to scan — Horn claims that structured-writing strategies are capable of first-pass sorting of 80 percent or more of the content of every subject matter that it has been applied to (Horn, 1993). • Better information retrieving and understanding — students' performance improved significantly using structurally written training materials (Jonassen, 1981). • Help to develop just-in-training — structured-writing enables instructional designers to analyze and present all the information of the initial training precisely in a short and easy-to-read format for learners to use as reference. • More effective writing techniques — forty information blocks can be used to sort 80 percent of the sentences found in writing about most relatively stable subject matters such as sentences found in textbooks. • Decrease in reading time and level — participants perceived that they need less time to finish reading the same material written with structured-writing techniques.
Challenges	• Increasing amount of complex information that needs to be presented Meeting the needs of a wider range of readers • Lack of motivational techniques in structured-writing • Lack of attention in incorporating detailed information

Reference

Balan, P. (1989). Improving Instructional Print Materials through Text Design. *Performance and Instruction, 28*(7), 19-18.

Fields, A. (1982). A study of the effectiveness of an information mapped programmed text in promoting learning. *Assessment and Evaluation in Higher Education, 7*(1).

Fields, A. (1983). Information Mapping: An Overall Appraisal. *Programmed Learning & Educational Technology, 20*(4), 276-282.

Hartley, J. (1982). Information Mapping: A critique. *Information Design Journal, 2*(1), 51-58.

Horn, R. E. (1992). Opinion: Clarifying Two Controversies about Information Mapping's Method. *Educational & Training Technology International, 29*(2), 109-117.

Horn, R. E. (1993). Structure Writing at Twenty-five. *Performance and Instruction, 32*(2), 11-17.

Horn, R. E. (1998). Structure Writing as a Paradigm. In C. Dills (Ed.), *Instructional Development: State of the Art*. Eaglewood Cliffs, NJ: Educational Technology Publications.

Horn, R. E. (1999). Information Design: Emergence of a New Profession. In R. Jacobson (Ed.), *Information Design*. Cambridge, MA: MIT Press.

Information Mapping, I. (1998). *Meeting the Information Challenges of the 21st Century*. Information Mapping, Inc. Retrieved November 21, 2001, from the World Wide Web: http://www.infomap.com/download/challenge.doc

Information Mapping, I. (1999). *The information mapping method: 30 years of research*. Information Mapping, Inc. Retrieved November 25, 2001, from the World Wide Web:

Information Mapping, I. (2001). *Information Mapping: Description of the Method* [Webpage]. Information Mapping, Inc. Retrieved October 30, 2001, from the World Wide Web: http://www.infomap.com/method/method.htm

Jonassen, D. H. (1981). Information Mapping: A Description, Rationale and Comparison with Programmed Instruction. *Visible Language, 15*(1), 55-66.

Whiteside, M. F., & Whiteside, J. A. (1993). *Structure Writing Techniques for Information Brokers*.Unpublished manuscript.

A Framework for Object-Oriented Collaborative Analysis

Scott Schaffer

Purdue University

Ian Douglas

Florida State University

Abstract

Currently much energy is being used to create the technological framework necessary for an object-based approach to learning system development. However, there appears to be little consideration of the changes in analysis and design thinking required for the move towards object-based systems. This article provides a view on what changes are required and establishes a relationship between learning objects and performance support. The vision for learning objects is that rather than build every new system from scratch, systems will largely be constructed of reusable objects derived from object repositories on the web. Efficient construction and identification of useful objects requires, at minimum, knowledge of learning design strategies and principles. More importantly it requires identification of performance problems and related performance support tools that will address those problems at both organization and individual levels. To link this problem-oriented approach to the identification of proper human performance solutions, a holistic planning approach is recommended.

A Framework for Object-Oriented Collaborative Analysis

The aim of this paper is to describe processes that are required to support design, development, and evaluation of performance improvement solutions and the features of a methodological framework supporting the specification of reusable performance improvement materials. In recent years, the academic and workforce development communities in the United States have become increasingly concerned with the cost effectiveness of student and employee development processes. Efforts to improve the return-on-investment (ROI) of such development have been hindered by a craft orientation to the design and construction of learning and performance support systems (Clark & Estes, 1999). Such an orientation is expensive since it relies on the knowledge and experience of a few expert performers rather than using a standardized approach that is accessible to all performers. One solution to this problem has been to enhance the reuse of learning and performance support materials that had been previously developed. The idea behind reuse is that new systems will largely be constructed of standardized, reusable objects derived from object repositories on the Web rather than built from scratch in a craft-oriented manner.

Studies of ISD professionals in a variety of working environments suggest that time pressures and management impatience with the ISD process result in an ISD practice that looks a lot different than the theory (Rossett & Czech, 1996). Likewise, the preparation of instructional designers may fundamentally limit the ability of designers to effectively impact or add value to the organization by focusing exclusively on learning. Davies (1989) found that designers in the private sector were generally thought to be competent but lacking in promotability due to their lack of business orientation and inability to take proactive approach to solving organizational performance problems.

In addition to the limited impact of ISD practice on the workplace, there is a growing discontent among many practitioners with the ISD methodology. In a recent article (Gordon & Zemke, 2000), ISD was criticized for being too slow, not necessary, leading to bad solutions and having an outdated world-view. Whatever the merits of such claims, the underlying premise of ISD that a systematic approach to design should be used remains valid, therefore, if you reject traditional ISD you should have something to put in its place.

Emerging Trends

Within the software-engineering domain, similar criticism of traditional design methodologies has resulted in a number of alternatives collectively described as 'agile' methodologies (Fowler, 2000). The agile approaches can be characterized as being a collection of suggested features, individual qualities and techniques, rather than a rigid definition of steps and outcomes. This is seen in the agile manifesto (http://agilealliance.org/), which is a collective statement of the common characteristics of agile methods. The manifesto includes statements such as: "We welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage". This contrasts with the approach in traditional methodology where there is a focus on defining and fixing requirements prior to building the software.

Training, especially classroom training, has traditionally been the dominant approach to developing human performance in organizations. Pioneers in the field of performance technology such as Thomas Gilbert, Robert Mager, and Joe Harless have long advocated the view that organizational system elements such as expectations and feedback, tools and equipment, rewards and incentives, and motivation must be analyzed to identify barriers to performance. The essence of this approach is to identify valuable behaviors that produce measureable results and to remove both individual and work environment barriers to performance (Gilbert, 1998). A study conducted with over 1000 organizations by Huselid (1995) found that human resources practices such as employee selection and recruitment, performance management, incentive systems, employee involvement, and training combined to significantly impact turnover, productivity, and short and long term financial success. This study is significant in that training was but one of many strategies impacting organizational results. By extension, efforts to develop technologies to create and use reusable objects to develop the performance of military personnel should look beyond the limited paradigms of traditional training and personnel development.

More recently, a performance-centered approach to design of electronic performance support systems (EPSS) has emerged (Raybould, 2000; Dickelman, 2000; Gery, 1991). This approach relies quite heavily on analysis of the performer and the total performance environment in an attempt to design solutions intimately tied to the work context. Potential barriers to performance are removed as part of this design and learning is considered a consequence as well as a precursor to performance.. Thus, performance support design is somewhat of a blend of instructional systems design, performance engineering, and software design.

Efficient identification, construction, and reuse of information objects requires, at minimum, knowledge of learning and performance design strategies and principles. While much attention is being given to developing the methodological framework for an object-based approach to learning system development, there appears to be little consideration given to the changes in analysis and design thinking required for the move towards object-based systems. Such systems require analysis of human performance problems and identification of related performance support tools that will address those problems across organization and individual system levels. Lessons from software development have shown that it is not enough to have object-oriented construction technologies and standards; reuse and object thinking must also permeate analysis and design thinking.

Framework

In this paper, a methodological framework for designing performance support as an alternative to the traditional ISD model is described. Traditional ISD thinking primarily focuses on two human performance support solutions, i.e. education and training. There are a number of emerging performance support alternatives to training, e.g. knowledge management systems, personal digital assistants or wearable computer to access on-the-job performance support, automation of tasks and redesign of equipment with improved human factors engineering. Traditional approaches to training that assumes the learner is a passive recipient of knowledge are no longer effective. For many of the new roles within an organization, information presented in classrooms will quickly decay; therefore problem solving skills and self-directed knowledge acquisition are more valued. Traditional methodologies also tend to be oriented towards developing integrated stand-alone systems rather than systems constructed from pre-existing reusable components. There are now a number of technologies and emerging standards that enable a reusable object approach to the construction of performance support systems (e.g. www.adlnet.org).

We deliberately use the term framework rather than methodology. A framework is meant to provide a structure for a variety of methodologies tailored to specific groups or situations, rather than a set of rules for a single correct way of developing systems.

The key characteristics of an object-oriented performance support framework include:

1. A human performance-orientation rather than a solution (training) orientation
2. Object-orientation to facilitate reuse through the emerging knowledge/learning object technologies
3. A set of recommended features including:
    - System modeling
    - Collaborative development and peer review
    - Integration with repositories of reusable objects
    - Blended performance solutions
    - Parallel iterative development of solutions
    - Managed deployment with feedback
    - Performance-based improvement
    - Rationale management
    - Automated support tools

Figure 1 illustrates a life-cycle model for the planning, construction and delivery of performance support systems. It envisions the development of support tools that facilitate collaboration and modeling for the planning stage of the framework. It is intended to complement current initiatives towards developing technologies and standards for reusable object-based design and construction. In terms of delivery, the document envisions an evolution of learning management systems towards performance support management systems based on the foundation of performance analysis. Newly developed learning and performance improvement solution packages are accessed, used, and evaluated in a continuous improvement feedback process. Thus, information, knowledge, learning and performance support subsystems are interrelated and accessible based on individual performer requirements.

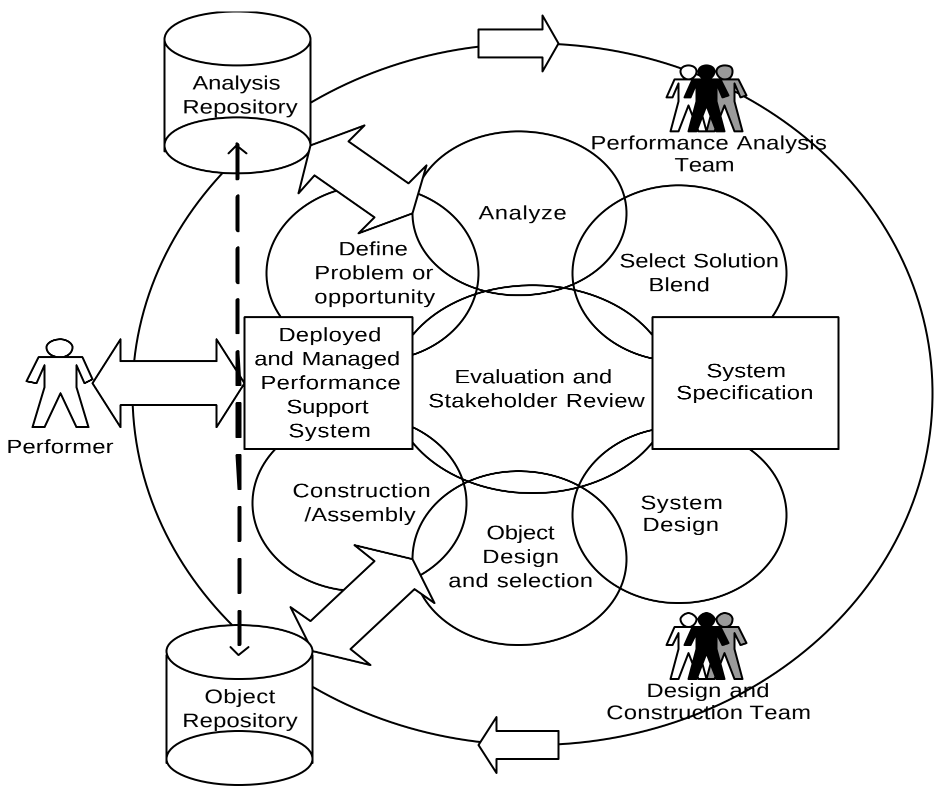


Figure 1. Life-cycle model for object-oriented performance support systems

System modeling

Prior to the development of a new system, it helps to create a graphical model of what you are going to build. In architectural design, for example, an architect will create a drawing of a building design. This drawing may be altered many times at relatively low cost before a final plan is used for construction. Once the building is constructed, alterations become difficult and costly. A similar approach is used in many design domains and is facilitated by a commonly used modeling notation. In learning and performance systems, modeling is not yet an established part of most methodologies and there is no standard modeling notation. In software systems development the Unified Modeling Language (UML) has recently become popular for modeling object-oriented software systems prior to their construction (Booch, 1999). Parts of this language, in particular use case modeling, are adaptable to the needs of object-oriented performance systems.

Collaborative development

Traditional analysis and design can be seen as an expert-centered activity, i.e. an ‘expert’ in design will work with a subject matter expert in a single geographical location to design a training solution. The Internet has the potential to greatly widen the scope for collaboration of others in the analysis and design process when combined with the modeling approach noted above. If models of problem domains and intended solutions are published openly using a standard, easily understood graphical notation, these can be inspected by geographically distributed stakeholders. Thus, a group of analysis and design experts, subject matter experts and end-users/performers can discuss and pass comment on models and identify flaws prior to final construction.

Integration with a repository of reusable objects

There are efforts underway to create repositories of reusable objects. The thinking of analysts and designers must be consistent with this object repository approach for reuse to be successful. Developers should begin thinking in terms of objects at the analysis phase rather than at the construction phase. We propose that analysis models should be framed in terms of analysis objects. Analysis objects are descriptions of requirements that can be matched against existing objects in repositories or form the specification for the construction of new objects.

Blended performance solutions

Currently, performance problems are mainly solved with education and training solutions. By identifying a number of potential solutions to performance problems it is possible, and appropriate, to create a blend of several solutions to a performance problem. Performance models created during analysis have many potential uses. They may be excerpted to create job descriptions and new employee orientation checklists. Developed solutions can also be re-purposed to develop collateral materials that will assist the performer when transferring or applying solutions in the workplace. For example, core skills might be taught in a training course, and a variety of reference materials created or excerpted from them. These job aids or knowledge bases provide performers with on-the-job access to knowledge and procedures for seldom occurring situations.

Parallel iterative development

Traditionally, analysis, design and construction of the whole solution system is completed before delivery. However, in an iterative development approach, different solutions can be selected and developed at different rates. An object-oriented systems approach allows for the decomposition of solution systems into sub-systems and objects, where parts of a system can be created largely from pre-existing objects. Thus some solutions may be identified and designed concurrently with ongoing analysis. This allows multiple, blended solutions to progress to delivery at different rates from others which reduces the overall systems development cycle time, and demonstrates the added value of the analysis process.

Managed deployment with perormance-based evaluation

The performance support developer's responsibility does not end with product delivery. A system of quality assurance should be in place, such that use of a system is managed and monitored with the resulting outcomes fedback into subsequent development and new versions of systems. Evaluation of the products that performers access in terms of their content quality and the value they add to the individual performer and organization, requires management oversight and participation. The test of an effective system is not in functional performance or user satisfaction, but in the closing of the performance gaps identified in the analysis across multiple levels of the performance system. There should be an iterative relationship between performance monitoring and performance support system analysis and design.

Rational management

Most performance problems have a range of potential solutions; despite this, developers often consider only one type of solution. It is not always the case that those making the decisions are unaware of the alternatives. It is more probable that political, historical and cultural factors dictate that there are certain solutions for certain problems. Thus, it is important for decision-makers to have a defensible approach that promotes out-of-the box thinking with careful consideration given to potentially cheaper and better alternative solutions that are also politically palatable.

Rationale management (Moran and Carroll, 1996, Burge and Brown, 2000) is concerned with capturing the knowledge that leads to the construction of a system. In particular it requires an auditing of the decision making when choosing problem solutions. Most performance analysts will be able to produce reasons for their analysis decisions; the distinction in giving a rationale is that there should be the following:

- A description of the issues that were addressed prior to the design decision.
- A list of the alternative solutions considered.
- The criteria used in the selection.
- The argumentation used to support each alternative.
- The decision.

The benefit of rationale management is that it requires the performance analyst to use a rational process to make their decision-making explicit. It discourages decisions based on whim or prejudice; as such decision making will not have a clear rationale.

Automated analysis and design support tools

There are a now a large number of software tools that assist in the implementation of automated instruction and a number that manage the delivery of instruction via the web. There are relatively few tools relating to the systematic analysis, design and documentation that should precede construction and delivery, and none that incorporate the emerging object model. There is scope for creating the equivalent of computer aided software engineering (CASE) tools for object-based performance analysis and/or instructional design.

Spector and Muraida (1997), Goodyear (1997) and Kasowitz (1997) review much of the previous work in automated design support tools. Spector and Muraida note that there is strong motivation to develop such tools given there is "a lack of instructional design expertise, pressures for increased productivity of designers, and the need to standardize products and ensure the effectiveness of products." The tools referred to in these reviews are based on the traditional models of instructional design and were mainly experimental; there are very few commercial products of this type. In contrast to this situation, there is now a range of tools designed to assist with object-oriented software analysis and design and some of the thinking embedded in such tools could be used to create new tools to support object-oriented performance support systems. Although the ideal would be to have tools that support a range of the features referred to above there are some that can support individual features (e.g.

collaboration is supported by tools such as Microsoft's Share Point Team services http://www.microsoft.com/frontpage/sharepoint/)

Conclusion

The object-oriented performance support framework incorporates an object orientation that matches analysis thinking with object technology. A great deal of work is underway to define conceptually and technically what learning objects are and how they work. This object approach to computer-based instruction follows in the path of object-oriented software development. The software industry has found that object thinking begins not when constructing objects, but much earlier in the process – with analysis (Due, 2002). For objects to be considered useful and reusable in a variety of performance solutions (both training and non-training), their characteristics must be considered at each step in the problem-solving process. This framework therefore suggests that organizations committed to reusable objects not rush to the construction of objects at the expense of object thinking in the analysis phase of problem solving.

Many organizations have learned that merely providing more information or more training to improve performance is usually insufficient. When training is an inappropriate solution, the use of learning objects simply means doing the wrong thing more efficiently. Human performance technology (HPT) and object orientation (OO) can affect each other in a recursive process: meaningful performance system analysis impacts how one creates and uses objects, and object orientation can facilitate performance analysis. Individually, each of these elements can provide benefits to an organization, but taken together they create a synergy, equipping the organization to respond more creatively, effectively, and efficiently to performance problems and opportunities.

There is a need for greater consideration, research and collaboration on the issues incorporated within the methodological framework. The current framework is presented not as a definitive answer to the need for new methodologies, but as a starting point for debate and refinement of methodological thinking.

References

Booch, G. (1999). UML in action. *Communications of the ACM*. Vol., No 10, pp. 26-28.

Burge, J. and Brown, D. C. Reasoning with design rationale. In John Gero (ed.) – *Artificial Intelligence in Design* '00, Kluwer Academic Publishers, Dordrecht, The Netherlands, pp.611-629.

Clark, R. E. & Estes, F. (March-April, 1999). The Development of Authentic Educational Technologies. *Educational Technology*, 39(2), 5-16.

Davies, I.K. (1989). Total educational technology (TET): Challenging current limits. *Canadian Journal of Educational Technology*, 18(2), 132-137.

Dickelman, G.J. (2000). EDIT 797: Performance-based design [Online], http://pcd-innovations.com/EDIT797/id98_m.htm

Gery, G. (1991). Electronic performance support systems: how and why to remake the workplace through the strategic application of technology. Tolland, Massachusetts: Gery Performance Press.

Gilbert, T. (1998). Human competence: engineering worthy performance. Amherst , MA: HRD Press, Inc.

Goodyear, P. (1997). Instructional design environments: methods and tools. In S. Dijkstra, N.Seel, F. Schott and Tennyson, D. (eds) *Instructional Design: International Perspectives*, Vol . 2, Mahwah, NJ: Lawrence Erlbaum.

Gordon, J. and Zemke, R. (2000) The attack on ISD The Attack on ISD. *Training*, April. Retrieved online, November 1, 2001 http://www.trainingsupersite.com/publications/archive/training/2000/004/004cv. htm.

Harless, J (1988). Accomplishment-Based Curriculum Development. Newnan, Georgia: Harless Performance Guild.

Huselid, M.A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Review*, 38(3), 635-672.

Kasowitz, A. (1997) Tools for automating instructional design. *ERIC clearing house in Information Technology in Education. Syracuse*, NY. http://www.ed.gov/databases/ERIC_Digests/ed420304.html

Moller, L., Benscoter, B., and Rohrer-Murphy, L. (2000). Utilizing performance technology to improve evaluative practices of instructional designers. *Performance Improvement*, 13(1), 84-95.

Moore, G. A. (1999). Crossing the Chasm: Marketing and Selling Mainstream Customers, Harper-Collins.

Raybould, B. (2001). Performance support engineering: building performance- centered web-based systems, information a systems, and knowledge management systems in the 21st century. Performance Improvement, 39(6).

Raybould, B. (1995). Performance support engineering: An emerging development methodology for enabling organizational learning. Performance Improvement Quarterly, 10(1), p. 71.

Rossett, A. and Czech, C. (1996). They really wanna, but….the aftermath of professional preparation in performance technology. *Performance Improvement Quarterly,* 8 (4) pp. 115-32.

Spector, J. M. and Muraida, D.J., (1997). Automating design instruction. In S. Dijkstra, N.Seel, F. Schott and Tennyson, D. (eds) Instructional *Design:International Perspectives*, Vol. 2, Mahwah, NJ: Lawrence Erlbaum.

Wiley, D. A. (2000). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In D. A. Wiley, ed., *The Instructional Use of Learning Objects: Online Version*. Retrieved May 18, 2001, from the World Wide Web: http://reusability.org/read/chapters/wiley.doc

Making Connections in Teacher Education: Using IP-Based Video Conferencing to Link Pre-Service Teachers with K-12 Classrooms

James D. Lehman

Purdue University

JoAnn Phillion

Purdue University

Tristan Johnson

Florida State University

Learning Systems Institute

Abstract

Teacher education programs often struggle with issues such as diversity and technology integration in field placements for future teachers. Distance education technologies offer capabilities that can be used to address these issues. Video conferencing allows pre-service teachers to observe and interact with K-12 classrooms at a distance, which can provide for virtual field experiences of diverse classroom settings and involving innovative uses of technology. New IP-based video conferencing systems, which support good quality video and audio over the Internet, offer greater flexibility at lower cost than older video conferencing technologies. Pilot projects as part of P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, a PT3 implementation project, have developed models of how to link pre-service teachers and classes with K-12 teachers and students using IP-based video conferencing. Advantages of this approach include: development of pre-service teachers' observational skills, linkages with diverse classroom settings, and opportunities for university students to practice developing and delivering instruction via this technology. Limitations include issues with school Internet firewalls, classroom audio and sometimes video problems, and lack of in-person contact. The technology offers promise for certain kinds of field experiences in teacher education.

Introduction

Teacher preparation programs are faced with a variety of challenges. Over the past two decades, a number of national reports have emphasized the need to improve teacher preparation (Carnegie Forum, 1986; Holmes Group, 1986; Moursand & Bielfeldt, 1999; National Commission on Teaching and America's Future, 1996). Today, teacher preparation programs must prepare future teachers to meet national and state standards with regard to both content and pedagogy in an era when there is increased emphasis on performance. Teacher preparation programs must also help pre-service teachers learn to use technology and develop their understanding of diversity and multiculturalism (NCATE, 2001). Meeting these challenges may require new approaches.

Field experiences have been identified as a key means to better prepare teachers for the diversity and complexity of today's classrooms (Goodlad, 1990). While field experiences are generally recognized as critically important, many colleges of education, particularly those in rural areas, have difficulty placing students in field settings that provide for needed experiences with, for example, diverse student populations and technology. Distance education technologies offer capabilities that can be used to provide needed experiences for pre-service teachers when appropriate field sites are not in close proximity. Purdue University has initiated an innovative project in the use of technology-enabled field experiences, part of a Preparing Tomorrow's Teachers to use Technology (PT3) implementation grant, to address key components of its teacher preparation program including understanding of classrooms and diversity, technology integration, and development of appropriate instruction for K-12 learners.

While distance education has traditionally been viewed primarily in terms of content delivery, i.e. a teacher at one site presents course materials to students at other sites, today's distance education technologies offer opportunities for other types of interactions between colleges of education and K-12 schools. For example, using distance education technologies, future teachers can observe and interact with K-12 classrooms from afar. This concept is not new; closed circuit television was used for observation of classrooms in teacher education programs as far back as the 1960s (e.g., Abel, 1960). In the 1980s, Iowa State University's Teachers on Television program showed that the observation skills of pre-service elementary teachers could be improved through training using microwave-based video connections to public school classrooms (Hoy & Merkley, 1989). However, these technologies were expensive and difficult to set up and maintain. Today's video conferencing technologies offer a flexible and cost-effective option for observation of and interaction with school-aged learners at remote school sites. This paper reports on a project, part of P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, which is exploring the use of video conferencing distance education technologies for enhancing teacher education by providing opportunities for pre-service teachers and classes to link with K-12 students, teachers, and classrooms.

Background

After five years of reform planning by its faculty and administration, the School of Education at Purdue University recently completed implementation of the final phase of completely restructured elementary and secondary teacher education programs. The new programs, which were launched with students entering teacher preparation programs in the fall of 1999, feature a cohesive set of block courses and practical experiences that are anchored by four strands – technology, portfolio assessment, diversity, and field experience.

In Purdue's new teacher preparation programs, the technology strand is manifest in a required educational technology course followed by integration of technology experiences throughout other courses. To address the portfolio strand, each pre-service teacher develops a portfolio to document professional growth, for self-reflection on learning, and to provide the foundation for performance-based licensure. A large-scale, web-based, electronic portfolio system has been developed as another aspect of the P3T3 project. The diversity strand is supported by appropriate course work and by exposing pre-service teachers to various forms of diversity (e.g., socioeconomic, rural/urban, religious, cultural, special needs/gifted populations) during field experiences. The field experiences strand is supported by a Theory Into Practice (TIP) component that accompanies each block of courses in the new program. The TIPs provide our pre-service teachers with more and richer field experiences than were available in the past. The P3T3 project is helping to support implementation of the new programs and ensure that technology is integrated throughout the teacher preparation programs as originally intended.

The overall goals of the P3T3 project are to (1) prepare pre-service teachers to demonstrate fundamental technology competencies, using technology as a tool for teaching/learning, personal productivity, communication, and reflection on their teaching, and (2) prepare teacher education faculty to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. The project is meeting its goals via three complementary components: (a) faculty development and integration of technology in teacher preparation courses, (b) development of a electronic portfolio system to support production of portfolios by all pre-service teachers, and (c) creation of rich and diverse field experiences enabled by the use of technology. This paper focuses on the latter, specifically the use of distance education technologies to create virtual field experiences for prospective teachers.

As one way to address the challenges of providing diverse and rich field experiences in a limited geographic location, Purdue's P3T3 initiative is making use of two-way video conferencing to link pre-service teachers and teacher education classes with diverse K-12 students, teachers, and classrooms. The purpose of this initiative is to explore various models for enhancing teacher preparation through these linkages between the university and participating K-12 schools.

Two video conferencing systems are used in the project. Some of our partner K-12 schools are linked to an intrastate fiber optic video network called Vision Athena (http://www.visionathena.org). The Vision Athena network is managed by the Center for Interactive Learning and Collaboration, a partner in the P3T3 project. While Purdue University does not have a direct connection to the Vision Athena network, we can connect with schools on the network through a video bridge. The other technology we are using is IP-based video conferencing equipment from Polycom (http://www.polycom.com), which supports good quality video and audio over the Internet. This technology is relatively affordable and very flexible, because a standard H.323 connection can be established between any two locations with access to a reasonably fast Internet connection (128 Kbps or better). Because of these advantages, it is emerging as the technology of choice in our project.

We use two types of Polycom video conferencing equipment in our project. Room-to-room video conferencing is supported by Viewstation SP (point-to-point) or FX (multipoint) units. These compact units have a camera with panning and zooming capability that can be attached to any available video monitor and plugged into an ethernet jack for Internet connectivity. Prices start at about $2500 for the Viewstation SP. For person-to-person or small group to small group connectivity, we use the Polycom ViaVideo computer-based desktop video conferencing unit, which operates in conjunction with a Windows PC. While the ViaVideo camera is of lesser quality and lacks the panning and zooming capability of the larger Viewstation units, the inexpensive (about $400) ViaVideo unit adds the exciting capability for application sharing during video conferencing. Two pilot projects involving these IP-based video conferencing technologies are described in this paper.

Class to Class Video Interactions for Beginning Pre-Service Teachers

In the first block of the teacher preparation programs at Purdue University, teacher education students take two classes: Exploring Teaching as a Career and Multicultural Education. The classes are designed to provide a foundation for future education courses by helping the pre-service teachers to begin to understand the nature of teaching and schooling. The two courses share a TIP component, an early field experience, in which students typically travel to nearby schools to observe classrooms for a couple of hours each week. The goal of this initial TIP experience is to help students become familiar with the work of teachers, observe teaching, reflect on student diversity and its expression in the school setting, and begin to interact with learners.

Unfortunately, because of Purdue's geographic location away from any major urban centers, opportunities for encountering diversity during field experiences are limited for pre-service teachers in our program. In addition, pre-service teachers often feel there is no need to understand diverse populations of students because they plan to teach in predominantly white and rural areas after graduation (Yao, 1999). The demographics of the areas they plan to teach in, however, are rapidly changing and diversifying (Glazer, 1997). As local placements reflecting ethnic, linguistic, and socio-economic diversity are difficult to find within driving distance, and as it is essential that students have these experiences, one of our pilot projects has endeavored to use technology to reach out to diverse classrooms in other parts of the state.

The pilot project described here was implemented in order to link learning about technology with learning about multiculturalism by placing beginning pre-service teachers in diverse classrooms for their field experiences through the use of video conferencing and the Internet. In this pilot project, elementary pre-service teachers enrolled in a section of the first block's TIP participated in their field experience via video conferencing with a partner school in a diverse area of Indiana. Using Polycom Viewstation equipment, a faculty member (one of the authors) and students at Purdue linked with a teacher and students in a grade three bilingual class in a diverse inner city school in East Chicago. The two sites connected once a week throughout the semester for between one and two hours. During that time pre-service teachers observed the classroom, interacted with the children and teacher, and prepared a variety of enrichment activities which they taught using the interactive capabilities of the Polycom technology and the Internet. Prior to each interaction the teacher posted information about her current curriculum and suggestions for activities on her website. The pre-service students prepared mini-lessons based on the teacher's guidelines in consultation with the faculty member who acted as a liaison for all parties.

At the beginning of each semester, the pre-service teachers became acquainted with the technology. They learned to connect to the remote site, operate the remote controls for the cameras both at the Purdue site and the school site, and develop mechanisms to facilitate communication. The pre-service teachers practiced with the equipment by splitting into two groups and video conferencing between two local classrooms. The university students received a checklist of procedures to follow prior to connecting and while connecting for reference.

Prior to beginning the actual video conferencing field experiences, the university class made a site visit to the participating school. During this trip, the pre-service teachers spent the day touring the school; meeting staff, teachers and students; and interacting with the students in the grade three class involved in the project. During the visit, the pre-service teachers used guiding questions in order to do a mini-ethnographic project aimed at uncovering their assumptions of the school and students. This visit allowed the pre-service teachers to gain first-hand knowledge of the school and the students, which we believe helped to overcome some of the impersonal nature of remote connection.

Following the site visit, the virtual field experiences began and continued weekly through the remainder of the semester. (This pilot project has been repeated during five consecutive semesters.) Initially, pre-service teachers spent time observing the classroom and getting oriented to classroom activities. During one semester, the first session was spent on introductions. Students in the grade three class and pre-service teachers brought in baby pictures and made riddles about "Who am I?" Pre-service teachers prepared Powerpoint presentations of their riddles to share. Some riddles were done in English and some in Spanish for the bilingual classroom.

A typical interactive session began with the classroom teacher teaching a lesson. Pre-service teachers then took turns, individually or in small groups, directly teaching mini-lessons to the students. These activities reinforced what the teacher was teaching in the class or enriched the curriculum. Over the life of this pilot project, pre-service teachers have had the opportunity to engage in a variety of activities, including teaching lessons on equal and unequal fractions using everyday objects, colorful graphs, and diagrams and charts; reading stories and providing follow up questions; researching information about Benjamin Franklin and presenting it to students in the form of a skit; and communicating with the students in both English and Spanish. One session was devoted to discussing the World Trade Center disaster. Purdue pre-service teachers and the grade three students wrote memoirs about where they were on 9/11 as part of a process writing activity. The teacher provided links on her website that the pre-service teachers used to see how to discuss sensitive topics with young students.

Informal observations of the project to date suggest that it has had benefits. In each semester, the pre-service teachers quickly adjusted to the technology and learned how to manipulate the equipment. They readily followed the guidelines of the classroom teacher and the faculty member; however, most groups were not adventurous in exploring the capabilities of the technology to work with the students in the classroom. Journal entries indicated that they began to see technology as a tool that could be used for teaching and their own and others' learning, personal productivity, and communication. Significantly, one benefit seems to be the development of pre-service teachers' classroom observation skills. These beginning teacher education majors come into the course as unskilled observers, but through the guidance of a faculty member who observes alongside them via the video conferencing, they become better observers themselves. In addition, the shared observational experience leads to opportunities for richer class discussions.

The pre-service teachers understanding of diversity issues and how to teach children unlike themselves have apparently also grown as a result of the project. Diversity occurs is in every interaction, although often subtly and in ways students may not expect. Many pre-service teachers thought the classroom teacher would teach "differently" because she had diverse students. They also expected badly behaved students and indicated surprise at the well-maintained school and the well-behaved students. In interactions with the teacher and students and in interviews with the teacher, they learned that the teacher has high expectations, does not water down the curriculum, teaches in an integrated style, and builds on the students' prior experiences. They have also learned a great deal about teaching, including how to teach in a bilingual setting and how to teach at a distance.

On an end-of-semester survey during one semester, 15 pre-service teachers rated the overall video conferencing experience good, 4 were undecided, and 1 rated it poor. No one rated it either very good or very poor. The pre-service teachers saw advantages in the ability to connect to a diverse classroom site and learn about technology and distance education. Limitations included the lack of person-to-person interactions and technical issues such as connectivity difficulties, audio and video problems, and the time delay in verbal exchanges caused by the distance.

The teacher in the participating classroom indicated some reservations about feeling as though she was on display and that the students "went a little wild" after the Purdue class signed off. On the positive side she felt her students benefited from contact with Purdue students, enjoyed the activities, and readily spent time preparing for the activities. She felt that involvement in the project has kept her own thinking fresh, and she is using her participation in this project as part of what she will compile for National Board certification. Her students have indicated a range of feelings, most of them positive. While some of the K-12 students have reported feeling nervous, they like the attention and feel like the Purdue students are friends. Overall, these preliminary results are encouraging.

A second pilot project involving remote field experiences was developed as a part of a course, Production of Instructional Materials, open to both undergraduate and graduate students. A faculty member (one of the authors) launched this pilot project in cooperation with the P3T3 project to provide the university students with a genuine context and audience for the design, development, and implementation of instructional materials. Teams of university students created instructional materials for a K-12 audience. By linking with a K-12 classroom, an authentic context was created for university students needing to develop instructional design skills, and the K-12 students benefited by receiving custom-designed instruction. In addition, an apprenticeship model was employed as part of the project whereby advanced graduate students mentored the teams of university students, acting as project managers, during the instructional design process.

Three different experiences were implemented during different semesters. In each case, the key project goals were to: (a) develop and implement web-based learning materials for K-12 learners, (b) develop and implement video conferencing distance learning activities with students at a remote site; and (c) through these activities, provide university students with the opportunity to enhance their skills in the design, development, and implementation of instructional materials. Video conferencing was used to a lesser extent than in the first pilot project, described above, but it played a key role in the project. Various forms of evaluation, including observations, student reflections, peer assessments, and instructor assessments were employed during the projects.

In the first semester of this pilot project, a small group of university students created a web-based virtual field trip for a class of second grade students at a rural partner school who were planning to visit a children's museum in the state. The virtual field trip was specifically designed as an online learning activity with both asynchronous and synchronous components. The main aims of the virtual field trip were to expose students to information prior to the actual field trip to the museum, help students get excited about going to the museum, increase student participation at the remote site by helping them obtain information about the predetermined trip, and set the educational tone and expectations prior to the museum visit. To accomplish these goals the virtual field trip was designed to help students obtain information online, assimilate the information, and communicate their understanding to peers, university students, and teachers.

Video conferencing was used for both planning and part of the implementation of the lesson built around the virtual field trip. The university instructor and team of student developers used video conferencing on two different occasions to connect to the participating classroom teacher to collaboratively plan the virtual field trip and associated instructional activities. Then, video conferencing was employed for the university students to observe as the teacher implemented initial instructional activities with the second graders in the classroom. As a culminating activity, the team of university students used the video conferencing to remotely lead a final classroom activity involving the web-based instructional materials. Overall, the development and implementation activities spanned about ten weeks of class time, although only two hour-long video conferencing sessions were involved in the implementation phase of the project.

The next semester, university students engaged in small group to small group interaction with a group of fifth grade students. During this semester, the team of university students developed a stock market investment project based on specific programmatic themes outlined by the cooperating in-service teacher. Adapting the approaches of the first semester, four lessons were created, one web-based and three via live video conferencing. A key strategy implemented during this second iteration of the pilot project was the use of application sharing during video conferencing using Polycom ViaVideo units. This capability allowed the university students to share an application (Microsoft Excel) remotely and work with the K-12 students to co-construct a spreadsheet as part of the lesson. The purpose of the application sharing was to promote a higher level of interaction between university and K-12 students during the lesson.

The third semester of this pilot project continued the use of application sharing as one part of a comprehensive lesson developed for a fifth grade class at a partner elementary school in an urban center in the state. This time, the team of university students directed by an advanced graduate student developed a lesson involving both web-based instructional materials and synchronous video conferencing sessions built around a popular engineering contest founded at the university called the Rube Goldberg Machine Contest. Rube Goldberg was well-known cartoonist who drew cartoons of absurdly complex machines that took many complicated steps to perform a simple end result. In the early 1980s, students at Purdue University began the contest that paid homage to the cartoonist by requiring teams of engineering students to construct elaborate machines that required many steps to perform a simple task such as sharpening a pencil or screwing in a light bulb.

The university team developed a website to provide background information for the fifth graders about Rube Goldberg, metric measurement, and simple machine concepts. Video conferencing sessions were used to introduce students to the lesson concepts building toward the culminating activity of the lesson, a Rube Goldberg machine building contest for the fifth graders. Application sharing with the ViaVideo unit was used during one of the video conferencing sessions to help students understand simple machine concepts. Sharing a photo of a simple machine, such as a pair of scissors, students were able to manipulate images in a Microsoft Word document to demonstrate that they understood concepts of force, the location of the fulcrum of a lever, and so forth.

During the final session of the lesson, teams of fifth grade students, who had constructed their own Rube Goldberg machines to raise a small American flag in multiple steps, demonstrated their machines in front of the video conferencing unit. The team of university students observed the activity at a distance and served as the judges of the contest. Thus, the university students were able to gain experience in the creation of authentic instruction from planning to design to development to implementation and finally evaluation. At the same time, the fifth grade students benefited from an engaging lesson that involved important mathematics and science concepts and interactions with a genuine audience consisting of college students. It was in many senses a win-win activity.

These three iterations of this pilot project involved a number of important instructional attributes. The university students' learning was situated in real context that allowed them to develop important instructional design skills. The instructor and advanced graduate student modeled the instructional design process for the novice designers and coached them as needed. Under this guidance, the university students were able develop their own expertise, gradually assuming increasing responsibility for the instructional outcomes. The video conferencing played a key role in the process, both as a vehicle for planning with the cooperating teacher and as a delivery system for the lesson that resulted. It also stretched the university students by requiring them to plan and implement a lesson using what for most of them was an unfamiliar instructional environment.

A formative evaluation that included interviews and surveys from the university students indicated that on the whole the experience was beneficial. They felt that the remote field experience was instructionally valuable, showed a real-life application, increased their technology confidence, generated satisfaction, better prepared them for teaching in the future, and engendered a desire to continue using technology for teaching. Challenges included the difficulties of jointly planning an instructional unit with a cooperating teacher at a distance, the constraints of a semester schedule, and students' lack of comfort with this approach and the ambiguities that resulted. There were occasional problems with the technology such as difficulties in establishing good connections and the limitations of ViaVideo unit as a video conferencing tool with small groups when it was designed mainly to be a person-to-person video conferencing tool. Overall, the remote field experience was judged a reasonable success, and both university students and the K-12 students enjoyed their involvement in the experience.

Strengths and Limitations of the Distance Learning Technology

When working with any new medium of communication, there are inevitable difficulties and a period of acclimatization. The first step in each of these pilot projects was simply to get the technology working on both ends. For IP-based video conferencing, a significant initial barrier is school Internet firewalls. Because of information security concerns, most schools are protected by an Internet firewall. While keeping people out of the internal network, a firewall can be configured to allow selected outside connections. When trying to set up this access, we ran into difficulties in both of these projects. These problems were resolved, but not without a fair amount of time and the help of several technicians. Once established, the IP-based connections worked fairly well most of the time.

Once the equipment was working, the participants had to spend time learning to use the system to communicate. This process was not difficult, but it was critical to the success of each project. The university students needed to practice using the system to help them get a feel for the communication abilities, and the K-12 teachers and students also needed to practice with the system to develop a level of comfort and fluency with the technology to facilitate routine communication. We found that it helped to develop conventions to facilitate communication, such as having name signs and using signals to denote when students at the remote site were supposed to do something.

In both of these pilot projects, pre-service teachers learned to see technology as a tool that enabled them to communicate across distance, and with students they may have had little experience of in the past. Exposure to the classrooms in East Chicago and our other partner sites seemed to open their minds to new possibilities. As a result, class discussions were rich and varied. In addition pre-service teachers learned to work together in groups and in partnership with a faculty member and classroom teacher.

The main issue was that the pre-service teachers were not in a "real" classroom with "real" students. Some students, at least initially, felt a loss at this mode of interaction. Sustained interaction for a lengthy period, such as the two hours originally planned for the video conferencing with the diverse classroom in East Chicago, proved to be difficult for the pre-service teachers. So, that experience was restructured into shorter time blocks involving an initial discussion, observations, and then debriefing. In the other pilot project, students were somewhat uncomfortable with the open-ended nature of the process and the difficulty of communicating with a teacher at a remote site. Structure is needed to help pre-service education students benefit from this experience, but it is important to remain flexible and willing to adapt.

The technology is good, but students in the pilot projects have noted limitations. IP-based video conferencing connections are susceptible to problems as a result of limited bandwidth or network congestion. Sometimes the Internet-based video conferencing connection is "choppy." When Internet packets are "dropped" as a result of network traffic, this can result in the video freezing and the audio breaking up. Even when working perfectly, the picture on the screen, while not bad, could be clearer. Effective observation often means noting subtle facial expressions and body gestures not easily discerned by viewing a video monitor. The ViaVideo unit, which is really designed for personal video conferencing, can be used with small groups, but the results are not optimal; without panning and zooming capability, the video is limited.

Audio is as important as or more important than the video. While the teacher's voice comes through clearly most of the time, the children's voices are less clear. Furthermore, background room noise can create interference. While we have found that having the teacher work with the students to speak more loudly and clearly, audio quality is generally a problem that we have not fully resolved..

Considering all factors, as a part of a teacher education program, which has at its core emphases on early and continued field experiences, on developing technological skills, and on understanding diverse learners, these virtual field experiences seem to be a worthwhile way to expose pre-service teachers to experiences they might not otherwise get. Distance education technologies seem to offer significant promise for expanding the options for linking students in teacher preparation programs with K-12 teachers and students.

References

Abel, F. P. (1960). *Use of closed circuit television in teacher education: Relationship to achievement and subject matter understanding*. Minneapolis, MN: University of Minnesota. (ERIC Document Reproduction Service No. ED 020 473)

Carnegie Forum on Education and the Economy Task Force on Teaching as a Profession. (1986). *A nation prepared: Teacher for the 21st century. The report of the Task Force on Teaching as a Profession*. New York: Carnegie Corporation.

Glazer, N. (1997). *We are all multiculturalists now*. Cambridge, MA: Harvard University Press.

Goodlad, J. I. (1990). *Teachers for our nation's schools*. San Francisco: Josey-Bass.

Holmes Group. (1986). *Tomorrow's teachers: A report of the Holmes Group*. East Lansing, MI: The Holmes Group.

Hoy, M. P. & Merkley, D. J. (1989). *Teachers on television: Observing teachers and students in diverse classroom settings through the technology of television*. Ames, IA: Iowa State University. (ERIC Document Reproduction Service No. ED 319 711)

Moursand, D. & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age?* Research study by the International Society for Technology in Education, commissioned by the Milken Exchange on Educational Technology. Milken Exchange on Educational Technology. Available online: http://www.mff.org/pubs/ME154.pdf

National Commission on Teaching and America's Future. (1996). *What matters most: Teaching for America's future*. New York: Author.

National Council for the Accreditation of Teacher Education. (2001). *Professional standards for the accreditation of schools, colleges, and departments of education*. Washington, DC: Author.

Yao, F. (1999). The barriers of diversity: Multicultural education and rural schools. *Multicultural Education, 7* (1), 1-7.

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Instituting an Institute: How ADDIE Helped Launch a Faculty Instructional Technology Summer Institute

Laurel Warren Trufant

University of New Hampshire

Michael Giordano

University of New Hampshire

Abstract

As instructional designers, we often fail to practice what we preach. Learn how the Academic Technology group at the University of New Hampshire applied the widely accepted ADDIE model (Analyze, Design, Develop, Implement, Evaluate) to the instructional challenge of developing and implementing the campus' first annual Faculty Instructional Technology Summer Institute (FITSI).

Background

The University of New Hampshire is a public land-, sea-, space-grant institution serving an undergraduate population of roughly 12,500 undergraduate and 2,500 graduate students. UNH offers 2,000 courses in more than 100 majors and supports a broad array of undergraduate, professional, research, and graduate programs. The University pursues a three-fold mission of teaching, research, and public service.

Computing and Information Services (CIS) at UNH provides infrastructure, training, and support for technology that sustains the academic mission of the University. Academic Technology, one of the five groups within CIS, fosters collaborative partnerships that advance the integration of technology in teaching and learning, and provides support and access to instructional technology resources for faculty, students, and researchers. The Academic Technology group addresses the needs of over 700 full-time and adjunct faculty, a constituency that spans the technology-skill spectrum---from highly technical early adopters, to faculty reluctant to embrace technology in teaching.

In September 1999, UNH implemented Blackboard's course management system, giving many faculty on campus their first experience using technology as an integral part of traditional classroom teaching. Over the next two years, we sought ways to support this effort, and to develop and integrate other academic technology services. At the end of two years, over 50% of our full-time faculty were teaching more than 450 Web-enhanced courses to a student enrollment in excess of 22,000, but few had moved forward to embrace other instructional technologies. Our immediate challenge was to support Blackboard as a mission-critical application. Our ultimate goal, however, was to encourage faculty to incorporate a broad range of instructional technology tools into their teaching, not just build Blackboard courses.

Our early experience with Blackboard convinced us that we needed a development model that would draw faculty into instructional technology theory and practice without a prohibitive investment of time. Analysis had shown us that:

- The simplification of tasks accomplished through a course management interface clearly opens doors, raises awareness, and encourages preliminary exploration of the possibilities of instructional technology. It is not sufficient, however, to encourage faculty to explore other instructional technologies proactively. The sheer simplicity of the interface ironically preempts inquiry into other ways to use technology to enhance the traditional classroom.
- For those who did look past Blackboard to other instructional technologies, the primary inhibitor was not skills or risk, but time -- time to explore the theory, time to acquire the skills, and time to implement the practice.

Thus we found that, although Blackboard was opening doors to the possibilities of instructional technology, in most cases those doors weren't leading anywhere.

This realization helped us define a new development model that would move beyond problem-oriented support and application-based training, to a team-oriented design-and-development approach that would draw faculty more deeply into instructional technology theory and practice without a prohibitive investment of time. Our new model would:

- Encourage faculty to explore the broad possibilities of instructional technology;
- Promote an awareness of instructional design theory and instructional technology tools;
- Allow faculty to concentrate on pedagogical issues and content;
- Provide skill-based design-and-development support;
- Reduce the need for large investments of faculty time.

In March 2001, in collaboration with the University Library, the Academic Technology group hosted a small, half-day symposium entitled "Meeting Instructional Challenges with Technology." Open to faculty at large, the event was well attended and well received. The success of this modest effort suggested a faculty constituency interested in similar, but more substantive, events. Our initial research and discussions resulted in a proposal for a five-day, intensive Faculty Instructional Technology Summer Institute (FITSI) designed to address the needs of faculty who had taken their first tentative steps toward a creative and robust use of technology in teaching, and who were now ready to move to the next level. We sought and received funding from a number of sources, and the Institute took place during the first week of June 2002 on the UNH campus.

The FITSI Model

Our immediate objective in planning the Institute was to raise faculty awareness of instructional technology tools and relate the use of those tools to specific teaching and learning objectives. Our broader goal, however, was to foster a campus environment that would encourage but not coerce, engage but not intimidate, support but not direct faculty in the acquisition of instructional technology skills. Ideally, we wanted the Institute to become a regular feature of faculty development at UNH.

Feedback from faculty who participated in "Meeting Instructional Challenges with Technology" indicated that, to be successful, a more extended Institute model would have to:

- Provide incentives for faculty to explore the broad possibilities of instructional technology;
- Promote an awareness and appreciation of the relevance and impact of instructional technology and instructional design theory;
- Allow faculty to concentrate on pedagogical issues and content without having to invest an inordinate amount of time dealing with technology;
- Motivate faculty who were successful implementing instructional technology to carry the message out to their colleagues;
- Include an evaluation strategy to confirm the impact of instructional technology theory and practice on the teaching and learning process.

We determined that our inaugural Institute would address the pedagogical principles that support the successful integration of technology into teaching and learning, rather than the details of the technologies themselves.

We decided to ground the program in the widely acclaimed research of Chickering and Gamson detailing the "Seven Principles for Good Practice in Undergraduate Education" and Chickering and Erhmann's subsequent work, "Implementing the Seven Principles: Technology as Lever," which further developed Chickering's theory by applying the seven principles to the field of instructional technology. In the process, we focused on the three most common barriers that prevent faculty from successfully integrating technology into their teaching:

- Lack of familiarity with best practices, knowledge, and research on the appropriate uses of technology in the classroom;
- Lack of technical skills, especially the design and production of digital materials for direct use in the classroom;
- Lack of resources and time to analyze, design, develop, implement, and evaluate instructional technology projects.

We began our planning process with a survey of the literature and an examination of viable models at other institutions. As our own model began to take shape, it became apparent that, if we were to achieve the goals we had set forth, we would need a broad range of resources, the cooperation and support of a wide variety of people and groups on campus, and, above all, a clear plan to follow. We decided to apply the widely recognized ADDIE model of instructional design to our own instructional challenge.

The ADDIE Model

The ADDIE model supports a systematic approach to analyzing and meeting instructional needs. ADDIE, an acronym for Analyze, Design, Develop, Implement, and Evaluate, facilitates a series of steps that guide instructional designers in the planning and development of instructional projects. Each step defines activities, identifies relevant data, and answer questions crucial to the successful implementation of the project. For example, the analysis phase provides information about learner characteristics and environmental factors or limitations. Although commonly applied to instructional or training challenges, we relied on ADDIE as a useful anchor to help the Institute planning team define objectives and follow a shared set of principles and procedures as they worked toward a common goal.

Analyze

No amount of planning or effort can compensate for a lack of acknowledgment by faculty that technology has something to offer them, or a clear demonstration from faculty support groups that the benefits of technology are accessible. Hence, our own planning process began with an examination of best practices, a careful assessment of current services, an inventory of available resources, and a detailed analysis of our audience.

We turned first to the difficult task of obtaining participation and buy-in from outside Academic Technology. Our experience disclosed the following imperatives:

- *Seek support from the principal administrator* with responsibility for those developing and implementing the event. Since Academic Technology is a part of Computing and Information Services, we sought and gained sponsorship from the Asst. Vice President for Computing and Information Services.
- *Involve other campus organizations and groups* that share a common mission. In our case, we reached out to the Library and the Teaching Excellence program. Both groups participated actively in the planning and implementation of the Institute.
- *Enlist help wherever you find it.* At UNH, each college and school has at least one Academic Technology Liaison (ATL) who manages the information technology needs of the faculty and staff. We invited the ATLs to join in the planning and implementation of the Institute.
- *Promote interest among Deans and department Chairs.* The endorsement of Deans and Chairs lent weight and credibility to our effort. This is especially important for first initiatives. It is also useful to enlist the support of CIOs, Provosts, and other senior administrators who can tie your efforts to the overall mission of the institution.
- *Beg, borrow, or steal all the funding you can,* from whatever sources you can find. Most important – secure commitments for this funding early, so that your planning does not outstrip your resources. Our Institute was underwritten by a variety of sources: the Academic Technology group, Computing and Information Services, a campus fund called the Faculty Instructional Technology Development Grant, and even some Deans who strongly supported our effort.
- *Inform and involve mid-level managers and staff.* Their contributions are crucial to the success of the initiative. Our AT professional staff researched topics and technologies, developed and delivered hands-on workshops, produced documentation and Institute materials, and generally assisted in all aspects of logistics and implementation for the Institute. This is time-intensive and requires attention to detail, but without these supporting efforts, all your planning may be for naught.

Once we had commitments of support from as many quarters as possible, we were ready to determine how far that support could carry us. The next step was to analyze our audience. A careful scrutiny of our constituency revealed these significant facts:

- Our faculty -- despite prevailing wisdom to the contrary -- are risk-takers. Our training population did not consist entirely of early adopters, but shaded rather heavily over into early- and even late-majority users.

- Contrary to our initial instinct, an elaborate training model can, in itself, be intimidating. Faculty tend to extrapolate from the intensity of the training to the difficulty of the process -- "If it really requires that much training, it's too complicated for me."
- Training is often perceived as an obstacle to participation rather than as an enabling experience. Lengthy training, in fact, discourages faculty and acts as a disincentive to explore new ideas.
- Faculty identify the support they receive *after* training as the key to success. They are willing to experiment, stumble, innovate, and even fail, if they know there will be someone available to address their immediate concerns and ensure that their content is delivered intact.

The combined results of our review of the literature, our survey of available resources, and our analysis of our constituency ultimately led us to define six clear design objectives. A successful Institute would:

- Provide incentives for faculty to explore instructional technology;
- Promote an awareness and appreciation of theory as well as practice;
- Allow faculty to concentrate on pedagogy and content;
- Follow-up on Institute topics and provide ongoing encouragement and support;
- Motivate faculty to share their experiences with their colleagues;
- Evaluate the effectiveness of the model and confirm its impact.

Design

Our research had shown us that the most successful faculty development models shared one trait – they subordinated technology to a clear emphasis on pedagogy. We thus self-consciously focused on the pedagogical principles that support the successful integration of technology into teaching and learning, rather than the details of the technologies themselves. We structured the Institute to combine nationally recognized keynote speakers, presentations by experts in the field of instructional technology, videoconferencing, and a variety of hands-on workshops targeted on specific instructional technology skills and specific pedagogical concerns. Participants were chosen through a rigorous application process to identify those candidates best equipped to carry the Institute's message back to their home departments and colleges. We initially planned to accept two faculty members from each of the five colleges at UNH. In the end, however, support from college Deans was so strong that they came forward with funds to support additional participants.

A common adage among training professionals claims that "If you feed them, they will come." While this is generally true, we felt that faculty would need to be "nourished" by more than a few free lunches to commit themselves to five eight-hour days of intensive, total-immersion training. The most successful models we examined in our design phase all offered useful and substantive incentives to participants.

As incentives, we considered stipends, student support, PDAs, and laptop computers. In the end, we offered faculty the choice of a Dell or Macintosh laptop, fully equipped with Microsoft Office applications and a carrying case. The laptop was explicitly offered as the personal property of participants, to be used for professional or personal purposes, as they saw fit. Although clearly the laptop computer provided a strong incentive for most faculty who attended the Institute, it was gratifying to see that most focused on how they could use the laptop in their teaching and research. One or two even commented that they would use the laptop as a departmental resource, giving other colleagues access to it. This clearly supported our goal of disseminating information about technology and instructional design principles to the widest possible audience.

In return for this support, Institute faculty agreed to participate in three follow-up activities during the upcoming academic year:

- Work with Academic Technology and their college and departmental colleagues to promote the use of instructional technology;
- Assist in conducting a college-wide needs assessment to provide quantitative data for Academic Technology and also serve as a planning instrument for the next year's Institute;
- Communicate their experiences at three Faculty Instructional Technology Summer Institute meetings or events held during the subsequent academic year.

Develop

With our design objectives firmly in hand, we began to organize our resources and target them on specific aspects of the Institute model. Our design clearly called for a collaborative effort. We convened a development committee that represented all sectors of our Academic Technology group and representatives of the Teaching Excellence program and the University Library. This gave us access to videographers, photographers, instructional designers, trainers, and systems and faculty support personnel, as well as a crucial faculty and research perspective. This committee drew the outlines of a week-long program, considered incentives, addressed costs, identified resources, sought funding, and developed an agenda that included keynote speakers, videoconference presentations, and a series of hands-on workshops. A key focus of the development process was to address all six objectives identified in the design phase (incentives, awareness, pedagogy, follow-up, sharing, evaluation).

We self-consciously set out to address the three primary inhibitors to technology integration identified in our analysis phase.

- The first barrier, lack of familiarity with best practices, we addressed through presentations by two of the leading experts in the field. Both delivered four-hour presentations on the first day of the program to establish the foundation of theory and research upon which the Institute built. The presentations helped guide faculty as they began to build a "toolkit" of best practices (including the ADDIE model) and techniques to apply to instructional challenges throughout the week.
- The second barrier, lack of technical skills, was addressed by a series of hands-on, interactive workshops that built on the materials presented the first day. These focused on putting the teaching/learning theories explored on the first day of the program in context, showed faculty how to integrate instructional technologies successfully into their curriculum, and encouraged discussion of how these technologies can enhance learning outcomes.
- The third, and perhaps most resistant, barrier for faculty is the lack of time and resources. We addressed this barrier by showcasing the wide range of resources and services available to UNH faculty through the Academic Technology group. We demonstrated how these resources could be matched to specific instructional challenges, making it possible for faculty to think creatively about the use of technology in the classroom without a prohibitive investment of time.

To maintain the emphasis on pedagogy, we bracketed our practical, hands-on workshops between presentations by nationally recognized experts in the theory and principles of active learning and the systematic design of instruction, regardless of whether that instruction was technology-based. Mid-week, we engaged two additional guest speakers, thus modeling tele- and videoconferencing, and Internet II technology. We concluded the week with a guest speaker who provided a retro- and pro-spective look at where instructional technology has been and where it may take us.

Interspersed throughout the week were twelve hands-on workshops on topics that supported the principles and concepts discussed on the first day:

- An Overview of On-line Communication Tools*
- An Overview of Academic Technology Support Services*
- Adapting Course Materials for a Digital Environment
- The Visual Display of Information
- Using Technology to Create Collaborative Workspaces
- Using Internet Resources: Fool’s Gold or 24-karat?
- Technologies that Support Active Learning*
- Managing On-line Discussion*
- Using Threaded Discussion to Encourage Critical Thinking
- Opening New Channels for Feedback Using Technology
- Assigning and Evaluating a Video Project
- Creating and Using Images in Your Classroom

Four of these were designated “core” sessions (*) that all participants attended; the remaining eight were developed as “breakout” sessions from which faculty chose. In addition, all participants engaged in a panel discussion led by faculty currently using technology in their teaching.

Workshop developers were required to meet five criteria:

- Communicate clear objectives and identify which of the seven principles was addressed;
- Provide a firm grounding in theory and research, including a bibliography of key sources;
- Provide sufficient documentation so that faculty who did not attend the session could learn from it;
- Provide hands-on activities that would allow faculty to experiment with the target technology;
- Provide a PowerPoint presentation for the Institute Web site (http://at.unh.edu/fitsi/2002).

Evaluations from the Institute indicate that the decision to subordinate technology to teaching was crucial to the success of the week.

Our stated intention from the inception of our Institute plan was to establish an event that could act as a springboard for future faculty development programming and events. Following up with participants was thus an essential part of our overall plan. To ensure that the Institute would indeed have a long-term impact, we built five follow-up mechanisms into the initial design.

- A "reunion" scheduled for later in the summer at which participants would help us lay the groundwork for future instructional technology efforts;
- The "shadowing" of one or two participants by Video Services to track their ongoing development and document how they implemented the techniques learned at the Institute;
- An event scheduled for late in the fall at which we would communicate our plans for a college-wide instructional technology needs assessment;
- Involvement of all participants in this needs assessment, including distributing the instrument, communicating its objectives to their colleagues, and helping us to collect and analyze the data;
- A spring event at which participants would share their experiences with colleagues and welcome participants for the next Institute.

Another design objective was to ensure that Institute faculty helped spread the word, not only about their own experiences at the Institute, but about the impact that instructional technology has had on their teaching. To this end, we encouraged feedback, acted on suggestions, and solicited ideas for future programming.

Implement

The pool of expertise and talents available to us through Academic Technology professional staff was considerable. The key to successful implementation was to keep everyone's eyes on the prize, to keep the Institute targeted on the six design objectives, and to keep the development and implementation process moving forward at the necessary pace. To coordinate the efforts of this diverse group, we established four committees:

- *Logistics:* Identified and secured appropriate facilities and technical support for Institute events;
- *Presentations:* Solicited abstracts for workshops and presentations, and ensured that Institute events addressed both the pedagogy and technology;
- *Materials:* Designed and developed templates for all supporting materials and produced a comprehensive annotated bibliography for all workshops and sessions;
- *Advertising:* Wrote press releases for on- and off-campus publications and developed the Institute Web site.

These four committees worked together to move the planning and implementation process forward on schedule. A key directive was to coordinate all committee efforts toward the production of consistent, targeted, high-quality documentation for the Institute that would stand alone as a resource for faculty who did not attend. The net result was a high-profile professional presence that lent weight and credibility to all Institute events.

In retrospect, we identified four key imperatives for the implementation phase:

- Carefully cultivate an atmosphere of participation and ownership for all concerned;
- Establish deadlines and adhere to them;
- Clearly articulate all objectives;
- Assign responsibilities for key tasks and hold people accountable.

Evaluate

Our desire to establish the Institute as a permanent part of the faculty development landscape at UNH made careful review and evaluation of our initial efforts crucial. Moreover, the successful models and programs we had examined all included a comprehensive evaluation plan as an integral part of their design.

We gathered attitudinal survey information on-site for each of the twelve hands-on workshops. The instrument consisted of twelve statements, accompanied by a Likerd scale, phrased to elicit to what degree faculty agreed with positive statements about the workshops. We also encouraged discursive comments from faculty, including what they liked best and least about the workshop.

The statements were grouped under two main categories:

- Overall impressions of the workshop:
    - The workshop was well organized and easy to follow;
    - Objectives for the workshop were clearly communicated;
    - It was clear which of the seven principles the workshop addressed;
    - There was enough opportunity to interact with the presenter;
    - The workshop was about the right length;
    - The presenter was knowledgeable and presented the material clearly;
    - Overall, this was a good workshop.
- Workshop content, materials, and hand-outs:
    - The hand-outs were well organized and easy to understand;
    - The material presented met my expectations;
    - The information provided will be useful to me;
    - The hands-on exercises were clear and worthwhile;
    - There was a good mix of presentation and hands-on activities.

To our surprise, faculty took the time to be thoughtful and reflective on these level-one evaluation sheets, and our response rate approached 90%.

In addition to individual workshop evaluations, we administered an overall evaluation on the last day of the Institute that gave participants an opportunity to rate the effectiveness of each Institute event or session, including keynote and guest speaker presentations. We felt that, although this was somewhat redundant in the case of the workshops, it gave participants an opportunity to review their impressions in retrospect and from the distance of at least a day or two. We also gave them an opportunity to evaluate the logistics of the Institute, including venues, food, comfort, and overall atmosphere (see Table 1).

Table 1. Institute Evaluation Summary

Category	**Rating**
Appropriateness of meeting rooms and sizes	12-Excellent; 4-Above Avg
Overall atmosphere	16-Excellent
Lunch and refreshments	12-Excellent; 3-Above Avg; 2-Avg
Number of events and activities (please indicate if it was too much or not enough)	12-Excellent; 4-Above Avg
Overall quality of the Institute	14-Excellent; 2-Above Avg

Scale: Excellent, Above Avg, Avg, Below Avg, Poor; Responses: 16 out of 18

In the two weeks immediately following the Institute, each committee convened to debrief their experiences. Minutes from each of these meetings were summarized and presented to the original planning committee. Suggestions and comments from faculty, as well as from Academic Technology professional and administrative staff, were examined. From this information, we drew a list of decisions or procedures that we will consider changing, adding, or avoiding in planning for next year's Institute. Some representative items are:

- Move the Institute forward a week or two to avoid conflict with a Teaching Excellence program;
- Begin the application and review process 3 months earlier;
- Minimize the number of outside speakers and carefully vet their presentations;
- More actively involve the ATLs in the development and delivery of workshops;
- Devote more time to orienting faculty to their new laptops.

In addition to this structured evaluation, we also solicited more thoughtful feedback on the appropriateness of the specific objectives of the Institute through a follow-up survey and personal contact with participants beginning two weeks after the close of the Institute.

Outcomes

Thanks in large part to a systematic adherence to the ADDIE model, our first Institute was an overwhelming success. Planning is already underway for FITSI 2003. Interest and enthusiasm among faculty, department Chairs, Deans, and senior administrators is high. Academic Technology professional staff are already gearing up for the effort. Our short-term objectives have thus been met.

In the larger scheme of things, we hope the Institute will engage a growing number of faculty in the theory and practice of instructional technology. In order to facilitate dialogue about instructional technology for a campus-wide audience, we will adopt an holistic approach to faculty development, one that takes into account the primacy of pedagogic concerns, the expressed needs of the faculty, and the collective knowledge and experience of our instructional technology professionals. Doubtless we will analyze, design, develop, implement, and evaluate a number of different strategies. Sometimes we will fail; sometimes we will succeed.

Some of the projects we are currently developing include:

- An Educational Technology Assistant Program (*e*TAP) that will bring student assistants, AT professionals, and faculty together to form instructional technology teams to plan, develop, and implement course redesign through the use of instructional technology tools and techniques;
- An Instructional Technology Fellowship that will provide incentives for interested faculty to collaborate with AT professional staff to design and implement faculty development initiatives that relate new technologies to specific instructional objectives;
- A regular program of informal workshops and seminars that present and discuss “best practices” to guide faculty as they begin to think about a more robust use of technology;
- A Transforming Teaching through Technology (T^3) award that will recognize exemplary efforts by individual faculty to use innovative technologies to improve their teaching.

We will doubtless rely on the ADDIE model as we proceed with these initiatives.

Our immediate objective will be to minimize the barriers that faculty encounter as they begin to integrate technology into their teaching. Our long-term objective will be to help faculty gain a deeper understanding of their own technology needs. Ultimately, we seek to foster a campus environment of development and growth that will underwrite the instructional technology vision we have for the campus.

References

Butler, D and M. Sellborn. “Barriers to Adopting Technology for Teaching and Learning,” *Educause Quarterly 2002*, vol. 25, no. 2, 22-28.

Chickering, Arthur and Zelda Gamson. “Seven Principles for Good Practice in Undergraduate Education,” *AAHE Bulletin,* March 1987, 3-7.

Chickering, Arthur and Stephen Erhmann. “Implementing the Seven Principles: Technology as Lever,” *AAHE Bulletin,* October 1996, 3-6.

Emerson, John D. and F. Mosteller. “Development Programs for College Faculty: Preparing for the Twenty-first Century,” *Educational Media and Technology Yearbook 2000,* vol. 25, 26-42.

Gillespie, Kay Herr. “Using Technology in Faculty Development: Practical Examples,” *New Directions for Teaching and Learning*, Winter 1998, no. 76, 79-92.

Hershfield, Allan F. “Education’s Technological Revolution: An Event in Search of Leaders,” *Change*, November-December 1980, vol. 12, no. 8, 48-52.

Kaminski, Karen. “Infusing Technology into the Classroom: A Comparison of Three Faculty Development Workshops,” *Tech Trends*, April 2000, vol. 44, no. 3, 38-39.

Privateer, Paul Michael. “Academic Technology and the Future of Higher Education: Strategic Paths Taken and Not Taken,” *Journal of Higher Education*, January-February 1999, vol. 70, no. 1, 60-70.

Rogers, E. M. *Diffusion of Innovations.* New York, NY: Free Press, 1962.
Rossett, Allison. *Training Needs Assessment*. Englewood Cliffs, NJ: Prentice Hall, 1987.

Using Case-Based Methods to Prepare Tomorrow's Teachers to Use Technology

Caroline Sanzone

Donna Ferguson Pabst

Erin K. Hunt

Leslie Bevill

Dennis Charsky

Manisha Javeri

Pei-Lin Liu

Edward Caffarella

University of Northern Colorado

Abstract

In response to school-needs, state-requirements, and a PT3 grant from the Department of Education, the University of Northern Colorado is redesigning the two requisite educational technology courses for the undergraduate teacher preparation programs. The first course redesign has been implemented; the program's one-credit 200-level course is currently equipping UNC teacher candidates with basic computer and software skills. The second requisite course, the 300-level, has been redesigned, developed, and is now in the first stage of implementation. The first part of the course instructs teacher candidates in the concepts of technology integration. Then, to make those concepts more meaningful and transferable, the course immerses students in a case-based learning unit. This paper describes the unit's problem scenarios. It also details the electronic environment and graphical user interface in which the scenarios and the information necessary for problem solving are presented.

Introduction

In 2000, UNC was awarded a Preparing Tomorrow's Teachers to use Technology (PT3) grant. A major initiative of the grant is to redesign the educational technology undergraduate courses so that UNC's School for the Study of Teaching and Teacher Education (STTE) is better able to prepare students to meet the new standards for using technology in instruction. The first year of the grant, the university's PT3 team made up of the Project Director, Project Manager, and seven doctoral students from the department of Educational Technology (ET), redesigned the 200-level courses, Technology in Education, (i.e., the first educational technology course students take). The PT3 team crafted these courses to give students the technology tools they will need for superior performance throughout their university careers, for successful synthesis of technology integration theories with other learning theory, and, ultimately, for effective classroom instruction. The courses' curricula vary for elementary, middle grades, and secondary preservice teachers. Currently, UNC's undergraduate Preservice Teacher Education Program (PTEP) requires students to take two educational technology courses, with each course being worth only one credit. The preservice teachers generally take the first course (Technology in Education – 200-level) at the beginning of their teacher preparation and the second course (Educational Technology Applications – 300-level) just before their student teaching experiences.

The 200-level curriculum includes introductions to both MAC and PC operating systems and introduces students to a variety of software (Word, Excel, PowerPoint, HyperStudio, Inspiration, and Dreamweaver) as well as how these tools can be integrated into a classroom setting. The second requisite course (300-level) has also been recently redesigned to instruct preservice teachers in the theories of technology integration, classroom management, room design and software evaluation (Charsky, Ferguson-Pabst, Javeri, Liu, Sanzone, & Caffarella, 2003). Once this foundation is laid, the class then immerses the students in a case-based study where they must collect, analyze, process, and synthesize authentic information critical to solving the real-world problem.

A study by Persichitte, Tharp, and Caffarella (1999) found that while technology is readily available to teacher education programs, only 45% of the programs' faculty regularly use technology during class and only 40% of those programs require preservice teacher candidates to use technology to design and deliver instruction. Those statistics exist despite current standards for technology-use in education. Moursund & Bielefeldt (1999) suggest that until we will see reform in education programs, technology integration in K-12 schools will continue to lag behind. Further, research has shown that teacher preparation programs are not providing the type of training and modeling preservice teachers need in order to be proficient and comfortable integrating technology (ISTE). Moss (1988) reports that teacher education programs need to provide educational technology in order to better prepare prospective teacher.

In 1999 the Colorado legislature passed Senate Bill 99-154, which includes eight standards for teacher education candidates to meet. The seventh standard states, "The teacher is skilled in technology and is knowledgeable about using technology to support instruction and enhance student learning." However, a survey of the University of Northern Colorado's (UNC's) partner schools (i.e., local K-12 schools) found a high need for successful implementation of that standard. In fact, many schools rated teacher technology skills as their highest need. Clearly, professional and potential teachers across the educational occupation have not been equipped to meet the demand for trained teachers who can integrate technology throughout their instruction.

Case-Based Learning

Case-based learning environments generally incorporate components from several learning outcomes: simulations, Anchored Instruction (AI), Cognitive Apprenticeships (CA), and Problem-based learning (PBL). Simulations are defined as a series of sequenced activities which represent a social situation reduced to manageable proportions to serve a specific purpose. The Cognitive and Technology Group at Vanderbilt (CTGV, 1992) defines Anchored Instruction as an approach to help students become more actively engaged in learning. This type of activity is designed to cause thoughtful engagement that helps students, in a collaborative atmosphere, develop effective thinking skills and attitudes that support effective problem solving and critical thinking. A Cognitive Apprenticeship is defined as a methodology that provides a framework for students to be placed into authentic environments where they are asked to analyze content and develop appropriate strategies through social interaction in a way similar to that in real life craft apprenticeships (Brown, Collins, & Duguid, 1989; Casey, 1996; Brill, Kim, & Galloway, 2001). Levine (2001) defines problem-based learning as both a curriculum development and delivery system that allows students to develop problem solving skills while acquiring content knowledge and skills. Students take an active role in the learning process while acquiring knowledge in a problem solving, authentic environment (Jacobson & Spiro, 1995; Koschmann, 1995; Lajoie, 1993). Therefore, for the purpose of this project, the PT3 team chose to define case-based learning as a way to place students in an authentic environment where they are actively engaged in collaborative atmosphere thinking critically about creative ways to solve problems.

Constructivist environments, like those of case-based learning, work well when students confront contextualized, ill-structured problems and strive to find meaningful solutions. Learners in this type of learning environment need to develop cognitive flexibility in order to transfer their knowledge to other situations and varying problems (Spiro et al., 1992). Constructivist and especially case-based learning environments permit such development. A case-based learning environment immerses students in a rich problem solving environment where they can, given the appropriate information, make the connections necessary for understanding the importance of technology integration and how such integration might look in a variety of classroom settings.

The 300-level course, Educational Technology Applications, concentrate on preparing preservice teachers to integrate the tools learned in the 200-level class and other technology into instruction. The PT3 team wanted the 300-level courses to give preservice teachers a picture of how integration looks in K-12 classrooms and ways in which they can use technology integration to meet state standards and solve instructional problems. After determining the course objectives, the PT3 team split into sub-teams for designing and developing the different parts of this course.

The first half of the 300-level course provides theoretical information about such topics as instructional design, software evaluation, classroom management, and teaching strategies. Although assignments throughout the course require preservice teachers to apply the concepts they learn, the PT3 team felt that situating knowledge and application in a more authentic, problem-based environment would help the PTEP teachers better understand all that technology integration involves. Therefore, the team decided the second half of the 300-level course should be a case-based learning scenario that immerses preservice teachers in a rich environment of active learning (REALs).

As is characteristic of all REALs, the 300-level course's environment relies on authenticity as a student-motivator. The environment's authenticity also gives students the opportunity to organize concepts in such a way that they can transfer them to situations they may find in practice (Grabinger, 1996). The PT3 team talked with the university's teacher education professors and K-12 teachers to devise weekly scenarios enriched by reality-based electronic artifacts (e.g., email notes from the principal and other teachers, phone messages in the form of audio-files, to do lists, letters, streaming video). The team wanted the case-based learning unit's scenarios and materials to imitate, as closely as possible, typical experiences a first-year teacher might encounter.

The active learning problems set forth in the 300-level course specifically meet the criteria for case-based learning and instruction. Ertmer and Russel (1995) write, "Case based instruction is a teaching method which requires students to actively participate in real or hypothetical problem situations, reflecting the kind of experiences naturally encountered in the discipline under study." Students actively apply learned knowledge and skills to a problem situation. Ertmer describes these cases to be "ambiguous, messy, and recalcitrant." Such a problem lies at the heart of the 300-level REAL. In fact, students must first analyze a fictitious school's Colorado Student Assessment Program (CSAP) scores in order to define the case's problem. The unit's Web site (http://www.coe.unco.edu/ET34z/mnvc/) then offers the resources and information necessary for solving the problems. However, the 300-level course instructors also model ways in which the problems can be solved and act as technical and organizational support agents.

Throughout the unit's design and development, the PT3 team made a priority of building instruction that addresses the technology standards for teacher education as presented by the National Council for the Accreditation of Teacher Education Standards (NCATE, 2001) and the state of Colorado. Each piece of the case-based learning unit enhances students' understandings of technology integration and is directly linked to the standards.

Graphical User Interface

Upon entering the Web-based environment, the preservice teachers do not find the menus, navigation bars or buttons typical of traditional Web sites. Instead, they step into their new offices with the help of a unique graphical user interface (GUI) created by Caroline Sanzone, a member of the PT3 team and doctorate student in the Department of Educational Technology. Materials, in the form of email and telephone voice messages, letters, memos, and face-to-face meetings, that support the learning unit, are stored in and accessed via five active zones: the computer, telephone, in-box, file cabinet, and daily planner.

The daily planner is the main user-cueing device; the planner is the user's 'to-do' list. The list reminds users of the week's important tasks, such as checking e-mail, and attending events (e.g., an in-service day focusing on CSAP analysis). A mouse-click on the appropriate active zone opens a small window and allows the preservice teacher to check email, listen to voicemail messages, read letters, or investigate the contents of files and folders. The windows, which users can drag anywhere on the screen and open simultaneously, give users the ability to customize their work areas.

The complex design of the user interface is balanced by the authenticity of its elements. The office metaphor is not only relevant, but familiar as well. Anyone who has ever read a letter, opened an email, or used an answering machine possesses the prerequisite skills for successfully navigating the interface. From the first week of the unit to the last, the pre-service teachers see this case-based learning environment evolve, as new scenarios and pieces of information present themselves. As a result, the interface is flexible enough to accommodate this evolution, without forcing users to re-orient themselves every week. Just as one might save an old email or voice message for further review, the preservice teachers have access to items introduced in previous weeks, as well as new items, through the same five active zones.

The unit's scenarios are designed to realistically mimic a teacher's work environment, including interactions with fellow teachers, administrators, and support staff. A mixture of audio, video, Acrobat, word processing, and

HTML files make these interactions seem more realistic. Video clips and sound files let the user experience the environment with multiple senses and as though they were witnessing them first hand.

Figure 1. Graphic User Interface

The Scenarios

The case-based learning experience evolves from the initial pretense that a Colorado school (Spring Hill Elementary) has hired a new teacher by the name of Miss Nelson. Miss Nelson's specific grade level assignment is dependent on whether the PTEP students in the course are focusing on an elementary, middle, or secondary expertise level. The preservice teachers are asked to step into the role of this first year teacher (Miss Nelson) in order to solve the problems as they are presented week by week. The unit asks students to imagine that they have worked all summer to plan for their classes. However, much of that work is undermined when, in Week One, the teacher (Miss Nelson) receives a voice mail (in the form of an audio-file embedded in the unit's graphical interface) from the district Director of Personnel informing her that she has been reassigned to another school, this one with below average standardized-test scores. Week One of the case based learning unit exposes the preservice teachers to data, in the form of school profiles and standardized-test scores, that acquaints them with the new school's environment. Week One's GUI provides a letter, email message, newspaper articles, school profile, and various CSAP documents. The letter announces that Miss Nelson has received a grant from the Association for Technology and Learning (ATL) that will provide her classroom the funding for six computers, a printer, a scanner, a TV, a VCR, a digital camera, and $200 in discretionary funds. Miss Nelson also receives an email message from the district technology coordinator informing her that he has set up their computers, network connections, and peripherals and installed the necessary productivity software. Attached to the message is a PDF file which shows the floor plan of her room. The filing cabinet, in Week One, contains an archive of news articles from the Denver Post on varied CSAP issues, a detailed profile of Spring Hill Elementary School, and a copy of the past year's CSAP reading scores. The GUI will eventually link to electronic cumulative files which contain report cards, Individual Education Plans (IEPs), reading proficiencies, and other student related documents. In addition to familiarizing students with the simulated school environment, Week One also familiarizes the learners with the unit's online environment. Although each week's interface is self-contained and intuitive, in Week One, the course instructors model standard procedures and point out the unique features of the interface.

Week Two's GUI first points Miss Nelson toward an email from the school principal, Ms. Trunchbowl, announcing an in-service and orientation meeting on CSAP analysis. In this message, she asks Miss Nelson to work with her grade level teaching partners to analyze the instructional needs of their classes. She and the rest of her team are asked to use the forms attached to the message to analyze individual student CSAP scores. Within this message is a link to a tutorial that explains how to interpret CSAP data and use the numbers to identify specific student needs.

During Week 3, things begin to get out of hand for Miss Nelson. The technology resources she received from the ATL grant have become a source of behavioral problems, distractions, and accidents. While working at the computers, students have been off-task and disruptive; they have not completed their work; and they have been crowding and rough-housing around the computers. Miss Nelson files both an accident report for a student who has been hurt when she trips over a power chord and a discipline referral for a student who is using the Internet inappropriately. These two referrals pose the third week's problems. To combat the problems and make the best use of the equipment, the principal asks Miss Nelson to create a management plan that addresses safety and behavior issues, as well as detail a list of classroom rules for technology-use. The PTEP students also have the option of rearranging the classroom floor plan in a way that will reduce the problems being seen. To support the performance of those tasks, the GUI makes several resources available (i.e. a link that describes appropriate ways to use the Internet appropriately in the classroom, a newspaper article detailing Tech Troopers, and support materials from a co-worker offering job aids, tutorials, and posters.)

In Week Four, after the preservice teachers are well acquainted with their environments, they are asked to design instruction for their (Miss Nelson's) students. Week Four's task is to revise a preexisting lesson plan so that the lesson meets the instructional needs determined by Week One's data analyses. Preservice teachers are able to access lesson plans in the filing cabinet and then modify one of them to use the classrooms' technology resources to enhance instruction. In Week Four, the GUI provides access to a database of lesson plans (i.e., the fictitious lesson plan bank that Miss Nelson spent her summer creating) that do not use technology. Miss Nelson receives a memo from a district curriculum official explaining she must begin implementing technology standards. This memo contains a copy of the CDE and National Education Technology Standards for Students (NETS). She also receives a letter from the ATL, reminding her to spend the discretionary funds she received on appropriate instructional software. Finally, during Week Four Miss Nelson receives a voice mail message from a parent expressing concern over the way computers are used in elementary classrooms.

Week Five is framed as a teacher workday on technology integration. A memo from the school's principal reminds Miss Nelson that all teachers will be expected to share their newly created lesson plans and give productive feedback. This memo includes an enclosure, the collaboration worksheet, Miss Nelson and her teaching partners will use to critique each other's work. Miss Nelson, during Week Five, also receives a voice mail from a parent who has concerns about the age of their home computer. This mother is asking Miss Nelson to thoughtfully consider the homework she assigns that will require the use of a computer.

During week six, Miss Nelson receives an email message from the school principal letting her know how pleased she is with Miss Nelson's accomplishments and work with the ATL grant. Ms. Trunchbowl's message has an attachment that provides information on grant writing. Miss Nelson also receives a letter from the grant-giving foundation (ATL), asking her to submit a report on how she has used the resources that the foundation provided. In this report, the preservice teachers must reflect on how they can use technology as a tool to support their teaching strategies. Week Six's GUI also offers online resources for solving problems that inevitably occur when technology is used in classrooms. During week six's class, the instructors give each preservice teacher a 'trouble card' that plagues their lessons with technical difficulties (troubles will be individualized so as to disable the delivery of each teacher's lesson). In response, teachers must create contingency plans (e.g., handouts, library research of print materials) for their lessons. In the unit's final week, Week Seven, the PTEP students discuss their experiences, present their lesson plans, and submit their final report to the grant foundation.

Timeline

The PT3 team has designed and developed the case-based learning unit discussed in this article over the past year. The implementation of the course began in September, 2002. Data collection instruments such as the Stages of Concern Questionnaire (SOCQ), Attitudes Toward Computer Use Survey (ATCUS), instructor observations, student exit interviews, and a Likert scale survey on course effectiveness will assist the team in gathering data about the courses' effectiveness. The SOCQ measures how concerns about different innovations, in this case, technology integration, change over time (Horde & Hall, 2001); the ATCUS measures an individual's attitude toward computer usage (Popovich, Hyde, Zakrajsek, & Blumer, 1987); Instructor observations, Likert scale survey, and student exit interviews will add anecdotal information on student's projects, interaction with the interface, learning behaviors, and the general course effectiveness. Currently, students are administered the SOCQ and ATCUS in both the 200- and 300-level courses, and, after implementation, the team will continue to administer these instruments twice each term. The team will also analyze student projects as qualitative data that will indicate whether the case-based learning unit is effective in meeting instructional objectives.

With the importance of training teachers to effectively integrate technology, case based methods may be one of the most powerful tools one can utilize to meet state and national standards regarding this goal. Because teacher education students often do not see effective technology integration modeled in either their student teaching experiences, or in the majority of their college courses, one class often may not be enough to present the ill defined domain of technology integration to preservice teacher candidates. This case study may prove to provide enough information to give learners a basic understanding of what technology integration not only looks like but how it can be used to solve problems and help to meet state and national education standards. Activities such as these will also add to the body of knowledge regarding the effectiveness of constructivist environments, in particular, case based learning environments.

References

Ertmer, P.A., & Russel, D. (1995). Using case studies to enhance instructional design education. *Educational Technology 35*(4), 23-31.

Brill, J., Kim, B., & Galloway, C. (2001). Cognitive apprenticeships as an instructional model. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology.* Retrieved September 14, 2002, from http://itstudio.coe.uga.edu/ebook/

Brown, J. S., Collins, A., & Duguid, P. (1989, January-February). Situated cognition and the culture of learning. *Educational Researcher,* 32-42.

Casey C. (1996). Incorporating cognitive apprenticeship in multi-media. *Educational Technology Research and Development, 44* (1) 71-84.

Charsky, D., Ferguson-Pabst, D.E., Javeri, M., Liu, P. L., Sanzone, C., & Caffarella, E. P. (2002). *Stepping stones to integration: University of Northern Colorado's Preparing Teachers to Use Technology team's design and development of preservice teachers*. Manuscript submitted for publication.

Cognition and Technology Group at Vanderbilt (1992). The Jasper series as an example of anchored instruction: Theory, program description and assessment data. *Educational Psychologist, 27*, 291-315.

Grabinger, R.S.(1996). Rich environments for active learning. In D.H. Jonassen, ed. *Handbook of Research for Educational Communications and Technology,* 665-692. New York: Macmillan.

Hall, G.E. & Horde, S.M. (2001). *Implementing Change: Patterns, Principles, and Potholes*. Needham Hights, MA: Allyn and Bacon.

Jacobson, M. & Spiro, R.J. (1995). Hypertext learning environments, cognitive flexibility, and transfer of complex knowledge: An empirical investigation. *Journal of Educational Computing Research, 12*(4), 301-333.

Levine (2001). *What is problem-based learning?* Maricopa Center for Learning & Instruction. Retrieved September 14, 2002 from http://www.mcli.dist.maricopa.edu/pbl/info.html

Koschmann, T.D. (1995). Paradigm shifts and instructional technology: An introduction. In CSCL: *Theory and practice of an emerging paradigm,* Ed. T. D. Koschmann. Hillsdale: Erlbaum.

Lajoie, S. P. (1993). Computer environments as cognitive tools for enhancing learning. In S. P. Lauoie and S.J. Drry (Eds.), *Computers as Cognitive Tools* (pp. 261-288). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Moursund, D., & Bielefeldt, T. (1999). Will new teachers be prepared to teach in a digital age? *A National Survey on Information Technology in Teacher Education,* by The Milken Exchange and the International Society for Technology in Education (ISTE), 2/23/99.

National Council for the Accreditation of Teacher Education. (2001). Standards for Professional Development Schools. Retrieved September 14, 2002 from http://www.ncate.org/2000/pdsstrands_10_00.pdf

Persichitte, K. A., Tharp, D. D., & Caffarella, E. P., Technology Integration in Teacher Preparation: A Qualitative Research Study, *Journal of Technology and Teacher Education 7*(3), 219-233.

Popovich, P.M., Hyde, K.R., Zakrajsek, T. and Blumer, C. (1987). The development of the attitudes toward computer usage scale. *Educational and Psychological Measurement*, 47, 261-269.

Spiro, R.J., Feltovich, P.J., Jacobson, M.J., & Coulson, R.L. (1992). Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. In T.M. Duffy &

D.H. Jonassen, eds. *Constructivism and the Technology of Instruction: A Conversation*, 57-75. Hillsdale, NJ: Lawrence Erlbaum Associates.

Working With Faculty: Process, Lessons Learned, and Project Showcase

Donna Ferguson Pabst

Edward Caffarella

Caroline Sanzone

Dennis Charsky

Manisha Javeri

Pei-Lin Liu

University of Northern Colorado

Abstract

The Department of Educational Technology PT3 team at the University of Northern Colorado has worked with six cohorts of faculty fellows over the past two years in order to redesign thirty-two courses. The process the team follows has evolved over the past two years in ways that better support the faculty and their coaches. This article will document the methods used to work successfully with faculty cohorts and discuss selected projects, members of the team have supported.

Introduction

Grant Overview

In June of 2000, the Department of Educational Technology at the University of Northern Colorado (UNC) received a PT3 grant (Preparing Tomorrow's Teachers to Use Technology) funded by the United States Department of Education. The grant, Infusing Technology Use in the Preparation of Colorado Preservice Teachers, sets forth a blueprint for systematically changing the teacher education programs at UNC by infusing technology throughout the curriculum. The changes affect Pre-service Teacher Education Program (PTEP) students during their entire program from initial admission through student teaching. The project has three overarching goals: (1) graduates of the teacher education programs will effectively utilize technology for instruction in their classrooms when employed as full-time teachers; (2) student teachers will effectively utilize technology for instruction in the partner school classrooms; and (3) faculty members will effectively utilize technology for instruction and model appropriate technology use for the preservice teacher education students.

The PT3 grant team has worked toward these outcomes through five initiatives, two of which deal specifically with UNC faculty. Initiative Two calls for Professional Teacher Education Program (PTEP) faculty to model appropriate technology use and integrate technology utilization into their courses. Initiative Three proposes the same for general education and content area discipline faculty. Currently, the grant team has worked with six cohorts of UNC faculty who have learned about and applied technology in new ways in their undergraduate preservice and general education courses. Thirty-two UNC faculty fellows, 15 from the College of Education (COE) and 17 from the College of Arts and Sciences (A&S), have redesigned at least one of their courses to effectively utilize and seamlessly integrate technology.

Background

Although there has been a major investment in technology in K-12 and higher education institutions, the actual utilization and integration of this technology have been somewhat disappointing. Research by the Office of Technology Assessment (1995) and others (Moursund & Bielefelct, 1999) indicate that without reform to the education of teachers we won't see improvements in technology integration in the general education curriculum.

Higher education faculty members are beginning to be held more accountable for the use of technology and its integration into their coursework than in the past (Cheung, 1999). The students, however, are not reporting an increase in the use of technology in their general education or content area courses for instructional delivery, with assignments or student communication. Preservice teachers need to see the effective use of technology modeled so they will be prepared to use technology in their own classrooms. If preservice teachers do not experience the effective use of technology throughout their academic career, both in education and content area courses, they will not have models upon which to build their own personal views of technology integration.

Most preservice teachers do not see good modeling of technology integration or effective instructional strategies in their undergraduate instruction (Bruder, 1993). Machanic (2001) found that only limited faculty development is being done in relation to technology rich environments. In order for preservice teachers to use technology effectively, colleges of education must increase the opportunities for undergraduates to see technology modeled and use technology effectively throughout their educational career (Fawson & Smellie, 1990). In 1997 and 1999, Persichitte, Tharp, and Caffarella completed studies commissioned by the American Association of Colleges of Teacher Education, which investigated student and faculty use of technology by schools, colleges, and departments of education (SCDE). The authors found that the 744 institutions surveyed generally had extensive infrastructure already in place, but the faculty were either not using it at all, or they were only using it for personal productivity, rather than for instructional activities. The data also showed that faculty members were not requiring students to use technology for class projects. Both of these studies emphasized the importance of preservice teacher education students' exposure to effective models of technology use and integration throughout their preservice preparation programs.

In response to senate Bill 99-154, the Colorado State Board of Education enacted eight standards for licensing of teacher education candidates. The seventh standard is, "Knowledge of Technology" and is defined as, "The teacher is skilled in technology and is knowledgeable about using technology to support instruction and enhance student learning." Current assessment of the technology competencies of the PTEP students is that they have strong educational technology skills once they complete the two required undergraduate courses in Educational Technology. Students report, however, that there is still limited use of technology in their coursework. For the PTEP students to be thoroughly prepared to use technology in the classroom they must experience its effective integration into their coursework. By experiencing the effective integration of technology in education, general education, and content area courses, the pre-service students will be given valuable models upon which to build their own technology integration skills.

Process

Each term, faculty is invited to apply to participate in the grant by going through a Request for Proposal (RFP) process. The online application (http://www.coe.unco.edu/PT3/pt3Application.doc) asks faculty members to complete a project abstract, detail demographic data (e.g. name, department, course title and description) and write a three to five page project proposal that includes the proposed uses of technology, how the proposed uses will model technology for the preservice teachers, how the proposed technology will improve the course, and the proposed cost of supplies, software, and materials necessary for the redesign efforts. This proposal needs to detail both the delivery of instruction and student use of technology. The proposals must also include documentation showing the number of PTEP students that typically take the course. The grant requires a minimum of 50 PTEP students per semester per class or that the class has at least 75% PTEP students. Faculty members who apply to work with the grant do not need any prior technology experience other than the ability to complete the RFP in a word template and attach the completed document to an email message.

The project team, the COE Dean, and the A&S Dean all work together to review the proposals. Each term, the team selects between six to eight faculty members to participate as fellows. Faculty Fellows who are accepted are then released from one course for a semester, given a $500 stipend to purchase materials necessary to support the course redesign, and assigned an educational technology graduate student who serves as a coach for the term. The first faculty members were selected in the fall of 2000 and released from one course during the spring of 2001. Five subsequent cohorts of faculty fellows have worked with the team during the summer of 2001, fall of 2001, spring of 2002, summer of 2002, and fall of 2002.

Faculty/Student Coaching Teams

Each faculty member accepted to work with the grant is paired with an advanced doctorate student from the Department of Educational Technology who serves as a technology coach. Once Faculty Fellows are selected, the team matches, as closely as possible, the interests and proposal descriptions of the faculty to the backgrounds and expertise of the student coaches. At the beginning of each term, coaches begin the working relationship with their faculty member by contacting them and arranging an initial meeting to discuss the ideas presented in the faculty member's proposal. During this initial meeting, the team develops potential technology integration strategies, identifies the project's goals, prioritizes the tasks required to complete the project, considers any constraints of the project, sets regular weekly meeting times, creates a semester long schedule of activities necessary for the success of the project, and defines a timeline in which to complete the activities. Coaches provide the training, support, appropriate technology integration tips, as well as instructional design expertise so each faculty member is able to accomplish their goals. Together, the student/faculty team conducts a needs assessment and audience anlaysis for the course and identifies appropriate places to infuse technology. Once the assessment is completed, the faculty/coach team selects, designs, and/or produces appropriate instructional materials for the class. Because of the focus of the grant's overarching goals, the team has stressed the importance of the coaches supporting faculty in a way that they become independent and self sufficient with their usage. Our goal has not been the completion of projects as much as the support of systemic change within the institution. Faculty Fellows come to the project with a wide variety of expertise, progress at various speeds, and complete redesign efforts with varying success. Each chooses different areas in which to focus, depending on their particular interests and ideas for change. Faculty Fellows have worked with electronic portfolios for assessment, synchronous and asynchronous communication, teleconferencing, web-based learning environments, multimedia project-based learning activities, adaptive technologies, productivity software, inquiry learning, simulations, online course delivery, and video production.

Access to adequate software, hardware, and networking is critical to the redesign efforts. The faculty/student teams are fortunate to have access to high-end computer technologies in several COE computer laboratories. Faculty may choose from Smart Classrooms, as well as complete laboratories in either MAC or Windows platforms. Projectors, scanners, and digital still and video cameras are also available for their use. Once faculty members have completed their semester with the grant, they have diverse support options through the university in order to continually modify their courses. Support includes, but is not limited to, computer lab consultants, Informational Technology Services, and COE and A&S technical support personnel. In addition, some of the faculty/student teams have continued their collaborative efforts after the fellowship has been completed. The redesign efforts have resulted in curriculum revisions that are both instructionally improved and technologically enhanced.

After having worked with several cohorts of faculty members, the UNC PT3 team came to the conclusion that additional structure was necessary in the process of working with Faculty Fellows. An online hypertext packet of materials (http://www.coe.unco.edu/PT3/Faculty/Packet/Packet.htm) was created to detail expectations of faculty and limit problems encountered with past cohorts. This packet includes the topics of the weekly seminars as well as forms to complete during the term: GA/Faculty Fellows checklist of expectations, project goals, prioritized task list, timeline of activities, monthly reports, and final project report. All of these items are returned to the Project Director or Manager in digital form in order to keep complete records for federal reports. The student/faculty teams review the original proposal, identify achievable goals, decide of project restraints, equitably divide responsibilities, identify actual faculty needs, and produce monthly and final reports. Adding this structure has eased the fear factor faculty experienced, improved the redesign process, allowed the process to run more smoothly, and markedly enhanced the end products.

Faculty Fellow Seminars

All of the faculty members chosen to participate in initiatives two and three during a given semester also participate in faculty development seminars on technology use in the classroom. The weekly seminars provide the opportunity for Faculty Fellows to extend their knowledge and understanding of technology use in instructional settings and realize the importance of embedding the technology use within their courses. Professional development in the area of technology integration must carefully avoid over emphasizing the bells and whistles of the technology so that faculty members focus their attention on the message, not the technology used to deliver it (Machanic, 2001).

The Project Director of the grant leads the faculty development seminars with the support from the Project Manager and other faculty members from the department of Educational Technology. The content of the seminars is based on the needs and interests of the individual faculty members during each semester. The contents of the seminar presentations have included: exemplar redesign efforts, effective PowerPoint presentations, advanced word processing techniques, Dreamweaver basics, Smart Classrooms, Blackboard training, mechanics and conventions of the web, synchronous and asynchronous communication, Web-based learning environments, creation and manipulation of digital graphics, electronic portfolios, file management, student management systems, audio and video production, and technology integration. These seminars, approximately 16 hours over the course of the semester, provide an opportunity for Faculty Fellows to not only gain knowledge of new technologies, but also share successes, concerns, and frustrations in an environment of support and problem solving. The Project Director, Grant Manager, and Educational Technology faculty members, provide structure to and content for the seminars, identify subject matter experts to deliver further training, and provide a link between the Faculty Fellows, graduate coaches, and content explored during the seminars.

Showcase of Projects

Because each one of the faculty fellows has taken a slightly different approach to their redesign effort, depending on the outcomes identified in their proposal as well as their personal skills level, the final products have varied greatly. Examples of Faculty Fellow projects can be found on UNCs PT3 website (http://www.coe.unco.edu/PT3). Through interviews with faculty fellows after their redesign efforts have been completed the PT3 team has learned a great deal about the benefits of this type of staff development project. Faculty Fellows have shared the following comments:

- Working with PT3 in my redesign of the class was a lot of work; however, the skills, knowledge, and competence gained by my students outweighed the hard work I did and will continue to put in.
- This was a very fascinating and stimulating experience for me. It allowed me to use current technology more effectively while learning how to incorporate new types of technology into my courses.
- The program was especially useful to me because it helped me restructure and improve my course in ways I hadn't originally planned. My graduate coach helped me overcome the steep learning curve associated with the use of the new web page creation software.
- The PT3 fellowship has been a great experience for me. There were several technology related projects I wanted to incorporate into my teaching, but frankly I had no idea how to accomplish them. Working with my graduate assistant and the other PT3 staff made what seemed impossible, possible.
- Working with the PT3 grant has been a most extraordinary experience. I have been intrigued by the applications I have seen colleagues and students use. The seminars allowed me to become familiar with some and even proficient with others.
- I discovered that I could really make and record video clips on CD and the process wasn't too difficult. This led me to be able to require this of my students which will help them illustrate their own lessons for their classes.
- The most rewarding aspect of my work was becoming comfortable in the use of DreamWeaver. Not only did I create what I think is an attractive and user friendly website, I have become confident in my ability to manipulate the program to improve the website and work with students on their websites. This success is due in no small part to the second most rewarding aspect of the work, the professional relationship I developed with my technology coach. He was at all times professional, helpful and available.
- My main idealistic goal for this project was to develop such a familiarity with the technology that I would be comfortable in imparting this familiarity to my students. I wanted to be able to integrate technology into my understanding and presentation of history content. If the integration becomes seamless, and my students see it as seamless, than they in turn will be able to impart this technology onto their students in the future. The goal is to make technology an integral part of history pedagogy, for me and for the future K-12 history students that they teach. I am not sure that this goal will be realized, but at this point I suppose it is enough to say that I am confident enough to make the attempt.
- I most enjoyed having the time and support to make real some of the ideas I have had about my class for a long time. Without the one-on-one training and support, I probably never would have figured out how to

do something like this on my own. It was great to have a coach who was willing to sit down and talk me through the process in a step-by-step manner, but who also made sure that I was able to do things on my own (so that I could continue the work solo once the semester ended). It was also rewarding to hear and see what other fellows (both in my own group and from previous semesters) were working on or had already done, as well as to be exposed to other kinds of technology that I never would have considered before (e.g., sound editing). Those opportunities helped me start thinking about other possible ways of incorporating previously unknown kinds of technology into my classes. I think this is a wonderful experience for any faculty member, regardless of their prior experience with technology. I consider myself fairly tuned into technology uses in the classroom, but I discovered that there was a whole world of possibilities out there that I hadn't even considered. It's a great way to become acquainted with the range of possibilities for future technology use and to discover that the skills for using those technologies are entirely learnable.

- Working as a faculty fellow with the PT3 grant was time well spent! I learned and continue to learn much about ways to use technology in my online and campus classes. Since my involvement with the PT3 project I have also become more comfortable and committed to using technology, when appropriate, in my teaching.
- The PT3 experience exposes faculty to cutting-edge techniques for course preparation and presentation. It has proven to be an invaluable experience and has enhanced not only the focal course, but all my teaching endeavors.

Summary

Through the support of the graduate assistant coaches, Project Director, Project Manager, and other subject matter experts, the Faculty Fellows are able to not only redesign the course for which they are chosen to participate in the grant, but continue experimenting and learning on their own. Enthusiasm has been high among the Faculty Fellows who have participated in this fellowship opportunity. Although they begin their journey at very different levels of proficiency, most have significantly improved their skills and ability to seamlessly integrate technology into the content they deliver.

Fundamentally, the PT3 grant is based on the premise set forth by Kent & McNergney that "technology could transform the most basic tools used by teachers, and this transformation might also create radically new types of learning environments" (Kent & McNergney, 1999, p. 51). The long-term results described here for the redesign of PTEP, general education, and content area discipline courses are not yet known, but the short-term and systemic effects are already yielding great dividends. Faculty Fellows who have participated in the grant and successfully integrated various technologies into their courses are excited about the results they have achieved. Current PTEP students are beginning to see technology modeled in their education and content area courses. The work made possible by the PT3 grant is allowing preservice teachers to see and value the use of technology for teaching and learning. Hopefully, the effective uses of technology in preservice teachers' courses and the opportunity for them to develop their own skills will serve as models that UNC's future teachers will employ one day in their own classrooms.

References

Bruder, I. (1993). Redefining science: Technology and the new science literacy. *Electronic Learning. 12*(6): 20-24.

Cheung, S. A. (1999). The first year faculty experience. *Focus Online, 9*(2). Retrieved September 14, 2002, from http://www.dal.ca/~oidt/focus92.html

Fawson, E. C., & Smellie, D. C. (1990). Technology transfer: A model for public education. *Educational Technology, 30*(4): 19-25.

Kent, T. W., & McNergney, R. F. (1999). *Will technology really change education? From Blackboard to web.* Thousand Oaks, CA: Corwin

Machanic, M. (2001). Faculty development in higher education: Best practices review and planning recommendations for technology-rich learning environments. *DEOSNEWS, 11*(3). Retrieved September 14, 2002, from http://www.edu.psu.edu/acsde/deos/deosnews/deosarchives.asp

Moursund, D. & Bielefeldt, T. (1999). Will new teachers be prepared to teach in a digital age? *Miliken Exchange on Education Technology:* Santa Monica, CA.

Office of Technology Assessment. U.S. Congress. (1995). *Teachers & technology: Making the connection.* Washington, DC: U. S. Government Printing Office.

Persichitte, K. A., Caffarella, E. P., & Tharp, D. P. (1999). Technology Integration in Teacher Preparation: A Qualitative Research Study. *Journal of Technology and Teacher Education*, *7*(3).

Persichitte, K. A., Caffarella, E. P., & Tharp, D. P. (1997). *The Use of Technology by Schools, Colleges, and Departments of Education*. Retrieved September 14, 2002, from http://www.aacte.org/research.html

Microsoft Windows XP® Accessibility Features

Tom Atkinson

Central Missouri State University

In recent years, computer technology has dramatically changed the way we access information. And for no group is this more dramatic than for those with disabilities. With the support of assistive technology, people with all types of disabilities will be better equipped to enter the mainstream of information access.

A person without the use of their hands can enter text by talking to a computer.
A person with severe hearing loss can freely use the telephone.
A person without sight can instruct a computer to read aloud everything on the screen.
A young child with no voice can communicate through a talking computer.

In the evolution of technology, this is a critical time in our society for people with disabilities who have so much to gain by accessing emerging technologies – and so much to lose if access is denied. According to the Alliance for Technology Access, while the incidence of disability in the general population is 20%, it is even higher in communities of mixed ethnicity and economically disadvantaged and in rural communities. Research indicates that 67% of all adults with disabilities are unemployed. Disability (seen or unseen) is a part of every community and it is critical that everyone have equal opportunity to move toward a more accessible environment. (Alliance for Technology Access: tasc.ataccess.org)

There are several types of assistive technology available to improve accessibility when using computers:

Screen enlargers and screen magnifiers work like a magnifying glass by enlarging a portion of the screen as the user moves the focus.

Voice input aids or speech recognition assist people who have difficulty using a mouse or keyboard. These aids allow users to control computers with their voice instead of a mouse or keyboard.

Screen reviewers and screen readers make on-screen information available as synthesized speech or a refreshable Braille display. Generally, they can only translate information that is text. Graphics can be translated if there is alternative text describing the visual images.

An on-screen keyboard can help those unable to use a standard keyboard select keys using a pointing method such as pointing devices, switches, or Morse-code input systems.

Keyboard enhancement utilities help those with trouble typing--including increasing typing speed. Assistive technology can compensate for erratic motion, tremors, slow response time, and other related conditions. Word prediction utilities offer other types of keyboard filters including typing aids.

Alternative input devices allow individuals to control their computers beyond the standard keyboard or mouse with eye-gaze pointing devices, sip-and-puff systems controlled by breathing, and non-standard keyboards. (Microsoft Corporation, www.microsoft.com/)

Until recently, these enhancements required the user to obtain specialized software that provided the desired feature. With performance improvements in computers, accessibility features are being gradually incorporated into the operating system and are able to address the following types of impairments:

Vision
Hearing
Mobility
Cognitive
Language

From negligible to extreme, the range of impairments is broad. Symptoms of low vision include dimness, haziness, extreme far-sightedness or near-sightedness, color blindness, and tunnel vision. Those with hearing impairments may be able to hear some sound, but may not be able to distinguish words. Others may not hear any sound. For those with hearing impairments, computer prompts such as beeps and spoken messages can be problematic. Users with hearing impairments need visual signals for all information otherwise conveyed by sound. Mobility impairments can be caused by a wide range of illnesses and accidents such as arthritis, stroke, cerebral palsy, Parkinson's disease, multiple sclerosis, loss of limbs or digits, repetitive stress injury, etc. Poor muscle control or weakness can make using standard keyboards and mouse devices difficult. Some people are unable to type two keys simultaneously, while others may hit multiple keys or repeat keys when pressing or releasing them. Those with use of only one hand experience difficulties with certain keyboard and mouse tasks. (Microsoft Corporation, www.microsoft.com/)

Cognitive and language impairments ranging from dyslexia to difficulties remembering, solving problems, or perceiving sensory information to problems comprehending and using language can make using computers more difficult. A language translator could prove beneficial to people with any of these disabilities. (Microsoft Corporation, www.microsoft.com/)

Accessibility Features

Computer accessibility features provide better integration with assistive technology and easier communications that allow people with accessibility needs to work more effectively. The appearance and behavior of these features can be adjusted for specific vision, hearing, mobility, cognitive, and seizure-related needs. This article highlights many of the accessibility features included in the new Windows XP® operating system for PCs.

All features are installed within the operating system but must be activated and configured before they can be used. Standard accessibility options change the appearance and behavior of the keyboard, display, sound and mouse functions through the Accessibility Wizard, the Accessibility Options icon, and other icons in the Control Panel. Mouse and cursor options adjust the motion, size, color, tracking, and rate of blinking and flashing for those with seizure disorders that are affected by timing patterns.

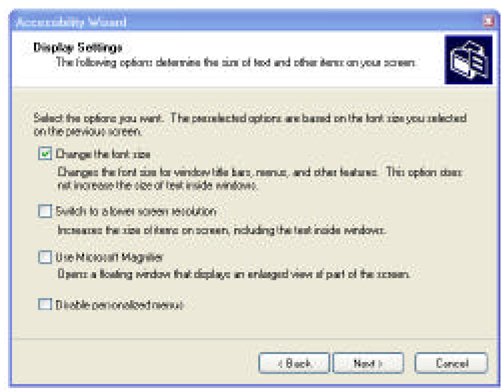


Figure 0. Accessibility

Shortcut keys called “hot keys” immediately activate accessibility features to help those who cannot use the computer without first having accessibility features enabled. “Hot keys” substitute for select commands and buttons from menus and toolbars for people who have difficulty using the mouse as their standard navigation device.

Additional features include magnifier, narrator, and on-screen keyboard to support individuals who require temporarily using a computer other than their own, or to log on and set up their machine for the first time. A “Utility Manager” enables users to start and stop the magnifier, narrator, or on–screen keyboard application programs. While these utilities are not intended as replacements for full-featured assistive technology products, many of the utilities provide very useful features available on any computer using the Windows XP® operating system.

The Accessibility Wizard provides an easy step-by-step approach for selecting or disabling specific features and configuring each option to user preferences. Microsoft Windows XP® menus are automatically updated to place frequently used selections at the top of the menu where they are usually more accessible. Disabling this feature may be preferable to some to allow a more consistent list of menu selections. To maximize the accessibility features, several taskbar and menu settings are recommended**:**

Ensure that the taskbar remains visible, even when running a program in a maximized (full–screen) window.

Display the “Quick Launch” toolbar to display the Windows desktop or start a program with a single click and customize it with buttons to start favorite programs.

Customize the Start menu by using large icons and specifying the number of programs you want to display on your Start menu. The size of icons and number of items on the Start menu can benefit those with vision impairments and cognitive/learning disorders

Specify the “Classic Start Menu” for the familiar look and behavior used in earlier versions of Windows.

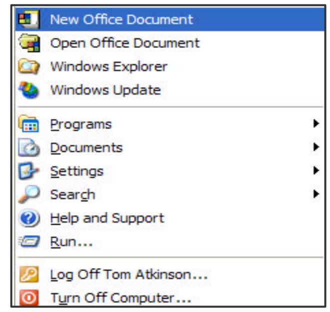


Figure 0. Start

Following the initial configuration using the wizard, options may be changed on dialog boxes for modifying display, sound, keyboard, and mouse characteristics.

Display Settings

The display settings provide a variety of settings to control the way information is presented to the user. Normally, higher legibility of documents can be achieved by adjusting the screen resolution of the video adapter to a higher setting (i.e. 1024 X 768). However, higher resolution settings often decrease the size of objects on the screen. Objects can appear larger with lower resolution settings (i.e. 640 X 480) that benefit individuals with vision impairments. High Contrast color schemes can increase legibility for some users by heightening screen contrast with alternative color combinations.

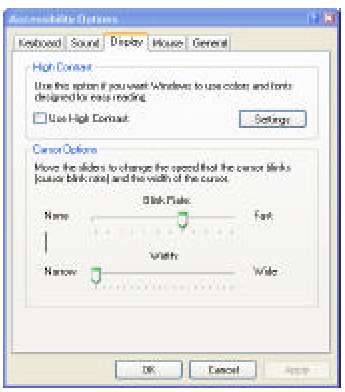


Figure 0. Display

Some of the display schemes use font size to improve legibility. Users make objects on the screen more visible by selecting the option to enlarge icons. Normally, by pressing keys that correspond to the underlined letters in menus, commands, or dialog box options, one can quickly select options using the keyboard, rather than the mouse. These features can confuse or disguise characters on the display, reducing legibility. Select the option to hide underlined letters for keyboard navigation and input indicators (the dotted rectangles around objects) until keyboard navigation is accessed with the ALT, TAB or arrow keys.

Windows XP® provides the “Magnifier” application software as a display utility for those who have low vision difficulties. The “Magnifier” provides a minimum level of functionality for people who have slight visual impairments by creating a separate window that displays an enlarged portion of the screen. Custom features include position, size, inverted colors, magnification level, and tracking options.

Sound Settings

The ability to clearly hear the sounds made by a computer is important to those who rely on sounds to acquire information from the computer—especially those who are blind or vision impaired. The volume of add-on computer speakers can be adjusted independently. A sound scheme can be applied containing settings that associate many program events to specific sounds (i.e. Close Window, Exit Windows, New Mail Notification, or Incoming Fax). Unique sounds associated with system events help those who rely on sounds to get information from their computers.

Windows XP® can display visual warnings for system sounds or display captions for speech and sounds within programs. “SoundSentry” allows the user to generate a blinking title bar or flashing border/screen whenever the computer generates a sound. Visual warnings can indicate sounds made by windowed programs and for sounds made by full screen text programs. “ShowSounds” is an

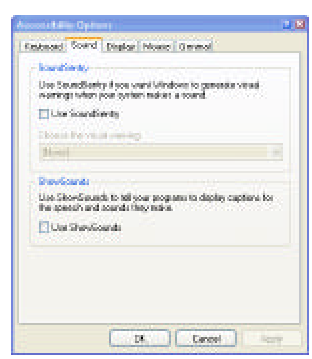


Figure 0. Sound

accessibility feature that instructs programs that usually convey information only by sound to also provide all information visually as text captions or informative icons.

Text–to–speech (TTS) provides playback of printed text as spoken words. An internal driver, called a TTS engine, recognizes and speaks written text through a synthesized voice selected from several pre-generated voices. The TTS engine is installed with the Windows XP® operating system. Additional engines are available from other manufacturers.

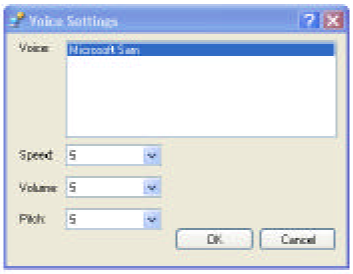


Figure 0. Narrator

"Narrator" is a text–to–speech utility for those who are blind or have low vision. "Narrator" reads what is displayed on the screen—the contents of the active window, menu options, or text that has been typed. It is designed to work with Notepad, WordPad, Control Panel programs, Internet Explorer, the Windows desktop, and some parts of Windows Setup. The Narrator application may not read words aloud correctly in other programs. "Narrator" may be customized by speed, volume, and pitch to announce events on the screen, read typed characters, and move the mouse pointer to the active item.

Keyboard Settings

Standard settings allow shortcuts to menu items by holding the "ALT" or "CTRL" key and pressing the corresponding key indicated by the underlined letter. Most system events may also be activated using shortcuts ("hot keys"). The amount of time that elapses before a character repeats when holding down a key, referred to as "repeat delay", and the speed at which a character repeats when holding down a key, referred to as "repeat rate", can be adjusted to slower rates to allow users more time to respond. To provide an audible cue, a click sound can be produced when a key is depressed. These actions can be set to toggle on/off with "hot keys."

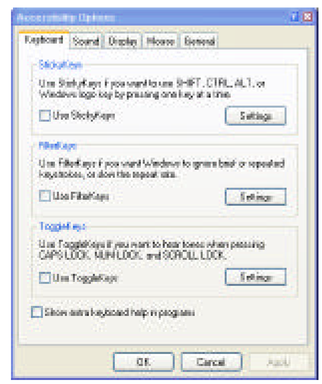


Figure 0. Keyboard Settings.

Microsoft Windows XP® provides several mobility options to assist those who have difficulty using the keyboard. The "On–Screen Keyboard" displays a virtual keyboard that allows those with mobility impairments to enter data using a pointing device or joystick. Besides providing a minimum level of functionality for those with mobility impairments, "On–Screen Keyboard" can also be of help to those who do not know how to type.

The "On-Screen Keyboard" supports entering characters by several methods that include clicking, hovering, and scanning. In clicking mode, data can be typed by pointing the mouse cursor to the keyboard characters and clicking. In hovering mode, a mouse or joystick is used to point to a key for a predefined period of time to type the character automatically. In scanning mode, On–Screen Keyboard continually scans the keyboard and highlights areas where you can type keyboard characters by pressing a hot key or using a switch–input device.

To make the keys on the "On–Screen Keyboard" more legible, select a large font style and size. If using a language other than U.S. English, it may be necessary to change font options to see additional characters. The selected font for the "On–Screen Keyboard" keys does not affect the font used in the selected program. To keep the "On–Screen Keyboard" displayed when switching to other programs or windows, select the "Always on Top" option. The "Click Sound" option adds an audible click when selecting a key on the "On–Screen Keyboard."

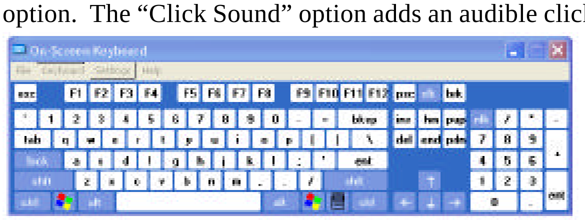


Figure 0. On-Screen Keyboard.

Other important keyboard accessibility features include "StickyKeys", "FilterKeys", and "ToggleKeys."

"StickyKeys" helps those with difficulty holding down two or more keys at a time. When a shortcut requires a key combination such as "CTRL+P", "StickyKeys" will enable the user to press one key at a time instead of pressing them simultaneously. "FilterKeys" adjusts the keyboard response so that inadvertently repeated keystrokes are ignored. "FilterKeys" can slow the rate at which a key repeats when held down. "ToggleKeys" helps those with vision impairment or cognitive disabilities by providing sound cues when the locking keys (CAPS LOCK, NUM LOCK, or SCROLL LOCK) are pressed. A high- pitched sound indicates the keys are switched on and a low pitched sound when keys are switched off.

Mouse Settings

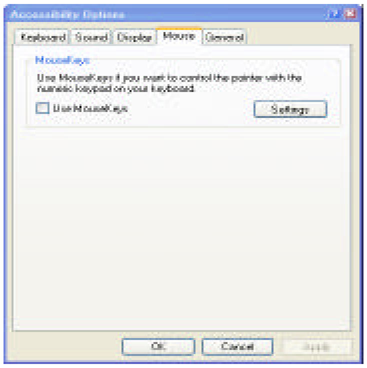


Figure 0. Mouse Settings.

A PC mouse typically supports two buttons designated as left and right. One button is used to position the cursor and to click and drag items. The other button displays a menu of tasks or options related to the item clicked. The button functions can be reversed if needed and the double-click response of the buttons can be adjusted faster or slower. Pointer speed relates to the distance that the pointer moves respective to the distance that the mouse or trackball moves. Changes to this setting can affect the user's ability for precision of the pointer and movement across the screen. For example, to move the pointer across the width of the screen, the pointer device must move farther when set to slow than when it is set to fast. A "ClickLock" option allows the user to highlight or drag an item without holding the mouse button. A "SnapTo" feature moves the pointer automatically to the default button in a dialog box so it is easier to see which button or option has focus to be activated when the ENTER key is pressed.

Pointer schemes contain predefined sets of mouse pointers, such as "Magnified" or "Windows Black (extra large)" that increase visibility of the mouse pointer on the screen. For better visibility when working with a document, especially when using an enlarged mouse pointer or a pointer scheme, the mouse pointer can be hidden while typing. The mouse pointer reappears when moving the mouse or trackball. Also, pointer trails can be added to help the user track pointer movement across the screen. This feature is especially useful when using Liquid Crystal Display (LCD) screens. To easily locate the mouse pointer, an option can be set to provide an animated visual cue by holding down the "CTRL" key.

For those with difficulty using a mouse, Windows XP® provides an application called "MouseKeys" that uses the numeric keypad to control movement of the mouse pointer. To use the numeric keypad for data entry and navigation, activate MouseKeys by pressing the "NUM LOCK" key.

General Settings

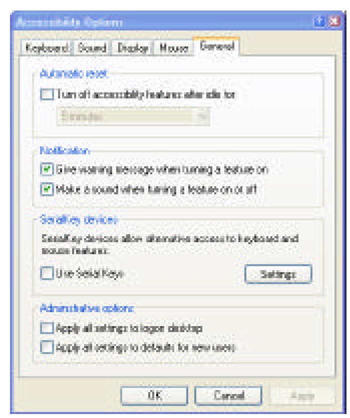


Figure 1. General Settings.

Several accessibility options can be found under the General settings dialog window. The user can be warned either visually or audibly when accessibility changes occur. When this option is selected, a warning appears or a confirmation sound plays every time a shortcut key is used to turn an accessibility feature on or off. This is useful for alerting users who might turn on a feature accidentally. By incorporating these functions into the operating system, all applications can potentially support alternative inputs from single switch or puff and sip devices plugged into the computer's serial port.

The accessibility preferences can be applied to other users when logging on to the system and can be set to automatically become disabled after a specified idle time. In this way, all users will be able to access features to help them log on to the computer. When multiple users share a computer, Windows XP® permits fast switching between users (without actually logging off from the computer) allowing multiple users to share a computer simultaneously without closing the programs they are running.

The cursor is used to indicate a focus point for entering and selecting information. Locating and following the cursor can be difficult even for users without visual impairments. An option may be selected to automatically move the cursor when the focus changes. This option improves the functionality of some screen readers and screen magnifiers that use the cursor to determine which area of the screen to read or magnify. The blink rate and width of the cursor can be changed to make the cursor easier to see on the screen or less distracting for those with vision impairments. Adjusting these settings can benefit people with mobility impairments. Those with seizure disorders related to flashing or blinking objects may want to turn the cursor blinking off.

Internet Accessibility

One of the most valued resources a computer can provide is access to the Internet. While many Web sites are not very user friendly, efforts are being made to improve accessibility. Many barriers still exist for users with visual impairments. Internet Explorer® Version 6 that comes with Windows XP® provides several features that support greater accessibility when browsing the Internet. These features are modified by selecting “Tools - Internet Options” on the browser menu.

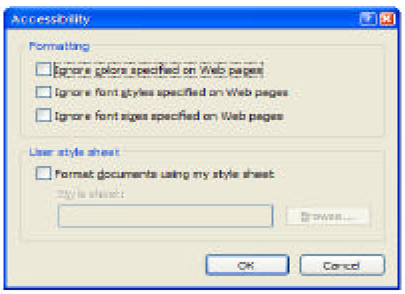


Figure 1. Internet Accessibility.

To improve visibility, the browser can be set to ignore colors, font styles, and font sizes specified by Web authors and to use alternate settings selected by the user. If the author of a Web page chooses different colors or font styles, the default settings will override them using custom style sheets. To increase contrast between screen elements, text and background colors can be pre-selected for displaying Web pages on the screen. Also, a specific color may be selected to designate Web page links not visited and those already visited. Particular color choices make links easier to see for those using high–contrast color schemes. Color settings can be chosen for highlighting links when hovered by the mouse.

Web designers often include alternative text information associated with an image on the page. Occasionally the description is cut off when using small images. To ensure that alternate text is not cut off if the amount of text is larger than the image area, the user should select the option to always expand the text. This option expands the image size to fit all of the alternate text.

When reviewing Web pages, users often scroll back and forth through the information. Screen readers will sometimes read part of the next link and extraneous information along with the next link. To prevent this problem, the scrolling feature can be set to a predetermined speed that allows screen readers to continue to read links correctly even when the next link is off the current screen. This option often improves voice recognition programs as well.

Animations, sounds and videos typically play automatically when displaying Web pages. Turning off the visual experience will help display pages more quickly. Those with low vision or sensitivity to screen flashing can eliminate the distractions by turning off this feature.

Summary

The Americans with Disabilities Act brought to the surface many of the deficiencies computer software producers must address regarding individuals with physical and cognitive impairments who use computers. Microsoft Windows XP® offers many accessibility features with options to adjust specific features to meet the needs of those requiring them. Although these features do not fully address the needs of all users with disabilities, they support an interface for other manufacturers and a common direction that will someday become available on all computers.

Figure 1. Web Access Svmbol.

Eventually, Web sites will include locations with more significant features for accessibility. The CPB/WGBH National Center for Accessible Media (NCAM) provides a symbol that may be used by webmasters to denote that their site contains accessibility features to accommodate the needs of users with disabilities. There is no charge to use this symbol in electronic or printed form. According to NCAM, more than 150 Web sites are displaying the symbol. NCAM guidelines should be followed when using the Web Access Symbol, text tag, and description to indicate that efforts were made to accommodate disabled viewers. (CPB/WGBH National Center for Accessible Media (NCAM): ncam.wgbh.org)

There is no way to guarantee that a site displaying the symbol will be 100% accessible or was even designed following the guidelines. However, in the spirit of the Internet, it is up to Web surfers to let the webmasters know when a site is or is not accessible and to offer suggestions for greater accessibility.

Another trend, “Rich media”, refers to elements on a Web page (or in a separate player) that exhibit dynamic motion over time or in response to user interaction. Rich media players typically have menu items that allow captions and other accessibility features to be turned on or off. For more information about improving accessibility to Web pages on the Internet, visit the following sites:

- BOBBY - Named for the British police officers, this site hosts a Web-based program that identifies accessibility problems on Web pages and teaches designers how to make sites more accessible. It also illustrates how Web pages will look via different browsers. http://www.cast.org/bobby/

- Web Accessibility Initiative - Sponsors information and resources. Take a look at some of the items (e.g., making a Website accessible, list of checkpoints for Web accessibility; quick tips for making Websites accessible) in the “Easy Introductions” section. http://www.w3.org/WAI/

- Designing More Usable Websites - Provides comprehensive links to references, tools, and numerous resources for increasing the accessibility of Websites. http://trace.wisc.edu/world/Web/

- Accessibility Tools for Adobe PDF Documents - Supports free tools that allow vision impaired users to read documents in Adobe PDF format. http://access.adobe.com/

- CPB/WGBH National Center for Accessible Media (NCAM) - A research and development facility that strives to make media accessible to underserved populations such as disabled persons, minority-language users, and people with low literacy skills. http://ncam.wgbh.org/

References

Alliance for Technology Access, tasc.ataccess.org
Microsoft Corporation, www.microsoft.com
CPB/WGBH National Center for Accessible Media (NCAM), ncam.wgbh.org

A Scenario Strategy to Promote Design Task Reflection

Neal Shambaugh

West Virginia University

Abstract

Scenarios provide a teaching strategy to promote reflection on design tasks in an instructional design (ID) course. Different approaches for generating and analyzing scenarios are described. A course summary provides a context for the use of scenarios. Data analyzed include student-developed scenario descriptions submitted pre- and post needs assessment and written student perceptions of the scenario activity. Initial scenarios produced improved clarity as to instructional problem and identification of project goals prior to needs assessment. Revised scenarios included narrative descriptions of successful implementations and new teaching options. Examples of student-developed scenarios are provided.

Background

Our conscious need to make decisions frequently takes precedence over thinking about the implications of these decisions. Such a need may be due to a human propensity to proceed to a solution in light of existing information (Simon, 1996) and the desire to act to decrease uncertainty. Disciplines, such as medicine, law, or engineering, may have formalized knowledge bases and guidelines for taking action (i.e., method) to address problems. Human problems do not lend themselves so easily, but are not out of reach of assistance. Instructional problems, those needs in which educational interventions are warranted, are forms of human problems that are complex. Schön (1983) characterized the differences in terms of terrain. As humans we prefer to keep to the high ground, which is hard and stable, rich with knowledge and tested principles. Instructional problems lie in the muck of the swamp, those "lowlands….incapable of technical solution (p. 42). Design disciplines often work in "domains for which certain critical scientific and engineering knowledge is missing" (Carroll, 2000, p. 63). Instructional design provides a systematic structure to think about and develop responses to instructional problems. Instructional designers face the same murky lowlands as other designers, but their role is crucial, as designers of all persuasions desire to take existing situations and improve upon them (Simon, 1996). The human world needs design.

In ongoing research on teaching instructional design (Shambaugh & Magliaro, 2001), novice designers tend to propose a solution to an instructional problem without a clear understanding of the problem. However, reflective critique of these decisions is frequently removed from design activity. For example, in classroom settings in which instructional design is being taught, students typically hand in design work and make revisions based on instructor feedback. This traditional form of learning activity, however, distances students from thinking about responsive design decisions, those that directly impact learners. Development work, involving teams of designers, users, and developers, typically involves periodic or benchmark reviews, but these may be limited to specific technical features of the work without appraising the overall potential of the design to address learner needs.

The use of scenarios is proposed to address this de-coupling of reflection from design. Scenarios record an envisioning of an approach or tentative solution and record our human tendency to move straight to a solution. Designer-constructed scenarios, tapping existing experience and information, provide condensed descriptions of proposed solutions to instructional problems. Scenarios, according to Carroll (2000), are concrete in that they propose a solution, but are also flexible as they are incomplete and easily revised. Scenario descriptions communicate a vision of intent in the context of what the designer knows. Analysis of the scenario, or claims analysis as labeled by Carroll, provides a means to evaluate the solution and improve upon it.

The scenario description provides a narrative intent, while an analysis provides an inquiry into why the scenarios occur. Scenario analysis provides a general and explicit representation of the causal relationships that constitute the scenarios (Carroll, 2000, p. 272) so that propositions or hypotheses about usability can be made. Analysis of scenario descriptions may involve several approaches, as outlined by Carroll (2000), in an effort to see which approach works best in different circumstances. These analysis methods can include (a) cause and effect, summarizing subject/verbs in the text and evaluating the causal relationships; (b) participatory analysis, in which student groups generate features and consequences in a scenario; (c) systematic questioning by the instructor (in a personal conference or on paper drafts) of each event, act, or intent in a description; (d) questioning stages of action at each phase ID (student drafts); (e) reuse of prior analyses, such as a match of learning types with intervention types; and (f) theory-based, involving designs based on a learning theory.

Used in an instructional design (ID) course, scenario construction becomes a learning task within different phases of ID. In this way, ID novices build on what they know and reflect on the design *as* they design. For example, on the basis of a scenario description of a proposed educational intervention during needs assessment, novice designers will be asked questions and prompted to learn more about the instructional problem. From what is learned from needs assessment, students revise their initial scenario description, which is the basis for subsequent questioning, reflection, and design moves. Thus, scenarios provide a tool to envision a learning situation and what might occur in these envisioned settings. Scenarios provide an application of the situated perspective, that "… learning [is] a continuous, life-long process resulting from acting in situations" (Brown, Collins & Duguid, 1989, p. 33). Thus, the research question in this study was "In what ways do scenarios assist novice designers in thinking through their instructional design decisions?"

Methodology

Course Design

During a 15-week semester (Fall, 2002), 20 students in a master's level instructional design course identified an instructional problem of their choice and designed a response to this educational need. Shambaugh and Magliaro (1997) was used as the text, which provided the instructional sequence for the course. The first two phases in the ID process, Learning Beliefs and Design Tools (principally ID models), were used to establish the context for the traditional ID process. Design-A-Lesson and Learning Principles tasks helped students to reflect on how they currently plan instruction and their views on learning. Students drafted a Mission Statement, which was used to assess how students' learning beliefs were being applied in their projects. Students also sketched a visual of their own ID model and provided an explanatory narrative.

Students identified an instructional need and recorded their initial understanding of the problem through an Intent Statement. Prior to a needs assessment, students were asked to write a scenario envisioning a successful implementation of the project. The subsequent Needs Assessment phase structured students' research into the instructional problem and options for addressing it. A personal conference provided individual assistance with their needs assessment strategy in terms of what to study, who to talk with, what references to consult, and how to summarize their findings. Based on Needs Assessment, students identified goals for their project and revised their original design intent, including a revised scenario. Students were then introduced to design phases, which included Instructional Sequence, Assessment, Instructional Framework, Instructional Media/Technology, and a Prototype instruction (e.g., unit, web pages, tutorial, workshop activities). Instruction helped to raise students' awareness to the purposes of assessment and appropriate assessment methods. During the Instructional Frameworks phase in which teaching options were specified, students demonstrated a teaching strategy in their Prototype Lesson. Instructional Media/Technology was addressed throughout the course beginning with Needs Assessment. Students were prompted to be open to media and technology possibilities and to make a case for how their choices supported their goals. A second personal conference addressed Program Evaluation and project issues. During the final week of the course students revised their personal ID models and submitted a written self-evaluation of the course and their learning.

Data Sources And Analysis

Three data sources comprised this study and included initial scenarios, revised scenarios, and student perceptions of the scenario task. Prior to conducting a needs assessment for their ID project, students developed a scenario description in a class session (week four) using work groups composed of individuals with similar projects. This initial group writing and sharing provided students with a draft from which to individually revise and submit the following week. This initial scenario description submission consisted of three sections: "Vision statement" describing a successful implementation of their design, a "Reality" statement qualifying the constraints on the vision, and "Next Steps" or new design decisions. A table was constructed, which recorded a summary of what the 20 students wrote for vision, reality, and next steps (design decisions).

During needs assessment, students conducted research on the content to be taught, the range of learners, and the reality of the context (i.e., context analysis). Outcomes of the needs assessment included a revised Project Intent document, which summarized the major features of the proposed educational intervention, including project goals and a revised scenario. Based on what students wrote in the revised scenario description, a table summarized each student's instructional problem and overall design strategy for subsequent development in the design phases of the course. Using this table, a cross-students analysis was then conducted to provide a general sense of what students were writing in the initial (pre-needs assessment) and revised scenarios (post-needs assessment).

One of the difficulties of studying teaching interventions is the inherent conflict between teaching and research. As all students were afforded the opportunity to write a scenario description, it is difficult to know to what extent the intervention can be attributed with improving design decisions. The baseline for comparison is the developmental research studies conducted on this course from 1994 to the present and summarized in Shambaugh and Magliaro (2001). During this collaborative work, we observed student difficulties with clearly expressing the instructional problem while they designed. Students have mixed performances in their needs assessment activity, some rather resistant to the complexity of the activity as an academic task, while others had difficulty in taking the data derived from the needs assessment and incorporating their findings into to their subsequent design decisions. The scenario strategy was tried to prompt student thinking and reflection on design tasks during design activity. Although scenario descriptions were implemented prior to the design phases of the course, we have found that students respond to the ID process on the basis of their initial design intent.

To partially address the value of scenario activity and its benefit for novice designers, a third data source asked students to record their perceptions of the scenario activity. During an in-class activity (week 5) students were asked to respond to two questions: "In what ways did the scenario activity and the re-write help your thinking? How can we make this a better activity?" Sixteen students were present in class and responded to these questions.

Results

Initial Scenario Descriptions

From the initial scenario activity, students wrote more clearly about what they wanted to accomplish with their project than in their first design activity, which asked them in week one of the course to identify an instructional need and how they would address this need. In the "Next Steps" component, students wrote about adjustments to their original ideas. For example, changing grade level from middle grades to fifth grade based on the person's teaching experience and learner needs in that grade. Several students made critical decisions as to their learners. This was most common with students who were teachers. These teachers wrestled with this question: Were the learners students in their classrooms or teachers like themselves? Several students wrote about the tensions they felt in their Vision-Reality statements, such as helping their students to learn the content, balancing software skill learning with its use in learning other content, deciding "who are my learners?" and searching for different ways to teach. The forms of the scenario written by students generally involved a first person statement of "this is what I want to do."

Revised Scenario Descriptions

The revised scenario description included shorter scenario descriptions. These revised scenarios, which were submitted after conducting a needs assessment, included details on new teaching or assessment approaches, such as the use of games for teaching multiplication, 3-D geometric worlds, and reflective journals (as opposed to a workbook). Design strategies included specific details on length of the intervention, target learners, and specific activities for the teacher and the student. The form for the scenarios evolved from the "this is what I want to do" to an increasing use of narrative to depict the implementation. These narratives consisted of several points-of-view, including Class Scenarios, in which the scenario described how teaching unfolded. In addition, some scenarios focused on a hypothetical Student Case or Teacher Case, and the specific use of innovative Learning Activities. Two student scenarios, labeled as Future Scenarios, focused on both short-term and long-term goals.

Student Perceptions Of The Scenario Task

Student perceptions were organized by what they wrote about their individual thinking and group activity. Students reported that the scenario activity gave them an opportunity to visualize and re-evaluate their original ideas, to "edit the dream" as one student wrote. Several students wrote about the value of talking in class and then rewriting their notes to link ideas, throw out others, and articulate the words for the instructional problem. One student commented that the task "made me really push myself to identify resources and constraints," while others commented that the scenario "helped me to think more deeply and to think about the activity differently."

The group activity where students paired up to discuss each other's vision for their project reported the value of "bouncing ideas of another," that the conversation "sharpened my own sense of what I am doing." An interesting comment worth noting was that "I viewed the project from the *outside* and having to tell others helped me to think more about the details."

Student Scenario Examples

The first student scenario example involved a substitute mathematics teacher who proposed to address the "dreaded word/story problems" students face in math courses. Her initial vision at week three in the course was to teach a complete unit in problem solving starting with simple logic activities. She observed that in elementary schools the "word problem problem" is aggravated by teachers who themselves are least competent in math. One of her Next Steps was to focus her ID project on fifth graders rather than middle school students because fifth grade students may have a teacher who does not excel in math skills. The revised scenario consisted of two parts; the first, a memory of an early substitute teaching experience while teaching fifth grade math. She was preparing to review a set of story problems at the end of a text chapter. The students reacted with "We don't do story problems in this room" and "Even our teacher hates story problems." Her memory recounted the use of a mystery game to allow students to use their curiosity to complete the story problems. The second part of the revised scenario included a narrative of teaching a math lesson using a story as the basis for problem solving. Subsequent teaching moves asked students to find out what they needed to solve the problem, encouraging the use of trial and error, discovery, and reviewing all problem solving strategies. Akin to Duckworth's (1987) "virtue of not knowing," this substitute teacher envisioned students with "time to plan, discover, fail, and succeed" with helpful tips and hints to guide the students to master problem solving. As a partial result of the scenario activity (and needs assessment), the student proposed a five-day logic unit, *Growing Solutions*, to help fifth grade students learn logical thinking skills. She proposed both individual and group activities and incorporating enough time into the schedule for student examples and review. Thus, her initial view of content as "solving word problems" expanded to include basic problem solving skills, logic, and overcoming a dislike for word problems.

A second student scenario development involved a university library staff person who proposed to create improved training materials for student library assistants. In his vision statement, the student identified four outcomes that would eventually become labeled as explicit project goals following a needs assessment. These goals included understanding of basic library access services, standardizing training content, appreciation for patron needs, and training on tasks within relevant library contexts. The reality of the current situation was the use of paper forms and outlines and inconsistent training across trainees due mainly to low staffing. The student's decision of Next Steps "only served to deepen my original intent to standardize instruction and to go beyond text and oral demonstration to include a more sensory experience" via an integrated package of self-paced multimedia tutorials. In the revised scenario a training sequence involving an imaginary trainee was described using self-paced PowerPont/multimedia modules, which served to standardize the training of skills. The student also envisioned that the modules would contain interactive features to provide feedback to the trainee and her individual learning style. The subsequent design proposal was entitled *Bringing Learners and Library Skills Together* and adopted the goals originally identified in the original scenario description.

A third student scenario, written by a teacher educator, envisioned a module for her Language Arts Methods course. The purpose of the course is to teach children the writing process, structure of text, grammar and spelling, and speaking and listening skills. The module was envisioned to specifically addresses sentence structure and grammar and to somehow teach students in the context of writing rather than through the use of worksheets. She wanted to use Internet sites to show examples of children's literature and examples of grammar. She wanted to create instruction that allowed time for pre-service students to try out ideas with each other. In her Reality statements, she identified lack of computers in her classroom, lack of her own personal organization, and an inadequate textbook section on grammar. In Next Steps she realized she could take her students to the library, that she would have to develop her own knowledge base for her students, and change her teaching from worksheets to students engaged in finding grammar examples in children's literature. In her revised scenario, this student used a student survey in her needs assessment to find out more from her pre-service students in terms of their attitudes toward grammar. She was surprised to find out that many wanted more knowledge of basic grammar rules and that their idea of grammar was grammar rules, not the use of grammar in writing. She proposed activities in the children's section of the library where students worked in small groups to locate examples of grammar concepts. She imagined students helping each other to find samples for use in writing. Her proposed project *Teaching Grammar in Context* identified the instructional problem as a lack of instructional strategies for teaching of grammar and a lack of a knowledge base of grammar rules. Her project proposed that her pre-service teachers design lessons for real life situations rather than the use of "skill and drill" lessons. Her project goals included an understanding of how to teach grammar to elementary students; designing lessons appropriate for NCATE, NCTE, ACEI, INTASC, and state standards; changing an attitude of teachng "skill and drill" to teaching grammar in context; and incorporating technology into their lessons.

Implications for Future ID Instruction

As this strategy is currently being implemented, completed ID projects were unavailable to help judge the overall usefulness of scenarios. Based on the available data, the initial scenario description (Vision, Reality, Next Steps) allowed students to address the mental tension between what they would like to accomplish and what they realized could be implemented given their known constraints. In their comments, students wrote that the task forced them to think through their plans. Based on the analysis of the initial scenarios, students wrote more clearly about the instructional problem than earlier attempts and identified specific intent that became goals for their ID project. As students generated goals prior to a needs assessment, these initial goals could be used to structure their subsequent analysis activity. An interesting question is to what extent should needs assessment be modified or even eliminated? This option may be worth considering in actual development work in which team members employ scenarios in a continual cycle of design-reflect-reframe. However, the value of needs assessment as a tool in an introductory ID course to learn more about content, learners, and context still appears useful.

One student asked that scenarios be implemented earlier than the fifth week of the course. One possibility for future ID instruction would be to forefront a scenario in class sessions to help students experience each phase of instructional design. A multimedia counterpart to the scenario might be considered for use out-of-class or online use to simulate collaborative design-reflect-reframe activity. Analyzing the revised scenarios provided a set of categories (the predominant form being a Class Scenario) to help future ID students address this scenario task in individual ways, as it was a new task to them and additional assistance is needed to help them. Suggesting a Class Scenario might not be effective for all students, as their projects differ in terms of learners and intervention types (e.g., units, web sites, workshops).

Another adjustment for future use would be to increase the use of scenarios in design teams. This might be effective if a class-based instructional problem or case study is used for ID instruction. Scenarios as design artifacts provide for designer reflection and dialogue (i.e., participatory design) through ongoing cycles of designing, reflecting, and reframing of the design problem based on growing understanding of the instructional problem and awareness of options and realities. One implication of scenarios is that some aspects of design decisions will be made explicit, while other aspects remain implicit and one may be unsure as to which occurs in these descriptions. Acknowledging that scenarios are limited by their incompleteness, they may still provide rich descriptions of the complexity of design work and how the designer views the problem and subsequent design response. Students seemed to value the activity. One reported that "when we start sharing, our thinking becomes clearer and additional ideas surface." Another student commented that the task forced her to admit that she needed to think more about the problem and during the re-write identified new ideas or places to search. Such statements suggest that the scenario merits consideration as a learning activity, particularly when connected to needs assessment.

A short-term goal of this research is to study how the scenario strategy could be used throughout the ID process, similar to Carroll's scenario-system development (2000), which still uses a requirements-design-evaluation cycle of activity, similar to the traditional ADDIE (i.e., analysis, design, development, implementation, evaluation) model. From this initial study, students generated statements, which became explicit goals for their instructional design project. These orienting goals could "seed" an iterative cycle of scenarios in which human needs, opportunities, and evaluation keeps design reflection of individuals or teams tightly involved within design activity. A subsequent step would be to use this scenario-based ID process to develop an instructional innovation. The information flow of this process, consisting of scenario descriptions and dialogue regarding these descriptions, provides a means to document the development.

The above activities contribute then to a long-term goal of this research, which seeks to formalize what is learned from design efforts for use in future design activities. “If we can and do generate lots of candidate scenarios and claims, we will have lots of guidance in specifying, prototyping, and evaluating designs” (Carroll, 2000, p. 283). Such formalization of "lessons leamed" might take the form of design principles generalized across some dimensions, such as subject-specific content, learning outcomes, or activity type, among others. Formalizations might also be categorized in terms of frameworks, such as taxonomies, developmental stages or issues, or implementation strategies (e.g., technology integration in schools). Ultimately, such formalizations would contribute to the development of explicit, archivable, and retrievable knowledge bases for particular disciplines.

References

Brown, J. S., Collins, A., & Duguid, P. (1989, January-February). Situated cognition and the culture of learning. *Educational Researcher*, pp. 32-42.

Carroll, J. M. (2000). *Making use: Scenario-based design of human-computer interactions*. Cambridge, MA: MIT Press.

Duckworth, E. (1987). *The having of wonderful ideas and other essays on teaching and learning*. Columbia: Teachers College Press.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.

Shambaugh, N., & Magliaro, S. G. (2001). A reflective model for teaching instructional design. *Educational Technology Research and Development, 49*(2), 69-92.

Shambaugh, R. N., & Magliaro, S. G. (1997). *Mastering the possibilities: A process approach to instructional design*. Boston, MA: Allyn and Bacon.

Simon, H. A. (1996). *The sciences of the artificial* (3rd ed.). Cambridge, MA: MIT Press.

Design of a Distant Education Medical Case Study

Kourosh Barati Gabrielle M. Cronin James F. Gerraughty

Saint Francis University

Abstract

In an effort to give Physician Assistant students practice in diagnosing and treating medical conditions, the Center of Excellence for Remote and Medically Under-Served Areas (CERMUSA) at Saint Francis University in Loretto, Pennsylvania, has developed web-based case studies for integration into the Clinical Pharmacology course that is taught at a distance. Designing the web-based case study learning environment required skillful utilization of multiple technologies. This paper focuses on the development methods and technology utilized in creating this unique learning experience.

Background and Rationale

Physician assistants are health care providers that are licensed to practice medicine with the supervision of a physician. Like a physician, physician assistants conduct physical exams, diagnose and treat illnesses, order and interpret tests, counsel on preventive health care, assist in surgery, and in most states they can write prescriptions. Physician assistants receive a broad education in medicine that is designed to complement physician training.

One of the hardest tasks of a physician assistant is correctly diagnosing and treating medical conditions. In clinical practice, physician assistants must gather all of the inhibiting and limiting factors to determine the cause of the problem and treat the problem. In some PA programs, the students learn the principles of pharmacology in one course and they learn direct application of the pharmaceutical principles in other courses. Since these skills are emphasized in two different courses, the students have exhibited a difficult time integrating the skills in preparation for their clinical rotations.

In an effort to combine both the cognitive and clinical aspects of this learning situation, the Center of Excellence for Remote and Medically Under-Served Areas (CERMUSA) at Saint Francis University has developed web-based case studies. These case studies are integrated into the Clinical Pharmacology course that is delivered to physician assistant students at a distance. These case studies have been developed to give the students a realistic opportunity to apply their skills of diagnosing and treating patient medical problems in a secure environment where wrong judgments will not have a life threatening or negative effect on the patient. To begin the integration of the web-based case studies into the Clinical Pharmacology course, four case studies were developed to preceed each of the four examinations given during the spring 2002 semester.

Outlining the Case Study Environment

Of course with all instructional design situations, the first thing to determine is the goals or objectives of the learning experience. For the case study, the design team sat down and discussed what the goals of this unique learning experience were to be. The team decided on the following goals:

Give physician assistant students the opportunity to diagnose and treat medical conditions.

Simulate an *actual* doctor visit.

Track the actions that PA students follow during a *real* office visit.

Be accessible **anywhere**, at **anytime**, on **any** computer with Internet access.

Since the case study environment was to reflect a *real* doctor experience, the case was divided into the steps or tasks that a physician assistant or Doctor would follow when diagnosing and treating patients. The case study was divided into four components:

Welcome – This area is designed to introduce the student to the learning environment. The students are informed of the task they must complete and how to navigate throughout the learning environment. Also in this section, the student is introduced to the patient. With every doctor's visit, the nurse comes into the room to take the patient's vitals and chief complaint. This information is passed on to the doctor or physician assistant before they enter the examination room to meet the patient. To ensure that the learning experience was simulating an actual doctor visit, the vitals and chief complaint of the patient is presented to the student upon entry into the case study.

Question the patient – An important part of any doctor visit is the dialog that occurs between the patient and the examiner. It is through this dialogue that the medical professional obtains the current symptoms of the patient, the history of the illness, the patient's past medical history, and the patient's background. Depending on the illness, the doctor or physician assistant may ask a lot of questions or may ask just a few questions narrowing in on the current disease state. In this area of the case study, the students can choose the questions that he/she wants to ask the patient. To simulate this vital patient/medical provider dialogue, the students see a video of the physician assistant asking the question and the patient's response to the question.

Examine the patient – In order to diagnose the patient, a physician assistant will perform various physical examinations on the patient. In this area of the case study, the students can choose the examinations that they wish to perform or order. The students see a video of the examination being performed as well as the results of that exam.

Diagnose and Treat – To end a doctor's visit, the patient is told the diagnosis and is given a course of treatment. In this area of the case study environment, the student must determine the diagnosis and prescribe a course of treatment. Of course, the physician assistant or doctor always explains the diagnosis and treatment to you along with some patient counseling issues. In the case study environment, the students submit this dialogue in a text box. When completed, the diagnosis and treatment form is submitted to the instructor for grading. The student will receive their grade and feedback from the instructor through the course e-mail.

Developing the Cases

Once the case study environment was outlined, it was time to begin developing the cases. In the development process, the design team had to answer two major questions:

How can we produce realistic videos to incorporate into the case study that showcase the events of a doctor visit?

How can we develop a web-based interface that will accomplish the goals of the learning environment and remain user-friendly given our intended audience?

Many different approaches, designs, and techniques were tried in our initial four case studies.

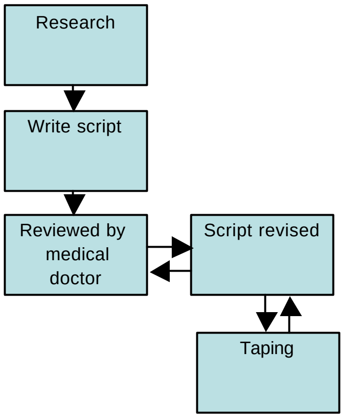
Developing realistic videos

Developing the script

The first step in developing the videos to be used in the case study was scripting the patient/physician dialogue for each case. One of the objectives of the learning experience was to simulate a real doctor's visit. Therefore, it was important that the characters appeared real but it was even more important that the medical content presented in the case was correct. Several different approaches to writing the script were taken to determine which method produced the most realistic patient visit.

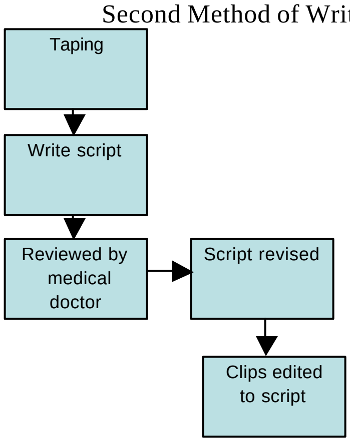
The first method of developing the script was for the instructional designer and pharmacology instructor to research the medical condition in various medical textbooks, journals, and Internet resources (ie. Yahoo Health, MDConsult). After researching the signs, symptoms, and causes of the medical condition, a preliminary script was written. This script was then sent to a medical doctor who checked the script for medical accuracy and provided several revisions. Once revised, the script was given to the actors. During the taping of the scenario, the actors may "ad lib" some. The changes to the script were noted and sent back to the medical doctor to ensure that the case remained medically sound. This method worked well as a way to ensure medical accuracy, however, the actors seemed rehearsed and the script did not reflect the personality of the medical examiner.

Figure 1
First Method of Writing the Script



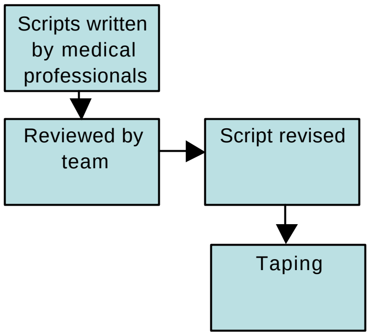
A second method of developing the script was to tape the case completely unscripted. A patient who had or is currently having the desired medical condition was found. The patient was brought into the production studio and the physician assistant performed the examination with the patient completely unscripted. For production purposes, the examination was taped multiple times at differing angles. The dialogue between the actors changed each time the examination was performed. Following the taping, the audio was transcribed and then collated to develop a script. The script was then sent to the medical doctor for medical accuracy and to ensure that the case was medically sound. This method produced a very realistic exchange between the patient and the physician assistant, however, the post production work of transcribing and collating the script was very time consuming, and therefore, would not be cost effective when producing multiple cases.

Figure 2
Second Method of Writing the Script



Currently being tested is a third method of writing the scripts as we continue with our development of case studies and work toward the development goal of one case per medical topic covered in the course. The topics to be developed were divided between two members of the case study design team, a medical doctor, and a physician assistant. Each of these medical professionals is writing the scripts for the case studies that they will be the on camera talent for. Once they have developed the script, the two medical professionals meet to share the scripts they have written, as well as check each other for medical accuracy. This method is still in it's preliminary stages but has so far made the doctor and physician assistant very realistic as the dialogue and examination truly reflect their individual personalities.

Figure 3
Third Method of Writing the Script



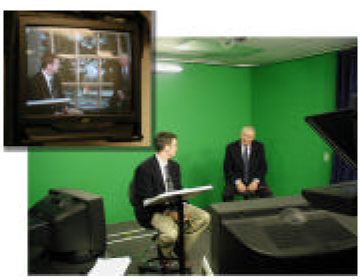
Taping the video

Once the case study was scripted and actors were determined, we were ready to shoot the video. Since the pharmacology case studies were to have taken place in a doctor's office, CERMUSA had two choices on how to show this:

Take our cameras, lights, mics, and cables out into the field at a real doctor's office and shoot the video there.

Create a doctor's office virtually by using chroma-key technology. Chroma Key, or green-screen technology has been used in the television industry for 40 years. It consists of a video processor that substitutes an image onto a color in the background, usually a green or blue colored field. The technology is most commonly used in television weather forecasts. CERMUSA's Distance Learning Prototype Laboratory has its own chroma key background in its studio.

Figure 4
Image of Chroma Key in Action



Since the first option wasn't cost effective, we went with the latter. In order to create the background, CERMUSA staff members went to a doctor's office and took pictures of the examination room in what would approximate a patient's view and a doctor's view. The images were then imported into Adobe Photoshop where a slight blur was applied to give the impression of depth of field for the production.

During the taping of the video, it was decided to shoot the video in individual shot takes. First take would be the two-shot, the doctor and patient in the examination room. Then, individual close-up shots of the doctor and patient were taken. This way, we would be able to have more shots to choose from in the editing, thereby making the resultant video visually appealing.

During the video production/editing, an option presented itself regarding the chroma key: Do we put the image in during the shoot, much like a TV weather broadcast, or do we add it in afterwards in our non-linear editor (NLE).

At first, we tried adding the chroma key image in our NLE. This process allowed us to insert any picture that we wanted into the video, increasing our flexibility. However, this process was time consuming, as the background image had to be rendered into the background color. For example, a ten second clip would render in approximately three minutes. When one is dealing with a two or three minute clip, this amount of time can be prohibitive to an efficient production time. Therefore, even with the benefit of slightly more flexibility in image selection, the time involved made this situation less than ideal.

The second option, adding the image during the original taping, turned out to be the better option. With some planning, CERMUSA could add any image it wanted into the background. It also freed up the time it took to render the image into the background. This option was found to be the best option in terms of getting the clips edited and out to the students in a timely manner.

Editing the video clips

Shooting the video gets you the images that you need; editing gets you the story that you want to tell. In terms of the medical content, the editing didn't make much of a difference as the content was contained in the dialogue. However, the vis ual images and the way they were arranged made the content more appealing.

Using a DPS Velocity 7.6 Non Linear Editor (NLE), CERMUSA was able to make the individual clips, make any changes to those clips that would come up, and encode the clips into the streaming media of choice. The individual clip production was similar to cutting and pasting in a word processor. One would be able to paste a portion of video, trim the time to get the desired length, and remove a piece of that video if it was necessary. This enabled the video editor to be able to add in other elements, such as still pictures, for example, adding a picture of a fungal skin infection. Finally, the NLE had the programs to encode the resultant video into the streaming media.

The look of the pieces was determined once again by the content. The video clips were edited so that if the doctor or patient was saying something important, or distracting, as the case may be, typically the single close up shot was chosen in order to draw the attention of the audience. For the general, "How are you doing?" type questions, as well as anything that would require a wider shot, such as an examination, the wider two-shot was selected.

Developing the web-based interface

Perhaps the most difficult aspect of developing the case study learning environment was the development of the web-based interface that would be used. This interface was the engine that the students would interact with. Through the web-based interface, the students would receive the medical content, enhance their clinical skills, and practice diagnosing and treating patients. Since the Clinical Pharmacology course is taught at a distance, it was important that the web-based interface be designed to fit the needs and technical skills of our intended audience.

To begin the development of the web-based interface, storyboards were created. These paper based drawings of the web-based interface outlined how the material would be presented to the students. The location of the navigational buttons and content material were essential consideration in this design. The design team knew it was important to be consistent with the layout, placing similar items in the same location throughout the web environment.

Once the look of the interface was determined and outlined in the storyboards, the design team had to determine the technology that would be utilized to create this unique learning environment.

Delivery of the video

One of the major hurdles in developing the web-based interface was determining how we would deliver the video clips to the students. These video clips are important to the quality of the case study. They are the added flavor that highlights the skills and techniques of a practicing medical professional.

The first method of delivery that was considered was to distribute the clips on a single CD media. An initial case study developed and implemented in Phase 1 of the project (2000 to 2001) used this delivery method. This solution posed many obstacles in a long run. One problem was maintaining the videos that were distributed to the students and keeping the medical content presented current and accurate. Medicine is a field that is constantly changing, as research is done, treatments for medical problems change along with the signs and ways of diagnosing the condition. Understanding the fact that at times we may need to change the clips to reflect the current medical practice, the idea of issuing the video clips on CD to the students became less acceptable. The final problem with this delivery method was that using CD-Rom media requires extra lines of codes and the use of cookies to determine the right drive for the CD drive.

After looking at problems associated with CD media, the idea of streaming video became the best choice of video delivery. Unlike video downloads, where one can easily spend half an hour downloading a video file onto your hard disk, in streaming video the video content is downloaded in small chunks so that it will start playing almost as soon as you start downloading. While the video is playing, the computer is downloading the next chunk. Streaming video technology thus gives virtually anyone the capability of providing an Internet based, on demand video broadcast. Currently the only real drawback to the technology is limitations on communications bandwidth, the amount of data you can send over a dial-up connection in a given period. This means that the displayed image must be delivered at a fairly low resolution.

From the video maker's point of view, what is great about streaming video is that it does not require any physical distribution, and therefore allows one to distribute to a global market, without the problems of postal restrictions and media format differences. It is also a technology which is very cheap and is easily used by someone wishing to distribute a single homemade video, as well as a big company marketing dozens of films.

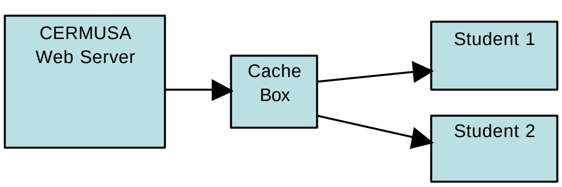
For the first run of streaming video in the case study, we decided to use Real Media software for the delivery of the video. However, a major issue that we encountered with this software was that it, along with other video software, required the player software to be installed on the client computer. This was a major concern for us and it required the users to install the player on their computers to view the video clips. As the students were accessing the case studies in computer labs at their institution, administrator rights set up on the computer lab PCs prevented the ability to download the necessary software on the local computer.

A solution to this problem was provided with Microsoft's Windows Media Player software. Most students have the Windows Media Player already installed on their Windows Operating System. Since it is desired to deliver the content as smooth and trouble free as possible to the user, utilizing this player was ideal. Another bonus to this software is that the server version of the media streaming was included with the Microsoft Windows 2000 Server. This reduced the cost of purchasing and upgrading the server software.

Even after using the streaming server, the major problem became the delivering of the video content to the remote sites. The use of firewalls and Packeteer® restriction software (an application traffic and bandwidth management system that enables network administrators to keep critical traffic moving at an appropriate pace through bandwidth bottlenecks and prevents any single type of traffic from monopolizing the link) by the network administrators created a new challenge for us, as well as pushing the video through high network traffic utilization. CERMUSA's Informational Technology staff came up with several possible solutions to this problem.

The first possible solution was to provide cache boxes to the remote sites. The idea was to setup special devices inside the institutions network and push videos from our main streaming server to the cache box. The clips would reside inside their network in a cached area. This would speed up the delivery process drastically. However, the price of mentioned devices was extremely high.

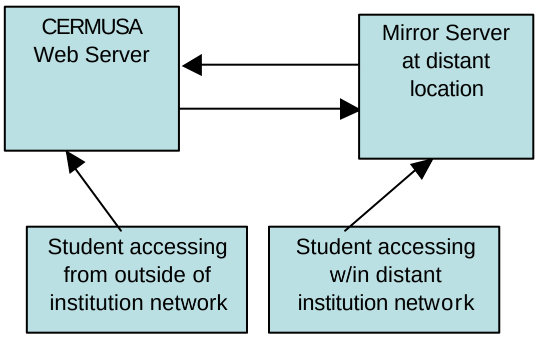
Figure 5
Cache Box Solution



A second, and probably the best option was very much the same as the first but cheaper in price. Using a normal PC with increased memory and hard drives, we developed our own cache box that would host the video clips. Using specific codes in ASP, we would route the users to connect to this server to view the videos if they were using any computer within that institution's network. At this time, we have installed a server at one of the remote institutions. Although we are still in the preliminary stages of testing this technique, the data thus far shows that the solution is working wonderfully.

Figure 6

Mirror Server Solution



Tracking the students

One of the goals of the learning environment was to track the path the PA students follow during a *real* office visit. This tracking allows us to understand the steps that they are taking in the process of diagnosing and treating the patient. The biggest challenge we had to face in order to track the activities was to decide what technique was the most common, and less troublesome, to employ.

One option to track the students' action was to use cookies. The main purpose of cookies is to identify users and possibly prepare customized Web pages for them. When you enter a Web site using cookies, you may be asked to fill out a form providing such information as your name and interests. This information is packaged into a cookie and sent to your Web browser which stores it for later use. The next time you go to the same Web site, your browser will send the cookie to the Web server. The server can use this information to present you with custom Web pages. So, for example, instead of seeing just a generic welcome page, you might see a welcome page with your name on it.

But what are the downfalls of using cookies? The main problem is that many people disable their cookies on their favorite browser. By disabling the cookies in your browser, or in some cases installing software to block and remove them, it is mainly impossible to accomplish the task of tracking the student's activities.

For the case studies, we determined that we would use Active Server Pages, or ASP for development and tracking purposes. ASP, provide a means for us to activate the case study web interface with dynamic live database-driven content. All these codes are server side activated. This means that Web server executes and delivers the content to the client, unlike the java scripts, so that they are not client side dependant. The major benefit to using ASP for development is that the end result is raw HTML so that there are no concerns if the visitor to the site is compatible with the language or tools we are using. Another benefit to server side Web development is that we can utilize components on our server without requiring the visitor to install any particular program. Almost 97% of the Case study web pages are ASP based.

From the time that a student logs onto the site, his/her presence and activities are tracked and logged into a database with the utilization of session variables. A session, in ASP terms, is a single visitor traversing an ASP application. The session starts when the visitor browses to an ASP application or goes to an HTML page that has code that directs to an ASP. The session persists until the visitor has left the site. Visitors to the site can have their session terminated implicitly or explicitly. The session ends implicitly when they haven't requested one of the pages for a predetermined number of minutes, in our case 20 minutes, or the session ends explicitly when there is a code or procedure to terminate the session variable.

While the visitor travels through our site, we can use the session object to store information about the visitor and to control certain aspects of the visitor's session. The session object includes collection, properties, and a method that you can code to provide this functionality. These session objects can be passed onto other pages and can be used by other pages for as long as the visitor stays on that web site. Once the visitor closes the web site, the session variable(s) will be destroyed. Unlike cookies, that are saved on the visitors hard drive, the session objects are client independent. An example using session objects can be seen below.

An example using Session objects:

```
// Declaring the Session objects
<%
Session ("UserName") = "John Smith"
Session ("UserID") = 10
Session ("City") = Pittsburgh
%>

// Using the Session objects

<%
If Session("City") = "Pittsburgh"  Then

Session ("City") = "Pittsburgh, PA"

End if
Response.Write "Hello: " & Session("UserName") & ".<P>"
Response.Write " Your account number is:" & Session("UserID") & ".<P>"
Response.Write "How are things in " & Session("City") & "?<P>"
%>
```

In our case study project one of the session variables that is used by all pages is the logon ID. This session variable is a unique variable that allows the pages to display or track only that specific user's activities. An example is what video clips has the student watched so far? One of the features in the case studies that we use session variables for is the patient diagnosis page. This page is designed for the students, at the end of the visit, to make their diagnosis and submit for grading. Students can only complete this form once. As mentioned before, all student activities are securely tracked into a database. The user logon is one of the objects that are constantly monitored. By doing this, we can track if the student had taken the diagnosis exam before, and if so it is easily traceable by matching the session variable that holds his/her user logon with a field in the database that had saved the user logon in the previous visits to the site.

Use of Java

A lot of the functionality of the case study is driven by Java scripts and Java applets.

- The first use of the java scripts is to detect the user's browser. With the case studies, we wanted to be sure that the students were using Internet Explorer to access the case. The reason for this is that older versions of Netscape (4.X) can handle the ASP with many limitations. The biggest fault with Netscape is the lack of handling tables and layers. It does not handle the placements of the objects used on the pages. In order to correct those problems we had to write separate scripts to allow Netscape to display the page properly. Netscape also lacks the capability to display inline frames, which are used extensively on the case study web site. Inline frames are frames that do not follow the frame rules and regulations of normal HTML. They are designed to display another page within a page without creating a whole new HTML frame structure. These inline frames are used to display video clips and to show students their track of questions or examinations that they have been following on each page.
- Another use of the java scripts is to maximize the browser to its full size on the user's screen. This is accomplished by detecting the resolution of the screen and the code automatically adjusts the screen to that size accordingly. When the screen is maximized the menu and navigational options of the Internet Explorer browser window disappear. This is done for two reasons.
    1. To save as much space for displaying more data on the page as possible.
    2. To make sure that visitors to the site don't get lost or make wrong clicks and leave the web site without finishing the learning activity.

- The java applets have been used to create slide down navigational menus for the visitors to make quicker choices.
- Finally, java scripts have been used to track the student's diagnosis and grade them according to their responses to the choices provided on the diagnosis page. All java scripts are hidden in separate files and are only referenced by a simple line of code. This insures that no one can see the codes and the results of the diagnosis.

Conclusions

As we went through the development of the initial four case studies, we tried the various methods and techniques outlined in this paper as we strived to develop the web-based case study learning environment. During the implementation of these four initial cases, we encountered several technical problems, other than the streaming video issues previously mentioned, that needed to be assessed and remedied.

One problem that we encountered was the character size of the textbox in the diagnosis and treat section of the case study. Originally, this box was created for 1000 characters. As we implemented the various cases, the students had more to say to their patients and began writing their dialogue in Microsoft Word to copy and paste into the text box. This increased the number of characters needed in the textbox. The textbox was adjusted to allow 2000 characters initially. Now as we continue developing more cases, the textbox has been readjusted to 8000 characters.

With the case studies, a complete text based version was provided as well as the video version. The text only version of the case study provided a transcript of the dialogue of the video / audio version of the case study. The transcript appeared in the area of the screen where the video usually appeared. The text only version of the case study could be selected by the student when they clicked to begin the case. The design team included the text only version in the alpha case design for two reasons. These reasons were:

1. To ensure that the web site met the requirement of the American's With Disabilities Act (Section 508).
2. To provide an alternative in the event of audio and video streaming failures.

Over 60% of the students utilized the text version of the case study because of technical difficulties with delivering the video to the students. As mentioned before, the institutions' network administrators were controlling their network traffic with Packeteer®. At first, the Packeteer® was blocking all streamed media from CERMUSA servers. After speaking with the network administrators, streamed media from the CERMUSA servers were placed as a high priority at both institutions. However, due to the other network traffic at both institutions, we still experienced long periods of waiting for the video streams to begin. Since the video version adds to the case by highlighting the procedures of a medical professional and showing the students how to correctly perform various physical examinations, finding a solution to the streaming video problem became essential for the future of the project along with adding more features to the videos to make them more essential for successful completion on the case study.

A development goal is to develop a case study for each of the medical conditions covered in the Clinical Pharmacology course. This goal means that CERMUSA will be developing an additional 45 case studies. The development has been divided into two phases, half of the topics in one year and then developing the remaining cases the following year.

As development continues, CERMUSA will continue to experiment with the video and web-based interface as technology and student utilization changes.

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Constructing Learners in 3D: An investigation of Design Affordances and Constraints of Active Worlds' Educational Universe

Michele D. Dickey

Miami University

During the past decade, a proliferation of new and emerging technologies have been designed and adapted as environments for distance learning. Among the more interesting contenders of adapted technologies are three-dimensional (3D) virtual worlds. Three-dimensional virtual worlds can be roughly described as networked desktop virtual reality. While there are a variety of applications, typically most provide three important features: the illusion of 3D space, avatars that serve as visual representations of users, and an interactive chat environment for users to communicate with one another. Although most 3D virtual worlds have been designed primarily as social and gaming environments, one 3D virtual world application, Active Worlds, has delved into the educational arena by creating the 3D virtual universe, Active Worlds Educational Universe, devoted solely to education.

While 3D virtual worlds are a relatively new technology only recently being explored for use as distance learning environments, studies of text-based or chat virtual communities have provided compelling views of how technology influences the representation and social construction of users in a computer-mediated environment (Bruckman, 1997; Riner 1996; Turkle, 1995). Like text-based chat communities, 3D virtual worlds provide users with a sense of presence. Participants can engage in conversation, build, and interact within an environment. Unlike text-based chat environments, virtual worlds afford users a visual representation of place, space, and self that provides users with a sense of immersion and embodiment in the environment. While virtual worlds do provide a sense of embodiment, it is important to note that this embodiment may be encoded with values and beliefs not readily apparent to users. Research into race, ethnicity, culture, and gender in virtual communities argues that virtual communities are embedded with values and hidden assumptions that promote the interests of some users, while marginalizing other users (Bailey, 1996; Balsamo, 1994; Branwyn, 1994; Cherny, 1995; Dibbell, 1994; Milthorp, 1996; Morningstar and Farmer, 1994; Stone, 1995; Todd 1996; Turkle 1995). While new technologies offer more options for distance learning, it is important that researchers, educators, and practitioners be aware of how an application may construct a user/learner through the values and hidden assumptions encoded within an application (DeVaney, 1993).

Purpose of Study

The purpose of this study is to investigate how the design affordances and constraints of Active Worlds Educational Universe impact the construction of learners and the culture of an educational three-dimensional virtual world setting. Specifically this investigation will examine affordances and constraints that impact: (a) presence; (b) individual and collective representation; and (c) embodiment. The context of this study is Active Worlds Educational Universe, a three-dimensional virtual world universe created and supported by the developers of Active Worlds. The goal of this study is to reveal how values and assumptions embedded in the design of an educational application impact the presence, representation, and embodiment of learners.

Theoretical Framework

The underlying question that guides this investigation is how do educational computer programs construct their subjects? Ann DeVaney (1993) first posed this question in an article entitled, Reading Educational Computer Programs. According to DeVaney, questions such as this are important for addressing often neglected culture-bound issues of educational technology. In an era of diversity and inclusion, it is important the educators be vigilant in addressing ways in which educational technology predispose learners to certain actions which may valorize some learners and depreciate others.

Methodology

The methodological framework employed in this investigation is a liberal adaptation of Affordance Theory. Affordance Theory, as described by ecological psychologist, James Gibson (1977), expresses the relationship that exists between an animal (perceiver) and the environment (perceived). The relevance of liberally adapting Affordance Theory for an analysis of a 3D virtual worlds setting is that 3D virtual worlds are simulated environments. The affordances and constraints of the application impact opportunities for how an environment may be perceived.

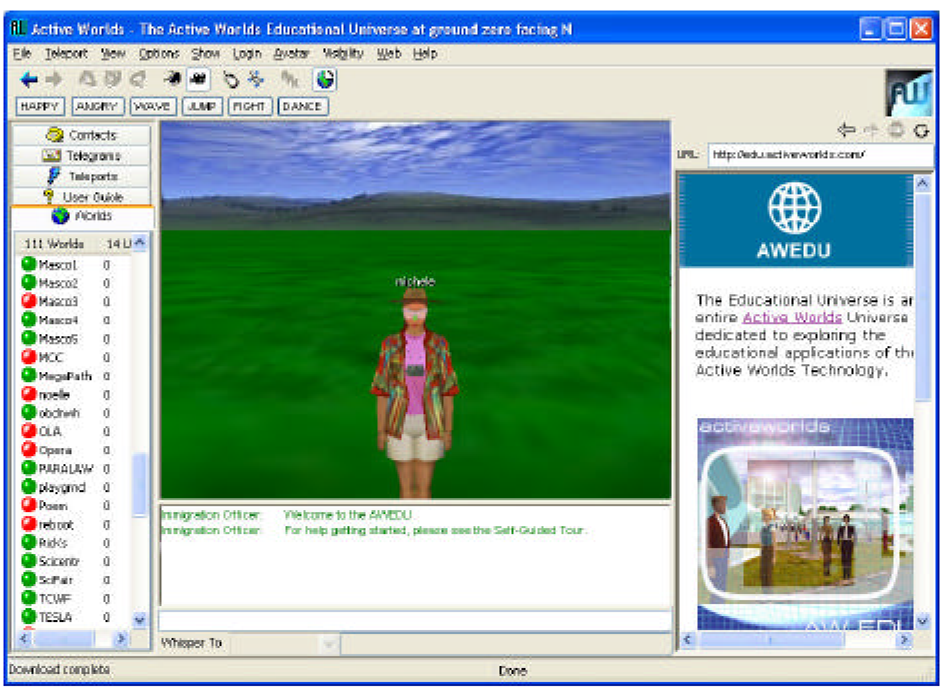
Methods employed in this qualitative investigation include participatory observations (Adler and Adler, 1994), informal interviews (Fontana and Frey, 1994) with learners, developers, and educators of Active Worlds Educational Universe, and interactions and observations with my students using Active Worlds Educational Universe.

Setting

The setting for this investigation is Active Worlds Educational Universe. Active Worlds first premiered in 1995. The client-server application consists of the Active Worlds Universe with over 1000 individual worlds for users to interact with other users worldwide. In 1999, the owners of Active Worlds created the Active Worlds Educational Universe, a universe devoted solely to education initiatives. The Active Worlds Educational Universe affords user-extensible provisions and support for building new worlds and adding to existing worlds. World owners are free to define and customize their world in whichever way they choose by selecting objects from the AWEDU object library or by adding custom built objects.

The AWEDU browser interface is comprised of four main scalable windows which include a 3D environment; a chat dialogue window; an integrated web browser; and a window for added navigational and communicational functions (see Figure 1). The 3D environment is the primary setting for interaction. Learners represented as avatars, move and interact with each other and the environment by either moving their mouse or by using arrow keys on their keyboard. Directly beneath the 3D environment is the chat window. Communication is limited to text messages which are display both above the speaker's avatar in the 3D environment and in the chat window below.

Figure 1. The Active Worlds Educational Universe browser.



Findings and Analysis: Presence/Attendance

Initially this investigation examined how the learner was constructed by focusing on three categories: presence, representation, and embodiment. Initially presence was determined by looking at the affordances and constraints of hardware and software requirements, skills necessary to participate, and language accessibility. However, as this study progressed, the categories that are emerging are not as first believed, but rather representation and embodiment are all elements that construct the learners Presence. The category initially labeled as presence now seems more aptly described as attendance.

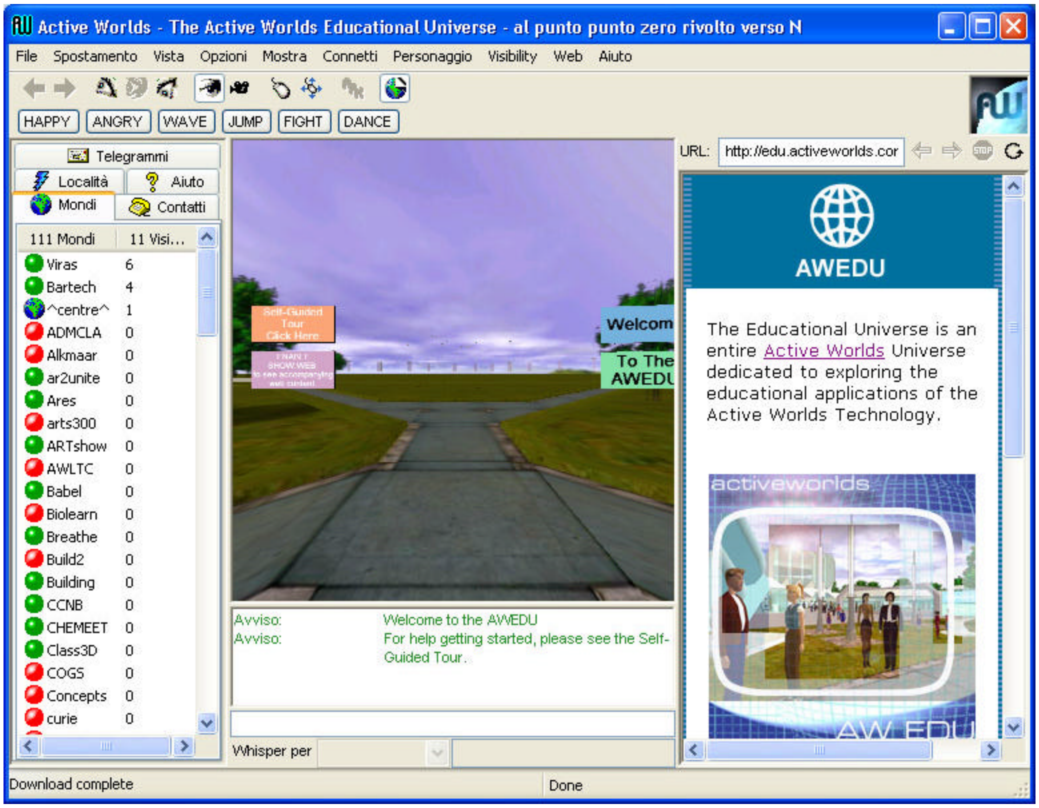
Findings

There are various affordances and constraints that impact a learner's attendance in the world. Hardware requirements include: Pentium 200mhz or equivalent, 64MB RAM, Microsoft Windows (95- XP), and DirectX 3.0. Currently there is no MAC version; however, Active Worlds Educational Universe is accessible on a Mac running Virtual PC. While there are few skills required to participate within the Active Worlds Educational Universe, basic skills required would include the ability or access to someone who can download the application from a website and install it.

Learners are constructed by language both in AWEDU and in the documentation. AWEDU is one of the few 3D virtual worlds to support many languages. While English is most often observed in some of the more commonly visited worlds, it is by no means the only language used. Depending upon the time of day and location, English may not be observed being used at all. The AWEDU browser supports the following languages: Spanish, Danish, English, Dutch, French, German, Finnish, Italian, Hungarian, Norwegian, Portuguese, and Swedish. Despite language support, some of the browser features remain in English (Figure 2.). English is also the primary language used for documentation. While there are provisions for multi-language support, clearly some knowledge of English would be an advantage for learners in this environment.

While the AWEDU browser officially only supports a select list of languages, it is not uncommon to find many other languages being used in various worlds including both Japanese and Russian. Additionally, since many languages use the same alphanumeric system as is used in English, many more languages are used than are represented by the browser.

Figure 2.The Italian language version of the AWEDU browser.



Analysis

Learner attendance is constructed by way of the hardware, software, downloading skills, and language. Learners must have access to a Pentium computer and have Internet access. In addition learners must possess the skills to be able to download an application and load it on a machine. This means the learner must also have the language skills to read the instructions or have access to a translation.

Learners' construction is impacted by language accessibility both in AWEDU and by access to documentation. Although the AWEDU browser supports multiple languages, the languages supported reflect primarily Western, European languages. Equally important to note is that not all functions are translated. Learners still to some extent must have English language skills or have access to a translation.

Findings and Analysis: Individual and Collective Representation

In AWEDU learner representation is constructed in various ways. The identity of the learner is essential for recognition, while avatars serve as the visual representation of learners in the 3D environment. While these two elements comprise and impact the direct construction of the learner, the environment also plays a strong role by illustrating world views displayed in the setting.

Findings: Identity

In real life, identity is often tied to some physical aspect of an individual. Appearance, facial features and voice are among the means by which we distinguish one another. In the AWEDU environment, these physical cues are not available. Learners are not recognized by voice, or by their appearance, but instead must rely on unique identities to identify one another. Within the Active Worlds Educational Universe registered users may select a unique identity. This identity/name may not be used by any other leaner. This provision allows learners to recognize and contact each other. A learner's unique name appears above his/her avatar the first time he/she uses the chat tool during a session. If the learner wishes to remain anonymous or lurk, not "speaking" will insure anonymity.

With a unique identity, learners may have extended communication options such maintaining a contact list which allows them to identify when another learner on their list is currently active. The may also send and receive telegrams from learners currently inhabiting other worlds. Although learners have the option of changing their unique name, any name change will be reflected in other learner's contact lists.

Analysis: Identity

A unique identity brings both privileges and accountability. It allows learners to establish both reliability and consistency in both the personal and social arena. Learners can build, develop contact lists, send and receive telegrams. This is important for establishing a degree of trust among learners. Along with the privileges of a unique identity comes a degree of accountability. Within a system where learners adopt alias identities a unique identity prevents learners from impersonating one another. In turn, this affords learners with some degree of self-governance among learners. The accountability established by a unique identity can also impose inverse limits on well meaning learners. Once a learner establishes a unique identity and other learners may add him/her to their contact list, any subsequent changes in his/her adopted identity will be reflected on the other learners' contact list. Initially this may not seem to impose limitations on how the learners represents themselves; however, in an environment where learners are free to re-construct themselves or develop alternate personae this can prove constrictive.

Findings: Avatars.

The creators of AWEDU define "avatar" as "the visual representation of people who currently inhabit the virtual environment. In an AWEDU world, avatars serve not only as the visual representation of a learner, but also as the camera into a 3D environment.

AWEDU provides a stable of avatars that world owners may select and make available to learners visiting a world setting. Learners are limited to selecting from avatars provided by world owners. Because of the limited range of avatars, many learners may use the same avatar within an environment. Consequently, learners must rely upon the unique identify to identify other learners.

With few exceptions the AWEDU avatars represent young, fit, Western, Caucasians. There are more male avatars than female, and it is interesting to note that there is a greater range of body types, sizes, ages, and styles of male avatars than female. Within the selection of female avatars, there is little variety in size, weight, age, ethnicity, and race. Most of the female avatars represent young shapely women with either snugly fitting clothing or short dresses and high heels. There are also no avatars representing differently-abled persons. There are, however, a few alternatives for learners not wanting to be represented as humans or as a gender typically in the form of a bird or alien-type caricature.

AWEDU allows world owners to create and import custom-made avatars; however, creating an AWEDU avatar is no small feat, nor one easily accessible to many learners. Creating an AWEDU avatar requires a basic knowledge of 3D concepts. It also requires that a learner be fairly proficient with creating Renderware (RWX) objects or in using 3D modeling software such as Caligari's Truespace.

Analysis: Avatars

For most learners there is little opportunity for creating custom avatars. With the exception of world owners, learners are confined to using one of the prefabricated avatars provided by an individual world. For visual representation, learners must rely on avatars that may not reflect their personal values, culture, ethnicity, or physical bodies. The avatars are primarily idealized representations of young adults that clearly reflect Western body-image values.

Findings: Environment

Initially it may seem incongruent to include environment as a component in learner representation. However, in AWEDU while various factors may limit or prevent learners from creating and using custom-made avatars, many worlds provide opportunities for building within worlds. AWEDU is a user-extensible system which allows learners to add to and build within a world setting. Depending upon provisions determined by the owner of a world, learners can claim property by placing ground covering on a section and build. Once a piece of land is staked or covered by a learner, no other user may build on that land, or above and below it. To build or add to property claim, a learner merely chooses from a selection of pre-fabricated objects that exists in the object library and places the object in the desired location. The objects in the library range from a variety of building materials such as walls, doors, and windows to specific items such as televisions, glasses, and cars. There are also a full range of objects such as flowers, trees, grass, and bushes that allow users to create an outdoor setting as well.

Analysis: Environment

Throughout most of the worlds in the AWEDU, are elaborate buildings and roadways constructed by learners and developers. These environments sometimes reflect places that exist in the physical world, and sometimes border on fantastic. One question worth asking is why is there a need for buildings and roads? In life, buildings serve many purposes, but primarily they offer us shelter from the environment. In a virtual world setting, there is no impact from the environment. It doesn't rain, snow, and the temperature has no impact upon our avatars. There is no real sun and the ambient lighting never changes. Why have buildings? Why have ground or gravity? The stock objects reflect and anticipate how developers perceive AWEDU will be used. While the provision of stock objects affords an assessable means of building in a world, it also constrains how one might envision a world (Heim, 1998).

The objects provided by AWEDU also reflect values of how nature is to be regarded. While there are a plethora of tress, flowers, bushes and grass to select, it is important to note that there are no weeds, the grass is well groomed, and the trees never shed leaves or require attendance. Nature is contained and controlled. Nature is modeled on a culture in which is mechanized and submissive (Merchant, 1980). The values perpetuated clearly reflect Western values of nature and the environment with no mutual impact on either the environment from the avatars or upon the avatars from the environment. In AWEDU, nature is contained and subservient, and learners are both in control and impervious from impact. Both the types of objects for constructing structures and the objects available for constructing nature reflect also reflect Western values.

Findings and Analysis: Embodiment

It may seem somewhat incongruent to speak of embodiment in a computer-mediated environment such as AWEDU. Although there are avatars serving as representatives of learners, nothing really impacts the avatar. It doesn't get hurt, feel hungry, or become tired. Avatars do not feel gravity or in anyway impact the environment. Despite that lack of kinesthetic cues, surprisingly research reveals that users in 3D virtual world settings often adopt and maintain proximity customs from in real-world interactions (Jeffery & Mark, 1998). Embodiment in AWEDU is constructed by way of animated avatar gestures, actions, and emotions; learner point-of-view and navigation; and kinesthetics and the environment.

Findings: Gestures/Emotions/Actions

In an AWEDU world, avatars are rarely idle. Unless the learner specifically alters the performance settings, all avatars inhabiting a world will cycle through a series of gestures. The gestures are not controlled by learners, but instead are pre-programmed animations which consist of such movements as the folding and unfolding of arms, looking from side to side, looking at a wristwatch (which may not be present), shifting weight, tapping a foot, and patting hair. Some facial gestures include blinking and winking. Learner have no direct control over these gestures, but are limited in whether or not to display them on their own systems.

Learners are only able to command a few emotions and actions of their avatar. The emotion commands might include such emotions as happy (the users avatar jumps up and down), and angry (pointing and shaking hand). Actions that can be controlled by the user include: wave, jump, and fight. These actions are not reflected from the learner's perspective.

Findings: Avatar Point-of-View, Navigation, and Kinesthetics

In AWEDU, the avatar serves two distinct purposes: it serves as a visual representation of the learner and it serves as the camera by which the learner views the 3D environment or scene. Learners have the option of selecting between first person perspective or an orthographic or third person perspective. The orthographic view allows users to see themselves (or more correctly, their visual representations) in 3D. This feature is helpful for choosing an avatar and building within the world. In order for the learners to move through simulated 3D space; it is necessary for the avatar or camera to move. Avatar navigation is limited to moving forward and backward and side to side. Learners may additionally look up and down as well as fly and descend.

There are few affordances that provide for much kinesthetic cues and experiences. Learners' cannot control avatar limbs, and other than navigational movement, very little is reflected from either first-person or third-person perspective. While avatars do not register impact with each other, depending upon specifications designated by a world owner, avatars may register impact upon encountering an object.

Analysis: Embodiment

Learner embodiment is constructed through gestures, emotions and actions, navigation and viewing perspective. From the perspective of cultural kinesthetic or non-verbal behavior it is interesting to examine the implication of some of the gestures that animate learner avatars. In most North American cultures when engaging in a conversation, looking at one's watch, or looking from side to side might indicate boredom or impatience. Additionally, to wink at someone may imply a range of different meanings within the context of a conversation. Although learners have no direct control over gestures, the non-verbal behavior conveyed through gestures may be in direct conflict to what is being communicated through the textbox.

Learners have limited control over actions and emotions. They have the option of displaying an action or emotion; however they have no control over how the action or emotion is displayed. None of the animations are reflected from a first-person perspective but can only be viewed from third-person perspective.

There are few affordances for embodiment in the AWEDU environment. For the most part, learners are prevented from displaying much non-verbal communication but must rely on text to convey emotions. This reliance on text might lead one to assume that the user is limited to text in constructing a sense of embodiment. Embodiment to some degree in AWEDU is relegated to the realm of navigation and proximity. The ability to see other learners and to move around may be sufficient to construct at least a limited sense of embodiment for learners. However, depending upon the purpose for which AWEDU is being used, it may be important to question how the limits of embodiment imposed on the user might limit the types of experiential knowledge that may be gleaned from these environments.

Discussion and Conclusion

One of the considerations that should be addressed by using AWEDU as a learning environment is whose world view is being promoted in this environment? AWEDU is embedded with cultural information and values. Choices made by the developers reflect and perpetuate ontological and epistemological views of the developers and in turn, learners in this environment are constructed by cultural values that may not reflect their own world views. Research into race, ethnicity, culture, and gender in virtual communities argues that virtual communities are embedded with values and hidden assumptions that promote the interests of some users, while marginalizing other users (Bailey, 1996; Balsamo, 1994; Branwyn, 1994; Cherny, 1995; Milthorp, 1996; Stone, 1995; Todd 1996; Turkle 1995) and AWEDU is no exception. To enter this virtual environment requires one to move into Cartesian space; to temporarily accept the notion of a mind/body split (Pryor and Scott, 1993). This temporary acquiescence is a product of Western cultural values and is not shared by all cultures (Todd, 1996). The paradox of the move into Cartesian space is that body hidden or obscured is both liberated and repressed (Stone, 1995). Learners are both emancipated from physical-bound representation, yet a new construction of self is filtered through technology.

AWEDU is a product of a Western ontology which is reflected in both how the learner and the environment are constructed. The affordances and constraints of the application reveal Western values both in how the learner and nature/environment are represented and by the lack of impact either have upon the other. The purpose of this investigation is not to discount the potential AWEDU might offer as a learning environment, but rather to apply a critical-cultural lens in which to view how this application might impact potential learners. In an era in which inclusion and diversity imbricate education, it is important we challenge educational developers to rethink the impact their designs have upon the relationship between learners and technology. Despite the constraints AWEDU imposes on learners one way in way in which this technology may prove most educational is that it a revealing mirror that reflects both values and assumptions about our culture and all it entails.

References

Adler, P.A. & Adler, P. (1994). Observation techniques In Norman K. Denizen and Yvonna Lincoln eds. Handbook of qualitative research. Thousand Oaks: Sage.

Bruckman, A. (1997). MOOSE Crossing: Construction, community, and learning in a networked virtual world for kids. Doctoral dissertation, Massachusetts Institute of Technology.

Bailey, C. (1996). Virtual skin: Articulating race in cyberspace. In Mary Anne Moser with Douglas MacLeod (Eds.), Immersed in technology: Art and virtual environments. Cambridge MS: The MIT Press.

Balsamo, A. (1994). Feminism for the incurable informed. In Mark Dery (Eds.), Flame wars: Discourse of cyberculture. Duke: Duke University Press.

Branwyn, G. (1994). Compu-sex: Erotica for cybernauts. In Mark Dery (Eds.) Flame wars: Discourse of cyberculture. Duke: Duke University Press.

Cherny, L. (1995). "Objectifying" the body in the discourse of an object-oriented MUD. In C. Stivale (Eds.), Cyberspaces: Pedagogy and performance on the electronic frontier.

De Vaney, A. (1993). Reading educational computer programs. In Robert Muffoletto and Nancy Nelson Knupfer (Eds.) Computers in education: Social, political & historical perspectives. New Jersey: Hampton Press.

Dibbell, J. (1994). A rape of cyberspace; or how an evil clown, a Haitian trickster spirit, two wizards, and a cast of dozens turned a database into a society. In Mark Dery (Eds.), Flame wars: Discourse of cyberculture. Duke: Duke University Press.

Fontana, A. & Frey, J. H. (1994). Interviewing. In Norman K. Denzin and Yvonna Lincoln eds. Handbook of Qualitative Research. Thousand Oaks: Sage.

Gibson, J. J. (1977). The theory of affordances. In R.Shaw & J. Bransford (Eds.) Perceiving, acting, and knowing: Toward an ecological psychology (pp. 67-82). Hillsdale, New Jersey: Erlbaum Associates.

Heim, M. (1998). Creating the virtual middle ground. Technos: a quarterly for education and technology. 7:3.

Jeffery, P. & Mark, G. (1998). Constructing social spaces in virtual environments: A study of navigation and interaction. In Hook, K., Munro, A., & Benyon, D. (Eds), Workshop on Personalized and Social Navigation in Information Space. Stockholm: Swedish Institute of Computer Science (SICS), 24-38.

Merchant, C. (1980). The Death of Nature: Women, Ecology and the Scientific Revolution. Mew York: Harper Collins.

Milthorp, R. (1996). Fascination, masculinity, and cyberspace. In Mary Anne Moser with Douglas MacLeod (Eds.), Immersed in technology: Art and virtual environments. Cambridge MS: The MIT Press.

Morningstar, C. & Farmer, F. R. (1994). The lessons of Lucasfilm's Habitat. In Michael Benedikt (Eds.), Cyberspace: First steps. Cambridge: The MIT Press.

Pryor, S. & Scott, J. (1993). Virtual reality: Beyond Cartesian space. In Philip Hayward and Tara Wollen (Eds.), Future visions: New technologies of the screen. London: BFI Publishing.

Riner, R. D. (1996). Virtual ethics-- Virtual reality. Futures Research Quarterly, 12 (1). 57-70.

Stone, A. R. (1995). The war of desire and technology at the close of the mechanical age. Cambridge: The MIT Press.

Todd, L. (1996). Aboriginal narratives in cyberspace. In Mary Anne Moser with Douglas MacLeod (Eds.), Immersed in technology: Art and virtual environments. Cambridge MS: The MIT Press.

Turkle, S. (1995). Life on the screen: Identity in the age of the internet. New York: Simon & Schuster.

Stepping Stones to Integration: University of Northern Colorado's Preparing Teachers to Use Technology Team's Design and Development of Preservice Teachers

Dennis Charsky

Donna Ferguson Pabst

Manisha Javeri

Pei-Lin Liu

Caroline Sanzone

Edward Caffarella

University of Northern Colorado

Abstract

The University of Northern Colorado's (UNC) Educational Technology Department's (ET) Preparing Tomorrow's Teachers to Use Technology (PT3) grant proposes to infuse technology-use in the preparation of Colorado's preservice teacher programs. UNC's PT3 project has five initiatives, one of which is to redesign the two, one-credit Department of Educational Technology courses that UNC preservice teachers are required to take. Previously, both courses equipped students to use computer productivity tools. Although students still learn such skills in the redesigned Technology in Education (200-level course), in the Educational Technology Applications (300-level course) they must now apply those skills to typical teaching tasks appropriate to the grade levels they are planning to teach. This paper discusses the processes the team followed and the stepping stones required for preservice teachers to be prepared to integrate technology into their K-12 classrooms.

Introduction

The University of Northern Colorado's (UNC) federally funded Preparing Tomorrow's Teachers to Use Technology (PT3) grant (Infusing Technology Use in the Preparation of Colorado Preservice Teachers) proposes to infuse technology-use in the preparation of Colorado preservice teachers. UNC's grant has three overarching goals: (a) graduates of the UNC teacher education programs will effectively utilize technology for instruction in their classrooms when employed as full time teachers, (b) UNC student teachers will effectively utilize technology for instruction in the partner school classrooms, and (c) UNC faculty members will effectively utilize technology for instruction and model appropriate technology use for the preservice teacher education students. In order to meet these goals, the PT3 project has five initiatives, one of which is to redesign the two, one-credit undergraduate educational technology courses. (Initiative One: Enhance the required educational Technology courses for students in the Professional Teacher Education Programs [PTEP] courses.)

Technology in Education

The number of computers in K-12 schools has increased dramatically over the past two decades, yet despite this growth, computer-based technologies are not being efficiently and effectively utilized by the majority of teachers. Without reform to education programs we will not see improvements in technology integration in K-12 schools (Office of Technology Assessment, 1995; Moursund & Bielefeldt, 1999). Teachers report there is a low level of computer use in their classrooms because of limited access to equipment and lack of training (Bosch & Cardinale, 1993). The equipment is more than unavailable (National Center for Educational Statistics, 2001), teachers feel inadequately prepared to use it (AACTE, 1999; Bosch & Cardinale, 1993; Topp et al., 1995). Preservice teacher education schools, colleges, and departments of education (SCDEs) are not solely responsible, but they are definitely lagging behind in meeting the needs of new teachers who must fully understand technology integration (Walters, 1992). A study, commissioned by the Milken Exchange and conducted by the International Society for Technology in Education (ISTE), found that teacher preparation programs, while well-intentioned, are not providing the kind of training and exposure teachers need if they are to be proficient and comfortable integrating technology with their teaching. Furthermore, preservice teacher education candidates must be able to recognize and address the technology integration needs of the schools which they are ultimately placed. They must also be able to model the various technology usages for the teachers and students with whom they will be working. Preservice teacher education programs need to provide instruction in educational technology in order to better prepare prospective teachers (Moss, 1988). Not only does the need for technology integration surface in research, it has been mandated through the National Council for Accreditation of Teacher Education (NCATE) and Colorado's Department of Education (CDE) content standards.

Content and sequence of courses. The preservice teachers at UNC are now required to take both Technology in Education (200-level course) and Educational Technology Applications (300-level course). Originally these two courses were encompassed in one, two-credit class. Data gathered from students taking this course early in their academic program showed that the productivity tools that were taught were very helpful but the integration and theory components did not make a great deal of sense. On the other hand, the data showed that students who took this class later in their academic career felt that if they had learned the tools earlier in their coursework they would have used these skills to support their learning in other classes. This group of students, however, found the theory and integration components tremendously relevant. This two-credit course was eventually divided into two one-credit classes, a 200-level and a 300-level, at that point of their academic career, to better teach both the productivity tools and the theoretical components. Both of these courses equipped students to use computer productivity tools (e.g., word processing, spreadsheets), with the 300-level course adding educationally relevant projects. Although the classes were listed as specifically appropriate for elementary, middle, or secondary preservice teachers, much of the content was generic. Students typically take the 300-level educational technology courses just prior to student teaching at the end of their junior or beginning of their senior year. During the fall and spring semesters there are approximately 8 sections of the courses with 20 students in each section. Including summer sections, approximately 400 undergraduate preservice teacher education students enroll in the 300-level courses during a year. In order to meet ISTE, NCATE, and Colorado Preservice Teacher standards, as well as the objectives of the grant, the 300-level courses are once again being transformed.

Lessons Learned. The grant team, consisting of the Project Director, Project Manager, and seven doctoral students in the Department of Educational Technology, has followed an instructional design process in the redesign efforts for the 300-level undergraduate courses. As part of the needs analysis, the PT3 team fully investigated research, state and federal standards, university curriculum, and the needs of the partner schools. Qualitative data gathered and analyzed by Lohr, Javeri, Mahoney, Strongin, and Gall (2000) found students taking undergraduate educational technology courses at UNC in the past wanted more challenging projects, project examples and non-examples, and fewer open laboratory meeting times. The graduate teaching assistants who served as instructors for these classes, felt that students who chose to take the course online and did not attend many, if any, of the classes had turned in less sophisticated projects than those who participated in the weekly class sessions. Lohr et al. (2000) also found that once students had completed the required undergraduate courses in educational technology, they had strong technology skills, but did not have good skills for the integration of those technologies into their instruction. This finding is also reflected in a national study completed by Persichitte, Tharp, and Caffarella (1998).

ET 300-level course redesign. After implementing the redesigned 200-level courses, the PT3 team examined NCATE standards, CDE standards, National Education Technology Standards (NETS), International Society for Technology in Education (ISTE) standards, UNC requirements, and data gathered from interviews with local public school personnel. These data were enhanced with additional data gathered from interviews with subject matter experts, extant data from the partner schools, and assessment documentation. These data were thoroughly analyzed and objectives were written for the 300-level course to ensure UNC teacher education students would have mastery of the appropriate applications and integration of technology in K-12 classrooms. As a result, the PT3 team recognized that empowering teachers with technology tools is insufficient for preparing them to integrate technology into their pedagogy. Five components were identified as critical to technology integration: (a) instructional software/media evaluation, (b) learning theory, (c) room management, (d) data evaluation, and (e) instructional design.

The graduate assistants were divided into two teams, theory and case study, based on the course content. The team realized, because of available data, that preservice teachers need to see technology integration modeled in the teaching and learning process (Oliver, 1994; Siegel, 1994). They need to be taught how to integrate the technology seamlessly into the curriculum as well as understand how to use the hardware and software.

Stepping Stones to Integration

The theory portion of the 300-level classes addresses components that are the stepping stones to technology integration: Software Evaluation (SE), Rationale for Technology Integration (TI), Technology and Teaching Strategies (TTS), and Room Design and Management (RDM). This instruction is delivered to students in a variety of ways (didactic, cooperative learning, differentiated, discovery) in order to model the ways various teaching strategies can effectively deliver similar content through the use of technology. The culmination of the theory portion of the class is a set of three student created lesson plans that integrate technology. The students, however, are not free to produce any lesson; each student must use the *Lesson Plan Options Chart* (see Figure 1). This chart's purpose is to force students to create three separate lesson plans utilizing different hardware, software, content, and teaching strategies. The chart forces students to narrow down their options in order to devise creative methods to integrate technology in as many ways as possible. Each lesson plan must also address room design, state content appropriate standards, objectives, materials and resources, learner characteristics, and evaluation/assessment procedures. Because lesson plans are the backbone of a teacher's instructions, students are carefully guided through an instructional design process.

Figure 1 Lesson Plan Options Chart

<table>
<tr><td colspan="3">Lesson Plan Options Chart</td></tr>
<tr><td colspan="3">Instructional Topic: ____</td></tr>
<tr><td>Computers
Choose One</td><td>Available Software
Choose One or More</td><td>Teaching Strategies
Choose One</td></tr>
<tr><td>1

10

30 – Computer Lab</td><td>Internet Explorer
Netscape Navigator
Microsoft Word
Microsoft Excel
Microsoft PowerPoint
Inspiration
HyperStudio
DreamWeaver
Adobe Photoshop
Content Software
CD-ROM
Title: _________________
Internet Based
URL: www. _____________</td><td>Cooperative Learning
Guided Discovery Learning
Individualized Learning
Lecture/Demonstration
Discussion
Other
(Must include typed description with lesson plan.)</td></tr>
<tr><td colspan="3">Mandatory Tasks</td></tr>
<tr><td>Part A
One lesson plan
One options chart</td><td>Part B
Two lesson plans
Two room maps
Two options charts</td><td></td></tr>
</table>

The importance of this project lies in the sequence of the four components (SE, TI, TTS, & RDM). Students enter the class with a plethora of emotions ranging from anxiety of working with computers to boredom and frustration because they do not comprehend how integrating technology can enhance pedagogy or improve student learning. The basis of the Lesson Plan project is to get students excited and enthusiastic about the capabilities and opportunities available from integrating technology as well as giving them the foundation for the second half of the class, a case-based study (Sanzone, et al., 2002).

Software Evaluation

In order to make informed decisions about instructional software, teachers need to be aware of and understand the qualities of good software. Textbooks and library materials are selected carefully and judiciously in schools districts (Klawe, 1994); however the same is not always true with software. Most schools do not have large software acquisition budgets and the lack of funding becomes even more exaggerated when teachers purchase software without first evaluating it on the basis of specific criteria (Sanders, 1995). The first assignment for the 300-level courses, therefore, is based on the identification, evaluation, and selection of appropriate quality instructional software. An online form asks students to detail general information, system requirements, and type of application, as well as evaluate the software's screen design, instructional content, orientation, motivation, navigation, and support available. Students complete this assignment online and also have access to an online searchable database of evaluated educational software for future use in their classrooms.

Rationale for Integration of Technology

The Rationale for Integration of Technology component answers the question we hear too often from our students: "Why do we have to take this computer class?" It is our opportunity to communicate the benefits, possibilities, and importance of technology integration. The objective of this component is to gain student's attention by showing innovative and unique instruction using videos of best practices created by the University of Northern Iowa's PT3 grant. Instruction for the class begins with a definition of technology. We define technology as any device that contributes or assists in instruction and/or learning, Our rationale for integrating technology is then presented to the class. The lecture begins with motivation theory and technology's capability to increase students' motivation through increased learner control and interactive learning environments. Next, the lecture continues by highlighting technology's capability to help students visualize concepts, facts, and problems; gain instant access to information; and apply learning using productivity tools. Further, instructors introduce instructional environments and activities that aid in individualizing learning and facilitate new instructional methods (e.g. constructivism, collaborative learning). Finally, the preservice teachers are shown the power of technology to harness and display a wealth of data that can be applied to instruction and improve student learning. Next, the students see videos of teacher's integrating technology into their class and pedagogy. Students are instructed to watch the video and then note specific instances in each video that showcase technology motivating students, using unique instructional methods, assists in students visualizing concepts, facts, and problems; gaining instant access to information; and applying learning using productivity tools, and harnessing and displaying data. After each video students are asked to volunteer their observations. Having sparked interest and enthusiasm, students are prepared to apply their excitement and knowledge. In the process, we have answered the nagging question, "Why do we have to take this computer class?"

Technology and Teaching Strategies

The third component, Technology and Teaching Strategies, bridges the rationale for integrating technology into practice. The purpose of the TTS component is to have students recognize how and where to integrate technology in order to enhance their traditional classroom teaching methods. This component emphasizes that technology use can be transparent when integrated in a manner that provides students with challenging, relevant tasks and activities. The class begins by discussing six teaching strategies (e.g. lecture, discussion, cooperative learning, individualized learning, discovery learning, hands-on learning) and how these strategies can be applied in traditional classrooms.

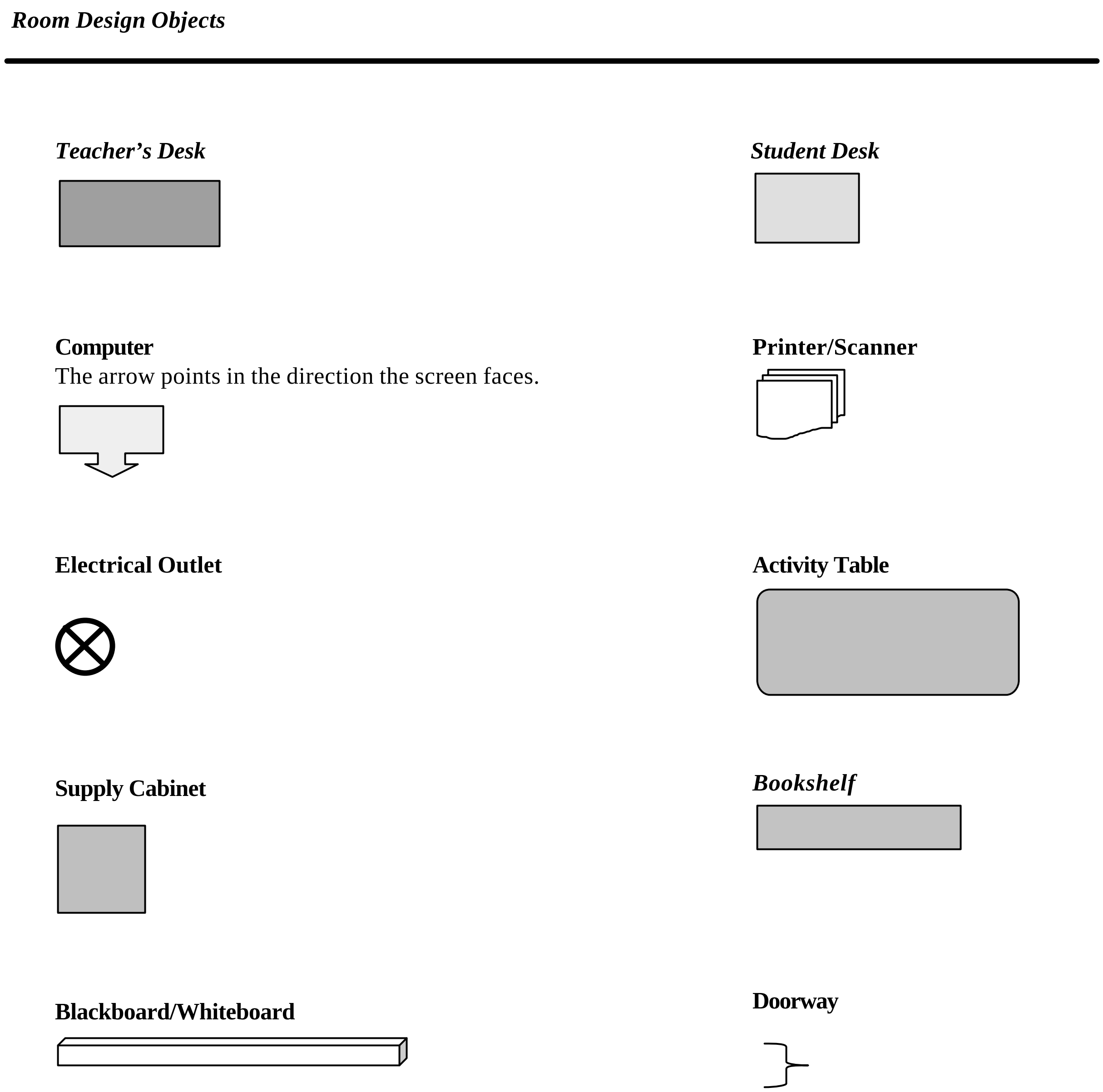
The class then breaks into four to five small groups with each group receiving one lesson plan that integrates technology. The content of each technology integrated lesson plan is the United States Constitutions' Bill of Rights. However, each lesson plan uses a different teaching strategy to deliver the same content (http://www.coe.unco.edu/ET34z/TeachingStrategy/TS_Assignment.htm). Each group then evaluates the technology integrated lesson on the degree to which the lesson plan fulfills the rationale for integrating technology. Further, the students are asked to analyze the lesson plan to judge whether the instructional objectives were met, sufficient time was allocated to the use of technology, and if the lesson will assist students in passing the Colorado Student Achievement Program (CSAP) exams.

During the next class, the groups are then re-created using a jigsaw technique. Students then present to members of the other groups, their group's evaluation of the lesson plan they discussed. Analyzing six different lesson plans that use different teaching methods and various technology enables students to comprehend the plethora of ways technology can be integrated appropriately and seamlessly.

Room Design and Management

The final component, Room Design and Management, moves the students from specific theory based pedagogical practices to practical concerns and issues regarding technology integration. Technology can bring a great many benefits into the classroom but it can also cause a great deal of strife. This component (RDM) deals with how teachers can effectively plan for and minimize potential management problems. The preservice teachers learn that using job aides, schedules, student experts, and the arrangement of computers can minimize or eliminate time necessary for troubleshooting, correcting off task behaviors, and dealing with students accessing inappropriate websites. To reinforce the importance of planning ahead to minimize disasters, every student is required to evaluate the room arrangement of a computer laboratory (room consisting of at least twenty computers). For homework, students evaluate the computer laboratory, judging whether the arrangement of computers lessens sunlight glare, facilitates easy movement of students and teacher, and allows for easy monitoring of student efforts; evaluating whether or not users have the ability to adjust volume controls; and evaluating the quality of available job aids, if they exist. Students must also create a room map in Microsoft Word showing the computer laboratory they evaluated (see Figure 2). Students return to class the next week with a completed computer evaluation chart, pair up with a classmate, and share their room map and assessment of the computer laboratory. When students have completed the portion of the class, they have the necessary skills and knowledge to create three lesson plans that integrate technology. In subsequent classes, students enter into a problem based learning environment that utilizes each of these stepping stones to integrating technology.

Figure 2 Room Design Objects



Summary

The components discussed in this paper are what the PT3 team considers the stepping stones to successful integration of technology. The sequence and activities in the first portion of the redesigned 300-level course thoroughly addresses the students' misgivings about the required educational technology courses. By completing the four components, the students shed their unenlightened perspectives for a more enthusiastic creative view. The ET 300-level students eave this part of the class with three completed lesson plans that effectively integrate technology, which can be placed in their preservice teacher exit portfolio. The instruction described also prepares students for the second part of the 300-level class, a problem-based study that asks students to actively apply learned knowledge and skills (Stepping Stones) to a problem situation. Each piece of this case-based learning unit enhances students' understanding of technology integration as well as the standards it is based upon. The effort to redesign the required 300-level educational technology course has been a year long process of analysis, design, development, implantation, and evaluation. Because instructional design is not a linear process, members of the redesign team continue to improve the class through formative and summative evaluations procedures.

References

American Association of Colleges for Teacher Education. (1999). Teaching teachers; Facts and figures. Washington, DC: Author. ED 292 774.

Bosch, K. A., & Cardinale, L. (1993). Preservice teachers' perceptions of computer use during a field experience. Journal of Computing in Teacher Education. 10(1), 23-27. EJ 492 121.

Klawe, M. N. (1994). The educational potential of electronic games and the E-GEMS project. In T. Ottman & I. Tomek (Eds.), *Proceedings of the World Conference on Educational Multimedia and Hypermedia*, 94, 61-67.

Lohr, Javeri, Mahoney, Strongin, & Gall (2000, November). *Rapid application development of self-paced preservice teacher technology courses.* Paper presented at the Association for Educational Communications and Technology, Denver, CO.

Moursund, D., & Bielefeldt, T. (1999). *Will New Teachers Be Prepared To Teach In A Digital Age? A National Survey on Information Technology in Teacher Education.* The Milken Exchange and the International Society for Technology in Education (ISTE), 2/23/99

Office of Technology Assessment. U. S. Congress. (1995). *Teachers and technology: Making the connection.* Washington, DC: U. S. Government Printing Office.

National Center for Educational Statistics. (2001). *The Digest of Education Statistics.* Washington DC: U. S. Department of Education.

Sanders, J. (1995). Girls and technology: Villian wanted. In S. V. Rosser (Ed.), *Teaching the majority.* (pp. 146-154). New York: Teachers College Press.

Sanzone, C., Ferguson-Pabst, D. E., Hunt, E. R., Bevill, L., Charsky, D., Javeri, M., Liu, P. L., & Caffarella, E. P. (2002). *Using case-based methods to prepare tomorrow's teachers to use technology.* Manuscript submitted for publication.

Topp, N. W., Mortensen R., & Grandgenett, N. (1995). Building a technology-using faculty to facilitate technology-using teachers. *Journal of Computing in Teacher Education, 11*(3), 11-14. SP 524 325.

Walters, J.T. (1992, June). *Technology in the curriculum: The inclusion solution*. Paper presented at the National Forum of the Association of Independent Liberal Arts Colleges for Teacher Education, Louisville, KY.

Use Of Support Tools In Computer-based Learning Environments: A Literature Review

Geraldine Clarebout

Jan Elen

University of Leuven

Abstract

Computer-based learning environments often confront learners with a number of non-embedded support devices, called tools. Environments in which tools are available for students assume learners to be the best judges of their own learning needs. However, research indicates that students do not always make adequate choices towards their learning process. To gain more insight in whether and how students use tools in computer-based learning environments, a literature review study was performed. A search was performed on the ERIC and Psycinfo-databases to find relevant literature with respect to tool use in computer-based learning environments. The publications had to deal with a research study in order to be taken into account in this review. This resulted in 25 studies. The results of these studies are discussed in this contribution to identify underlying factors influencing tool use.

Introduction

Computer-based learning environments often confront learners with different support devices to foster learning. These support devices can either be embedded or non-embedded support devices. Embedded support devices are totally integrated in the learning environment and cannot but be used by learners. Examples of such devices are feedback or structure in learning material. Non-embedded support devices or tools on the other hand are support devices which use depends on the initiative of the learners. They are added to the environment, and the learner decides on their use. In this contribution the latter kind of support devices is addressed.

However, it should be noticed that not all authors identify these support devices as tools, as devices whose use depends on the initiative of the learner. For instance, Hannafin, Land and Oliver (1999) make a distinction between tools and scaffolds, where scaffolds relate to the explicit guidance of the students and tools provide the means through which individuals engage and manipulate both resources and their own ideas. In this contribution scaffolds are identified as tools whenever their use has to be initiated by the learners. Moreover, all other categories could also be embedded support devices if the initiative to their use would not rest with the learner.

Designing environments in which tools are available for students assumes learners to be good judges for their own learning needs. They select the tools whenever they need it. Students are in control over the use of these tools. Contrary to these assumptions, research on learner control, reveals no clear benefit of learner control on learning (see reviews of Large, 1996; Friend & Cole, 1990; Goforth, 1994, Williams, 1996). In most learner control studies a positive effect on learner's attitude was found. The effect on learning results is clearly mediated by various student characteristics. Basically these reviews conclude that students are usually not capable to make adequate choices for themselves (see also Land, 2000; Hill & Hannafin, 2001; Clark, 1991; Lee & Lehman, 1993; Milheim & Martin, 1991), i.e. choices beneficial for their learning process. In an instructional context, students seem to lack the necessary skills to monitor and regulate their own learning. It is likely that similar problems occur with respect to control over tool use. If students indeed lack monitoring and regulation skills, they will have problems in determining when they need help, what kind of help they need and hence, when the use of specific tools might be beneficial. A recent evaluation study and follow up study performed by the authors for instance, confirmed that students do not use the available tools when working on a diagnostic problem in a computer-based training program (Clarebout, Elen, Lowyck, Van den Ende and Laganà, 2000; Clarebout, Elen, Lowyck, Van den Ende, Van den Enden, van Gompel & Vermeulen, 2001). Additionally, if students used the tools, they did not use them in an optimal way. The problem seems not to be specifically related to tools. For instance, Greene and Land (2000) reveal that even when support devices are integrated in the environment and students are obliged to use them, they tend to use them inadequately. Questions were provided to students to engage in deeper processing. In contrast to using these questions as a tool to aid cognition, students ignored them or responded with activities rather than the different underlying processes. Brush and Saye (2001) came to the same results in their study.

From the above, it can be noticed that the use of tools cannot be taken for granted. In order to gain more insight in the use of tools, a literature review study was performed. This study deals with tool use in computer-based learning environments. Consequently, only studies with computer-based learning environments are discussed. Do students use tools and if so, how do they use them is the core question. The results of this review may provide more empirical insights on the different assumptions underlying tool use and may help to identify learner characteristics and other variables playing a role with respect to tool use.

After a brief discussion of the methodology, an overview of the results is presented. Next, the results of these studies are reflected on in the discussion and finally possible solutions and suggestions for further research are offered in the conclusion.

Method

This literature review started with a search on the ERIC and PsycInfo-databases (for the descriptors: see Table 1). In Table 1, the number of initially found records is presented. The descriptors relate specifically to the use of tools or synonyms (options, adjunct aids) and to environments in which tools are most likely to be available (open learning environments, hypermedia environments). No limitation was applied for publication year. For all searches, the term "research" was added, since the aim was to find research studies involving tool use rather than mere descriptions of tools. If the search yielded too many results (N > 300), "computer+" and "use" were additionally entered as descriptors. Since this still resulted in 694 results for the ERIC database and 407 for the PsycInfo database for the descriptor "simulation+", the descriptor "support" was added to reduce the amount of results.

Table 1: Descriptors

Descriptors	**Number of initial documents**	
	ERIC	***PsycInfo***
“option+ use” and research	4	4
“use of option+’ and research not “option+ use”	10	3
“use of tool+” and research	54	161
“tool+ use” and research not “use of tool+”	17	0
“open learning environment+” and research	5	5
“electronic learning environment+” and research	7	1
“hypermedia environment+” and research	10	14
hypermedia and research and use not “hypermedia environment+”	298	165
“learner control” and research	204	60
“instructional intervention+” and research	64	35
“adjunct aid+” and research	4	1
“discovery learning” and research and computer+	95	44
“use of resource+” and research	119	52
“inquiry-oriented instruction” and research	9	0
“project-based” environment and research	3	2
“computer-assisted learning” and research	108	25
Simulation+ and research and use and support	61	48

All abstracts were read to find out whether these publications dealt with research on the use of tools. If these studies involved the use of tools, a research study (quantitative or qualitative) and a computer-based learning environment, the article was withdrawn. No constraints were put on level of education. Additionally, references of articles were looked at to find more studies. If a reference was found to a conference paper, the author was contacted to request that paper, accompanied by a request for similar references. Eventually 25 studies were withdrawn.

Results

To present the results, a distinction is made between the use of tools as independent, dependent and mediating variable. These terms should be considered in a broad sense. Some of the studies deal with correlations rather than causal relationships. This means that in a strict sense one cannot speak of dependent or independent variable. Depending on the aim of the study or the timing of events, the results were classified in one of the different sections.

Use Of Tools As Independent Variable

In this part, studies will be reported dealing with the use of tools as an independent variable. This will give insights in the effects of adding tools on the learning process.

Main Effects

Dempsey and Van Eck (1998) found that using an advisor tool positively correlated with the scores on the post-test. Unfortunately, the restricted number of times the advisor was consulted disabled them to apply causal statistics.

Viau and Larivée (1993) revealed that the use of a glossary explained 21.6% of the variance of results on performance. The use of a navigation map on the other hand did not influence the performance.

Carrier and Williams (1988) divided students in high option users and low option users and studied the difference between those two groups for performance. Only a moderate relationship was found between the level of option selection and performance.

Oliver and Hannafin (2000) researched the effect of tool use on higher order thinking. No influences were found. This might be explained by referring to the tools students used. The analysis revealed that mainly procedural tools were used and that tools aiming at helping the problem solving process were only seldom used. Additionally, qualitative analysis indicated that if these tools were used, they were not used as they were supposed to be. They were developed to scaffold higher order thinking, but students did not engage in higher order thinking processes when using these tools. For instance, they did not use the tools to organise information or to justify ideas, instead, when they used them, they applied them to make lists of web pages.

Interaction Effects

Carrier, Davidson and Williams (1985) compared students working either with a program in which students could decide on the use of elaboration tools (lean version) or with a program where students could choose to bypass elaborations (full version). They compared high ability users in the lean versions using a high number of options to high ability and low ability students in the full version to determine whether students made 'good' or adequate choices. High ability students seemed to profit from the choice they had in the lean version. However, some problems arose with the statistics since only few higher ability students selected few options and only few lower ability students selected many options in the lean version. Viau and Larivée (1993) found that for high ability students, time on and frequency of consulting the glossary was a better predictor for performance than time on the subject matter. The frequency spent on the navigation map had no influence. In the study of Carrier and Williams (1988) extremely high and extremely low option selectors or tool users showed decrements in the program controlled condition.

Cohill and Williges (1982) studied the effect of user versus computer initiated and selected help. Help initiated and selected by the user resulted in less time to finish the task, fewer errors and fewer editing commands, than help initiated and / or selected by the computer.

Martens, Valcke and Portier (1997) revealed an interaction effect between discernability and the use of processing tools on study outcome. When support is discernable, students seldom using processing tools have a higher score on the post-test than students frequently using those tool. Students seldom using processing tools score lower on the post-test than students using these tools more frequently, when support is non-discernable.

Summary

Some studies revealed a (moderate) positive effect of tool use on performance (Dempsey & Van Eck, 1998; Viau & Larivée, 1993; Carrier & Williams, 1988). This effect seems to be mediated by the kind of tool (e.g. use of glossary versus use of navigation map) and by the way students use these tools (Oliver & Hannafin, 2000).

There is some evidence for an interaction between ability and tool use on performance (Carrier et al., 1985).

It should be considered however, that most of these studies only deal with the effect of tool use on performance as a learning product. The influence on learning processes is only addressed in one study. Moreover, that was also the only study in which it was not merely looked at the quantity of tool use, but also the quality of tool use by looking at how students actually use the tools (Oliver & Hannafin, 2000). Table 2 provides an overview of the different studies and their results.

Table 2: Tool use as independent variable

	N	Environment	dependent variable	Result
Main effects				
Dempsey & Van Eck, 1998	58	Computer-based lesson	Performance during instruction	Pearson correlation: r = .407 p<.05
			Time spent on instruction	Pearson correlation: r = .432 p<.05
			Television watched	Pearson correlation: r = .292 p<.05
Viau & Larivée, 1993	70	Interactive textbook	Performance	Multiple regression analysis: 21.6% of variance explained by frequency of glossary consultation. Significant contribution of time (r = .32) and frequency (r = .44) of glossary consultation No significant contribution for time (r= .08) or frequency (r = .12)of navigation map consultation
Oliver & Hannafin, 2000	12	Problem-based learning environment	Use of higher order skills	Qualitative analysis: No effects found (little use) => no descriptives provided
Carrier & Williams, 1988	114	Computer-based lesson	Performance	Pearson correlation of option selection and post-test: r = .29, p<.05 ; with delayed test: r = .20 p<>05 Low opt. sel.: Mp= 4.7 SD=2.8 / Md= 4.8 SD=3.1 Medium-low opt.sel.: Mp=5.6 Sd=2.9 / Md=5.0 SD=3.4 Medium-high opt.sel.: Mo=7.4 SD=3.0 / Md=6.4 SD=3.4 High op.sel.: Mp=6.9 SD=3.7 / Md=6.5 SD=3.8
Interaction effects				
Carrier et al., 1985	20	Computer-based course	Performance	Fisher's Exact test: High-ability high option: post-test = .04 delayed =.11 High-ability low option: post-test:.80 delayed: .80 Low ability high option: post-test:.38 delayed:.51 Low ability low option: post-test: .11 delayed:.34
Cohill & Williges, 1982	72	Performance task	Time finishing task	User initiated user selected: M = 332.0 Other help configuration: M=394.8
			Errors per task	User initiated user selected: M = 0.8 Other help configuration: M=1.7
			Numbers of commands	User initiated user selected: M = 11.0 Other help configuration: M=15.0
			Command ratio	User initiated user selected: M = 2.7 Other help configuration: M=6.3 ANOVA's: no statistics presented, SD not given

Viau & Larivée, 1993	70	Interactive textbook	Performance	Regression analysis: Frequency glossary consultation: Weak: $M = 8.33$ $SD = 6.77$; $r = .43$ $p<.05$ Average: $M = 11.36$ $SD = 9.08$; $r = .50$ $p<.05$ Strong: $M= 10.75$ $SD=6.63$; $r=.30$, $p<.05$ Time on glossary: Weak: $M=11.46$ $SD =11.29$; $r= .26$ $p<.05$ Average: $M=16.26$ $SD = 16.07$; $r=.39$ $p<.05$ Strong: $M=12.11$ $SD =7.62$; $r=.54$ $p<.05$
Carrier & Williams, 1988	114	Computer-based lesson	Performance	MANOVA on repeated measures: Interaction between treatment and quadratic level of choice: $F(1,86) = 4.28$, $p<.05$ Interaction time by level of option selection, quadratic trend interaction: $F(1,86)=4.83$ $p<.05$
Martens et al. 1997	43	Interactive textbook	Performance	Discernability and processing tool: ANOVA: $F(1,42) = 5.66$, $p<.05$ Discernability and testing tool: ANOVA: $F(1,42)=3.67$, n.s. Discernability and orientation tool ANOVA: n.s.; no results provided

Use Of Tools As Dependent Variable

Studies on the use of tools as a dependent variable can be divided by considering the independent variables: student characteristics, support attributes, working method and additional advice. Interaction effects are dealt with after discussion of the main effects. These studies may contribute to identify variables that influence tool use.

Some studies refer to the same studies as presented in the previous section when use of support was both dependent and independent variable.

Student Characteristics: Main Effects

The following student characteristics have been investigated in the retrieved studies: general ability, prior knowledge, learning style, epistemic beliefs and metacognitive awareness.

The study of Carrier et al. (1985) showed high ability students using more elaboration tools than low ability students. Schnackenberg and Sullivan (2000) could not confirm these results, as they did not find any differences between low and high ability students. Chapelle and Mizuno (1989) did not find any significant difference for amount of tool use per minute, but did find a difference for amount of tool use per sentence. Low ability students use more tools per sentence than high ability students do. A more detailed look indicates that this difference is accounted for by consultation of facts and not by consultation of a grammar tool or dictionary. Chapelle and Mizuno also revealed high ability students to use tools differently than low ability students. High ability students use tools more while solving problems whereas low ability students use tools more as advance organizers.

The influence of prior knowledge on the use of tools was studied as well. Martens et al. (1997) found a positive effect of prior knowledge on tool use: the more prior knowledge students posses the more tools they use. Viau and Larivée (1993) claim this relation to be curvilinear. In their study, average students used additional information more frequent than both weak and strong students did.

Learning style was defined as the difference between active, neutral or passive learners (Lee & Lehman, 1993, Dempsey & Van Eck, 1998) or as field (in)dependence (Liu & Reed, 1994; Carrier, Davidson, Higson & Williams, 1984). No main effects of learning style defined as passive, neutral or active learners could be found. Neither did Liu and Reed (1994) find an effect for field (in)dependence in their study on the influence of learning style on the consultation of different tools. Although not significant, there seems to be a tendency for field independent students to more frequently use the index tool than field dependent students, while the mixed group more frequently uses the note-taking tool.

In contrast to Liu and Reed (1994), Carrier et al. (1984) did find an effect of field (in)dependence, but only for one elaboration tool, namely viewing additional examples. Field independent students viewed more additional examples than field dependent students did. For the other three tools (definitions, practice instances and feedback) no differences were found. Hasselerharm and Leemkuil (1990) found no difference for field (in) dependence.

Hartley and Bendixen (2001) studied the effect of metacognitive awareness and epistemic beliefs on the use of comprehension aids such as objectives and glossaries in a hypermedia tutorial. No effects were found of metacognitive awareness. Some significant correlations were found between belief in innate ability as epistemic beliefs and the use of self-check questions, belief in quick learning and respectively the use of advanced organizers and glossary. Opposite to what was expected, learners with more naive epistemic beliefs seemed to use more tools than learners with more sophisticated beliefs.

Tool Attributes: Main Effects

Martens et al. (1997) studied the effect of discernability of support on the use of tools. Besides the interaction effect as earlier reported, the results of their study indicate no main effect of discernability on the use of tools. Dempsey and Van Eck (1998) found an advisor tool presented on screen resulting in a higher consultation than an advisor tool as part of a pull-down menu.

A large group of studies in this category deals with the comparison of fullminus and leanplus conditions (Hannafin & Sullivan, 1995; Crooks, Klein, Jones & Dwyer, 1996; Crooks, Klein &Savenye, 1998; Hicken, Sullivan & Klein, 1992; Schnackenberg & Sullivan, 2000). In these studies, a comparison is made between students who can bypass instruction (fullminus) or students who can actively select more instruction (leanplus). The additional instruction consists of reviews, summaries and practice items (elaboration tools). In all these studies, significantly more instruction is selected in the fullminus group than in the leanplus group.

Crooks et al. (1998) found however that this difference in use of elaboration tools can be attributed to one function. In their study, they found overall difference between the leanplus and fullminus group to be related to the consultation of practice items. No differences were found between the two groups for the other elaboration tools. This seems to be an indication that the kind of tool matters. Similarly, Carrier, Davidson, Williams and Kalweit (1986) found a difference in use between different tools: paraphrased definition, expository instances, practice instances and analytic feedback. Paraphrased definitions were chosen more often than expository instances. Practice items were also more frequently chosen than expository instances.

Next to these studies, a number of studies report similar findings although no real main effects were found. These studies did not explicitly measure whether the difference in use was significant. Oliver and Hannafin (2000) provided students with different kinds of tools: procedural, cognitive tools, and scaffolding tools. Students used almost exclusively the procedural tools. Similarly, Fischer, Troendle and Mandl (in press) found that all students used a visualization tool, but only a limited number of students used the knowledge resources. Nevertheless, a prior knowledge test indicated that all students might have gained benefit from using these resources. The human tutor on the other hand was consulted very frequently for technical functioning and organization of collaboration.

Working Method: Main Effects

Crooks et al. (1996; 1998) investigated the influence of individual versus co-operative work on the use of help tools. The 1996-study, revealed individuals to more frequently use optional elements than co-operative groups. In the 1998-study however, no differences were found between the two working methods.

Additional Advice Or Training: Main Effects

Lee and Lehman (1993) studied whether presenting instructional cues to students working in a hypermedia environment would result in a more frequent consultation of information. A main effect was found. Students who receive additional cues select more information than without any cues. Gräsel, Fisher and Mandl (2000) found students receiving strategy training to make more adequate use of additional information available through a glossary, a diagnostic help tool and a database. They adapt their problem solving process based on this information. The group without strategy training ignored this information.

Relan (1995) investigated the effect of training students' tool use on its consequent use. Students had access to three kinds of reviews, immediate review (after each section), global review (after a whole session) and practice review. Students with training reviewed more before practice than during practice, which was not the case for students without training. An ANOVA with amount of review before practice as dependent variable and training as independent variable did not show significant effects. Carrier et al. (1986) compared a group that received encouragement to use the options to a group that did not receive this encouragement. The encouragement treatment group selected more options than the no-encouragement group.

Interaction Effects

Hannafin and Sullivan (1995) found an interaction effect between ability and version of the program. In a leanplus version of the program, high ability students selected more (43%) options than low ability students (19%) did. This difference was not found for the fullminus version of the program. Lee & Lehman (1993) found an interaction of the treatment condition with learning style. Learners with a neutral (versus active or passive) learning style with instructional cues selected more information than learners with the same learning style without instructional cues.

Relan (1995) reveals an interaction between treatment group and training. Students in a limited learner control condition review more items when they receive training than students in the complete learner control condition when they receive training, although the latter group had more options to review.

Summary

Some evidence is found that ability and prior knowledge affect the amount of tool use. Ability also seems to influence the quality tool use. No evidence was found of learning style influencing the use of tools, except for an interaction effect with the provision of instructional cues. It could be said that there is a relationship between the use of some tools and epistemic beliefs, but a closer look reveals low (though significant) correlations (see Table 3). None of the correlations exceeds 0.3. These studies highlight the kind of tool influences the use. For instance, performance support tools or procedural tools are more frequently used than cognitive or scaffolding tools.

The results on the effect of working method do not give the opportunity to draw any conclusion.

Advisement, instructional cues and encouragement on the other hand affect both quantity and quality of tool use. Training does not result in clear effects. An overview of the results is presented in Table 3.

Table 3: Tool use as dependent variable

	N	Environment	Independent variable	Result	
Student characteristics					
Carrier, et al. 1985	28	Computer-based lesson	Ability	Path analysis: partial ß coefficient: .59 No descriptives	
			Locus of control	Path analysis: partial ß coefficient: -.08 No descriptives	
Schnackenberg & Sullivan, 2000	99	Computer-based lesson	Ability	Amount of optional screens High: M = 25.04 SD = 15.57 Low: M = 20.15 SD = 15.68 ANOVA: F(1,98) = 3.71, n.s.	
Viau & Larivée 1993	70	Interactive textbook	Prior knowledge	Amount of tool use: Regression analysis Weak : M = 8.3 SD = 6.8 r =.43 p<.05 Average : M = 11.4 SD = 9.1 r =.50 p<.05 Strong : M = 10.8 SD = 6.6 r =.30 p<.05	
Chapelle & Mizuno 1989	13	Computer-based lesson	Prior knowledge	Amount of tool use per minute High: M = .09/min. SD = .06 Low: M = .14/min SD = .08 ⇨ T-test: t = -1.34; df =11, n.s. Amount of tool use per sentence High: M = .13/sent SD = .09 Low: M = .28/sent SD = .14 ⇨ T-test: t = -2.27 df = 11, p<.05	Purpose of tool use On-going problem solving: High = 78% Low = 48% Advanced organizer High = 7% Low = 32% Reconfirmation High=11% Low = 9% Extra information High = 0% Low = 7% Others High = 4% Low = 4%
Martens et al. 1997	51	Interactive text-book	Prior knowledge	MANOVA: ? = 0.88, p< .05 Prior knowledge enhancing effect on use processing tools F(1,50) = 6.12, p<.05 testing tools F(1,50) = 3.99, p<.05 orienting tools: not significant , no F-value	
			Reading comprehension skills	MANOVA: No significant effects / descriptives, no statistics	
Lee & Lehman, 1993	162	Computer-based lesson	Learning style (active/neutral/passive)	Selection frequency: Active: M = 0.86 SD = 0.66 Neutral: M = 0.82 SD = 0.72 ANOVA: F(2,161) = 2.64, n.s. Passive: M = 0.58 SD = 0.62	
Dempsey & Van Eck, 1998	58	Computer-based lesson	Learning style (active/neutral/passive	Amount of tool use Passive: M = .86 SD = 2.07 Neutral: M = 3.23 SD = 3.23 ANOVA: n.s. Active: M = 2.56 SD = 5.06 (statistic not presented)	
Liu & Reed 1994	63	Computer-based lesson	Learning style (field (in)dependence)	Amount of total tool use FD: M = 16.21 Fmixed: M = 29.28 FI: M: 24.84 ANOVA's for 5 support tools: n.s. , results reported for use of index: F(2,62) = 2.54, p = .09, no results reported for other 4 tools	
Carrier et al. 1984	44	Computer-based lesson	Learning style (field (in)dependence)	Frequency of option selection (proportion of total) Definitions: FI: .25; FD: .22 Expository instances: FI: 017; FD: .25 Practice instances: FI: .25; FD: .20 Feedback: FI: .34; FD: .35 => Chi-square analysis: only difference for expository instances: Chi^2 = 8.87, p<.05	

Hasselerharm & Leemkuil 1990	110	Computer-based lesson	Learning style (field (in)dependence)	45% used advisement; no significant effect. No statistics provided
			Prior achievement	No significant effect, no statistics provided
Hartley & Bendixen, 2001	101	Computer-based lesson	Metacognitive awareness	Regulation of cognition; Correlation with: use of: AO: r = -.008, p>.05 / O.: r = .009, p>.05 / G: r = -.086, p>.05 / SM: r = -.044, p>.05 / SC: r = .06, p>.05 Knowledge of cognition; Correlation with: use of: AO: r = -.144, p>.05 / O: r = -.028, p>.05 / G: r = .011, p>.05 / SM: r = -.113, p>.05 / SC: r = -.086, p>.05
			Epistemic beliefs	Omniscient authority: Correlation with use of AO: r =-.091, p>.05 / O: r = .002, p>.05 / G: r = .077, p>.05 / SM r = -.032, p>.05 / SC: r = -.082, p>.05 Innate ability: Correlation with use of: AO: r = -.016, p>.05 / O: r = .125, p>.05 / G: r = .032, p>.05 / SM: r = -.007, p>.05 / SC: r = .271, p<.05 Simple knowledge: Correlation with use of: AO: r = .04, p>.05 / O: r = .052, p>.05 / G: r = .141, p>.05 / SM: r = .066, p>.05 / SC: r = .043, p>.05 Quick learning: Correlation with use of: AO: r = .183, p<.05 / O: r = .09, p>.05 / G: r = .190, p<.05 / SM: r = -.163, p>.05 / SC: r = .163, p>.05 Certain knowledge: Correlation with use of: AO: r = .062, p>.05 / O: r = -.021, p>.05 / G: r = -.008, p>.05 / SM: r = -.015, p>.05 / SC: r = .054, p>.05
Support attributes				
Hannafin & Sullivan, 1995	133	Computer-based course	Leanplus/Fullminus	Amount of total optional screens consulted Leanplus: 32% Fullminus: 78% ANOVA: F(1,132) = 4.13 p<.05
Crooks et al. 1996	125	Interactive textbook	Leanplus/Fullminus	Amount of total optional screens consulted Leanplus: 56% Fullminus: 83% ANOVA: F(1,124) = 51.96, p<.05; ES = .99
Crooks et al. 1998	97	Interactive textbook	Leanplus/Fullminus	Amount of total optional screens consulted Leanplus: M = 67.36 SD = 16.11 Fullminus: M = 82.70 SD = 9.19 ANOVA: F(1,96) = 34.36, p<.05
Hicken et al. 1992	111	Computer-based course	Leanplus/Fullminus	Amount of total optional screens consulted Leanplus: 32% (SD = 27) ANOVA: F(1,92) = 70.80, p<.05; Fullminus: 80% (SD = 25) ES = 1.79 ⇨
Schnackenberg & Sullivan, 2000	99	Computer-based course	Leanplus/Fullminus	Amount of total optional screens consulted Leanplus: 35% Fullminus: 68% ANOVA: F(1,98) = 30,42, p<.05; ES = 1.08
Martens et al. (1997)	120	Interactive textbook	Discernability	ANOVA: No significant effects (no statistics presented) *This group partly involves students who have a printed version of the textbook*
Carrier et al. 1986	37	Computer-based lesson	Option type	Amount of times selected: Paraphrased definition: M =62.8 SD = 37.1 Expository instances: M = 26.1 SD = 25.9 ANOVA: Practice instance: M = 31.5 SD = 30. F(3, 105) = 20.13, Analytic Feedback: M = 34.5 SD = 25.9 p<.05
Working method				
Crooks et al. 1996	125	Interactive textbook	Individual/ co-operative	Amount of total optional screens consulted Individual group: M = 74% ANOVA: F(1,124) = 4.92, Co-operative group: M = 65% p<.05, ES = .35
Crooks et al. 1998	97	Interactive textbook	Individual/ co-operative	Amount of total optional screens consulted Individual group: M = 75.14 SD = 12.99 Co-operative group: M = 74.92 SD = 12.31 ⇨ ANOVA: Not significant (no statistics presented)
Additional advice or training				

Lee & Lehman, 1993	162	Computer-based lesson	Instructional cues	Selection frequency With cues: M = .94 SD = .58 Without cues: M = .59 SD = .73 ANOVA: F(1,161) = 9.81, p <.05
Gräsel et al. 2000	24	Problem-based learning environment	Strategy modeling	Amount of using additional information corrective Strategy group: M = 15.88 Without strategy group: M = 9.13 ⇨ Mann-Whitney U-test: U = 8.0 p<.05
	12		Instruction	Amount of using additional information corrective Instruction group: M = 8.17 Without instruction group: M = 4.83 ⇨ Mann-Whitney U-test: U = 8.0 p<.10
Relan (1995)	109	Computer-based lesson	training	Total amount of review: Learner control complete LCC: Comprehensive training: M: 3.2 SD = 2.4 Partial training: M = 2.9 SD = 3.0 No training: M = 3.1 SD = 2.8 Learner control limited (LCL) Comprehensive training: M= 4.2 SD = 3.6 Partial training: M = 1.2 SD = 1.6 No training: M = 2.4 SD = 3.6 ⇨ ANOVA: Not significant within LCC ⇨ ANOVA: Not significant over two groups (no statistics presented)
Carrier et al. 1986	37	Computer-based lesson	encouragement	Amount of option use Encouragement group: M = 38.8 No encouragement group: M = 25.4 ⇨ ANOVA: F(1,35) = 4.82, p<.05
Interaction effects				
Hannafin & Sullivan, 1995	133	Computer-based course	Ability + Leanplus/Fullminus	Amount of additional screens Fullminus- Low ability: M = 76% SD = 18.7% Fullminus- High ability: M = 79% SD = 20.6% Leanplus-Low ability: M = 19% SD = 5.1% Leanplus_High ability: M = 43% SD = 11.4% ⇨ ANOVA: F(1,132) = 12.36 p<.05
Lee & Lehman 1993	162	Computer-based lesson	Learning style + instructional cues	Selection frequency With cues-Active: M = .082 SD = 0.52 With cues-Neutral: M = 1.17 SD=0.58 With cues-Passive: M = 0.75 SD = 0.53 Without cues-Active: M = 0.90 SD = 0.78 Without cues-Neutral: M = 0.47 SD = 0.67 Without cues-Passive: M = 0.72 SD = 0.68 ⇨ ANOVA: F(2,161) = 5.55 p<.05
Relan 1995	109	Computer-based lesson	Learner control + training	Total amount of review during practice: Means see above ⇨ ANOVA: F(1,94) = 6.50, p <.05

Use Of Tools As Mediating Variable

This part discusses studies that try to explain differences between groups by referring to the amount of tool use. Explorative studies that cannot draw firm conclusions due to the lack of tool use are included as well. Previous sections already mentioned some of these studies (e.g. Dempsey & Van Eck, 1998).

Some of the studies in which a fullminus and leanplus group are studied found either no effect between these groups on performance (e.g. Hannafin & Sullivan, 1995; Crooks et al., 1998) or they found the fullminus group to outperform the leanplus group (e.g. Crooks et al., 1996; Schnackenberg & Sullivan, 2000). This finding is explained by referring to the number of tools used, which in all those studies is lower for the leanplus group than for the fullminus group. In a similar effort, Morrison, Ross and Baldwin (1992) compared a learner control to a program control group. The learner control group performed worse than the program control group. Apparently, the learner control group had reviewed only a limited number of items. From the possible total of 12 review items, 42.3% reviewed 3 items, 40% four or five items and only one person reviewed all items (N = 73).

Carrier et al. (1985) investigated through means of path analysis whether the 'tool choice' mediates between student characteristics and scores on tests. There was a significant positive correlation between tool use and post- and delayed test score, but when controlling for ability, this correlation disappeared.

Overall, the studies provide no clear empirical evidence about the mediating role of the variable tool use. Nevertheless, different effects of the learner and program control seem to be explained by referring to differences with respect to tool use. It should also be noted that a number of studies could not be finalized because students did not very often use the tools put to their disposal (see also previous sections).

Discussion

Merely providing tools to students does not necessarily result in (adequate) use of tools (e.g., Dempsey & Van Eck, 1998; Oliver & Hannafin, 2000, Fisher, Troendle & Mandl, in press). Studies investigating the effect of tool use do not reveal clear effects on performance. Interaction-effects and studies in which tool use is a dependent variable suggest that the lack of effect is due to learner characteristics such as ability and prior knowledge. In the introduction, the lack of monitoring and regulation skills was mentioned as an explanation of limited tool use. While metacognitive skills are acknowledged by different authors to be essential to make adequate learning decisions (de Jong & van Joolingen, 1998; Land, 2000; Hill & Hannafin, 2001, Lee & Lee, 1991, Kinzie & Berdel, 1990), only one study deals with the influence of metacognition on tool use. Hartley and Bendixen (2001) address metacognition, and more specifically metacognitive awareness. This metacognitive awareness was measured by the Metacognitive Awareness Inventory (Schraw & Dennison, 1994, in Hartley and Bendixen, 2001) and classifies items into two categories of metacognition, knowledge of cognition and regulation of cognition. Whether measuring metacognitive skills by means of a survey is a good representation of the skills students apply when dealing with a learning task might be.

A student characteristic that was not considered in the different studies, but might be of relevance to tool use are students' beliefs or perceptions about these tools. Winne (1985) already indicated that the functionality students ascribe to certain elements in a learning environment influence whether and how they will use these elements. Findings of Clarebout, Elen, Lowyck, Van den Ende and Laganà (2000) for instance, revealed students to think they were cheating when they consulted tools (cognitive tools and scaffolds). This might explain the limited use students made of the available tools. Interviews in the study of Brush and Saye (2001) clearly show students not using the tools as intended since students were unsure how to use them. This may also explain why the provision of additional advice results in positive effects.

In addition to learner characteristics, the kind of tools seems to influence the amount of use as well. Procedural tools are use more frequently than cognitive tools or scaffolds. Results of studies with elaboration tools indicate also that students used some tools more often than others (e.g. more practice items than reviews) or that effects are found for specific tools and not for others.

Overall however, the studies do not clearly reveal what variables influence tool use or what the effect is of tool use. The following observations may explain this lack of clear insights:

- In most studies the mere frequency of consultation of tools is looked at rather than the adequacy of the use. In order to take the latter into account, not only the amount of use should be considered, but also what students actually do when they use tools (e.g., Gräsel et al., 2000). A problem inherent to this aspect is that students should first use the tools before it can be studied how they use the tools. The section on tool use as mediating variable indicates that this is not always the case.
- The reported studies mostly deal with course-based environments. Students study a lesson that is presented on a computer and afterwards they get a knowledge test. It might be questioned whether students have a need to consult the tools to improve their learning process or performance with respect to the specific task.
- Some studies show that the lack of using tools is related to lower performance on a learning task (Dempsey & Van Eck, 1998), or that consulting a help function explains a significant proportion of the variance on performance (Viau & Larivée, 1993). Only a limited number of studies directly address the relation between the use of tools and performance (see limited number of studies in section 2.1). Oliver and Hannafin (2000) aimed at studying this effect, but could not draw any conclusion since students hardly used the tools. If the effects of tool use on performance are studied, only learning results are

looked at. The learning process itself and the effects of using these tools on the learning process are addressed in only one study.

- Support tools mostly provide additional support on the content level (elaboration tools). In a few studies only support on other levels is provided such as on a problem solving or metacognitive level (e.g., cognitive tools, scaffolds). This can also be due to the course-based character of the environments.
- A more methodological remark relates to the research instruments. Overall, studies use only one instrument to collect data, while a triangulation of different instruments can provide a closer insight in the amount, the timing and the quality of tool use. For instance, a combination of log files, surveys and observations could provide a more complete picture of students' learning process when working in a computer-based learning environment.
- Three studies only report effect sizes in addition to the p-value of significance. While significance tests provide information on the probability of the sample statistics given the sample size, it does not evaluate the likelihood of the population of the sample. Effect sizes allow researchers to compare the results of their study to result of other studies (Vacha-Haase, 2001).
- The studies investigate tool use, but the adequacy of the tools for learning or the need for students to consult these tools is never questioned. An evaluation of the tools themselves, and the task to be solved can provide evidence that these tools are indeed beneficial for learning.

Although some indications are given of whether and how tools are used and of variables relevant to the issue of tool use, a firm empirical basis is clearly lacking. However, to have insight in tool use becomes of particular interest with the use of open learning environments. The use of these environments is advocated to foster the acquisition of complex problem solving or higher order reasoning skills (Jacobson & Spiro, 1995; Jonassen, 1997). In open learning environments, the learners construct their own knowledge in interaction with the environment. In other words their is a large amount of learner control and learners have to regulate their own learning (Hannafin, 1995). This also includes making choices towards tools to be used. To design these kind of environment it is important to know what variables influence tool use.

The review presented here is of course limited. For instance, the European and Asian conference papers and dissertations are not considered when searching the ERIC and PsycInfo databases. More studies might be available on the use of tools. Another aspect relates to the subject of the review itself. Non-significant results or negative results are not likely to be published as positive and significant effects. Designing an environment in which support tools are put to the disposal of students, but students not using these tools may be viewed as a negative result.

Conclusion

The studies reviewed indicate different variables to influence the use of tools. Only limited studies however address the adequacy of tool use.

When advocating the use of open learning environments, the issue of tool use becomes more apparent. Learners are left in control and decide themselves on the use of these tools. Reviews on learner control and studies reviewed in this contribution reveals that students hardly posses the necessary monitoring and regulation skills to make adequate choices, i.e. choices beneficial for their learning process. The limited number of studies addressing tool use in computer-based learning environments indicates that more research is needed to identify different learner, tool and task characteristics that affect tool use. How tool use can be encouraged also deserves additional research.

From an instructional design perspective two alternatives to enhance tool use can be followed. One option would be to make the environment initially less open (reduce learner control on tool use) and provide support to students without students asking for it, and gradually remove this support (Clark, 1990; van Merriënboer, 1997). Monitoring and regulation activities are supplanted for the learner and gradually left over to the learner. In this option, support is not necessarily adapted to the needs of students. Some students will receive too much or not enough support. Both can be detrimental (Clark, 1991) as the introduction of support might increase, rather than reduce, the cognitive load for some students (de Jong, & van Joolingen, 1998).

Giving students advice on the level of how and when to use the tools could be an alternative option. This would mean that students are left in control over the use of tools, but depending on the different steps student take, advice on the use of these tools is provided. This advice helps them to monitor their own learning process and to promote adequate tool use. An analysis of the different steps students undertake may highlight that students do not posses the necessary monitoring skills. Students may then receive additional advice, while students who posses these skills would not receive advice.

Some promising findings of Lee and Lehman (1991, and Gräsel et al. (2000) suggest that providing additional advice to students can encourage the adequate use of tools. Including explanations about the aim of tools might result in more adequate use as well (Winne, 1985) and might prohibit students to ascribe different functionalities to these tools as they are intended to have. This indicates the students' instructional conceptions might be a variable that should be taken into account when studying tool use.

Comparing these two options should result in insight in what approach is most beneficial to foster adequate tool use and support students learning process. However, research should not only focus on measuring domain specific knowledge, but rather focus on problem solving and whether transfer occurs.

References

Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Brush, T., & Saye, J. (2001). The use of embedded scaffolds with hypermedia-supported student-centered learning. *Journal of Educational Multimedia and Hypermedia, 10*(4), 333-356.

Carrier, C. Davidson, G., Higson, V., & Williams, M. (1984). Selection of options by field independent and dependent children in a computer-based concept lesson. *Journal of computer-based instruction, 11*(2), 49-54.

Carrier, C., Davidson, G., & Willams, M. (1985). The selection of instructional options in a computer-based co-ordinate concept lesson. *Educational Communication and Technology Journal, 33*, 199-212.

Carrier, C., & Williams, M. (1988). A test of one-learner control strategy with students of differing levels of task persistence. *American Educational Research Journal, 25*(2), 286-306.

Chapelle, C., & Mizuno, S. (1989). Students' strategies with learner-controlled CALL. *Calico Journal, 7*(2), 25-47.

Clarebout, G., Elen, J., Lowyck, J., Van den Ende, J., & Laganà, S. (2000, June). *Kabisa: A computer-based training program for diagnostical reasoning: An evaluation*. Poster presented at the ED-MEDIA conference, Montreal, Canada.

Clarebout, G., Elen, J., Lowyck, J., Van den Ende, J., Van den Enden, E., van Gompel, A., & Vermeulen, L. (2001, August). *Influence of instructional beliefs on the use of help functions in a computer-based training program*. Paper presented at the EARLI-conference, Fribourg, Switzerland.

Clark, R. E. (1990). *The contributions of cognitive psychology to the design of technology supported powerful learning environments*. California: University of Southern California.

Clark, R. E. (1991). When teaching kills learning: Research on mathematantics. In H. Mandl, E. De Corte, N. Bennett, H. F. Friedrich (Eds.), *European research in an international context: vol. 2. Learning and Instruction* (pp. 1 -22). Oxford, NY: Pergamon Press.

Clark, R. E. (1994). Media will never influence learning. *Educational Technology Research and Development, 42*(2), 21-29.

Cohill, A. M., & Williges, R. C. (1982). Computers augmented retrieval of help information for novice users. In R. E. Edwards, & P. Tolin (Eds.), *Proceedings of the Human Factors Society 26th Annual meeting* (pp. 79-82). Santa Monica: Human Factor Society.

Crooks, S. M., Klein, J. D., Jones, E. E., & Dwyer, H. (1996). Effects of cooperative learning and learner-control modes in computer-based instruction. *Journal of research on computing in education, 29*(2), 109-123.

Crooks, S. M., Klein, J. D., & Savenye, W. C. (1998). Effects of cooperative and individual learning during learner-controlled computer-based instruction. *The Journal of Experimental Education, 66*(3), 223-244.

de Jong, T., & van Joolingen, W. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research, 68*(2), 179-201.

Dempsey, J. V., & Van Eck, R. (1998, April). *Advisor use in CBT: Modality and placement*. Paper presented at the Annual meeting of the American Educational Research Association, San Diego.

Fischer, F., Troendle, P., & Mandl, H. (in press). Using the internet to improve university education: Problem-oriented web-based learning and the munics environment. *Interactive Learning Environments*.

Friend, L. C., & Cole, C. L. (1990). Learner control in computer-based instruction: A current literature review. *Educational Technology, 30*(11), 47-49.

Goforth, D. (1994). Learner control = decision making + information: A model and meta-analysis. *Journal of Educational Computing Research, 11*(1), 1-26.

Gräsel, C., Fischer, F., & Mandl, H. (2000). The use of additional information in problem-oriented learning environments. *Learning Environment Research, 3*, 287-325.

Greene, B. A., & Land, S. M. (2000). A qualitative analysis of scaffolding use in a resource-based learning environment involving the world wide web. *Journal of Educational Computing Research, 23*(2), 151-179.

Hannafin, M. (1995). Open-ended learning environments: Foundations, assumptions, and implications for automated design. In R. D. Tennyson, & A. E. Barron (Eds.), *Automating instructional design: Computer-based development and delivery tools* (pp. 101-129). Berlin: Springer-Verlag.

Hannafin, M. J., Hall, C., Land, S., & Hill, J. (1994). Learning in open-ended environments: Assumptions, methods and implications. *Educational Technology, 34*(10), 48-55.

Hannafin, R. D., & Sullivan, H. J. (1995). Learner control in full and lean CAI-programs. *Educational Technology, Research and Development, 43*(1), 19-30.

Hartley, K., & Bendixen, L. D. (2001, April). *The use of comprehension aids in a hypermedia environment: Investigating the impact of metacognitive awareness and epistemic beliefs.* Paper presented at the annual meeting of the American Educational Research Association, Seattle.

Hasselerharm, E., & Leemkuil, H. (1990). The relation between instructional control strategies and performance and attitudes in computer-based instruction. In J. M. Pieters, P. R. Simons, & L. De Leeuw (Eds.), *Research on computer-based instruction* (pp. 67-80). Amsterdam: Swets & Zeitlinger.

Hicken, S., Sullivan, H., & Klein, J. (1992). Learner control modes and incentive variations in computer-delivered instruction. *Educational Technology, Research and Development, 40*(4), 15-26.

Hill, J. R., & Hannafin, M. J. (2001). Teaching and learning in digital environments: The resurgence of resource-based learning. *Educational Technology, Research and Development, 49*(3), 37-52.

Jacobson, M. J., & Spiro, R. J. (1995). Hypertext learning environments, cognitive flexibility and the transfer of complex knowledge. *Journal of Educational Computing Research, 12*(4), 301-333.

Jonassen, D. H. (1997). Instructional design models for well-structured and ill-structured problem-solving learning outcomes. *Educational Technology, Research and Development, 45*(1), 65-91.

Kinzie, M. B., & Berdel, R. L. (1990). Design and use of hypermedia systems. *Educational Technology, Research and Development, 38*(3), 61-68.

Land, S. M. (2000). Cognitive requirements for learning with open-learning environments. *Educational Technology, Research and Development, 48*(3), 61-78.

Large, A. (1996). Hypertext instructional programs and learner control: A research review. *Education for Information, 14*, 95-108.

Lee, S., & Lee, Y. H. (1991). Effects of learner-control versus program-control strategies on computer-aided learning of chemistry problems: For acquisition or review? *Journal of Educational Psychology, 83*(4), 491-498.

Lee, Y. B., & Lehman, J. D. (1993). Instructional cueing in hypermedia: A study with active and passive learners. *Journal of Educational Multimedia and Hypermedia, 2*(1), 25-37.

Leutner, D. (1993). Guided discovery learning with computer-based simulation games. Effects of adaptive and non-adaptive instructional support. *Learning and Instruction, 3,* 113-132.

Liu, M., & Reed, W. M., (1994). The relationship between the learning strategies and learning styles in a hypermedia environment. *Computers in Human Behavior, 10*(4), 419-434.

Martens, R. L., Valcke, M. M., & Portier, S. J. (1997). Interactive learning environments to support independent learning: The impact of discernability of embedded support devices. *Computers in Education, 28*(3), 185-197.

Mayer, R. E. (1998). Cognitive, metacognitive, and motivational aspects of problem solving. *Instructional Science, 26,* 49-63.

Milheim, W. D., & Martin, B. L. (1991). Theoretical bases for the use of learner control: Three different perspectives. *Journal of computer-based instruction, 18*(3), 99-105.

Morrison, G. R., Ross, S. M., & Baldwin, W. (1992). Learner control of context and instructional support in learning elementary school mathematics. *Educational Technology, Research and Development, 40*(1), 5-13.

Oliver, K. M., & Hannafin, M. J. (2000). Student management of web-based hypermedia resources during open-ended problem solving. *The Journal of Educational Research, 94*(2), 75-92.

Relan, A. (1995). Promoting better choices: Effects of strategy training on achievement and choice behavior in learning controlled computer-based instruction. *Journal of Educational Computing Research, 13*(2), 129-149.

Schnackenberg, H. L., & Sullivan, H. J. (2000). Learner control over full and lean computer-based instruction under differing ability levels. *Educational Technology, Research and Development, 48*(2), 19-35.

Spiro, R. J., Feltovich, P. J., Jacobson, M. J., & Coulson, R. L. (1991). Knowledge representation, content specification and the development of skill in situation-specific knowledge assembly: Some constructivist issues as they relate to cognitive flexibility. *Educational Technology, 31*(9), 22-25.

Vacha-Haase, T. (2001). Statistical significance should not be considered one of life's guarantees: Effect sizes are needed. *Educational and Psychological Measurement, 61*(2), 219-224.

van Merriënboer, J. J. (1997). *Training complex cognitive skills: A four component instructional design model for technical training*. Englewood Cliffs, NJ: Educational Technology Publications.

Viau, R., & Larivée, J. (1993). Learning tools with hypertext: An experiment. *Computers & Education, 20*(1), 11-16.

Williams, M. D. (1996). Learner-control and instructional technology. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 957-983). New York: Macmillan Library.

Winne, P. H. (1985). Steps towards cognitive achievements. *Journal of Elementary School Journal, 85*(5), 673-693.

Teaching High School From a Distance: Developing Effective e-Learning Strategies

Salley Maddox Benoit Sawyer

Northern State University

This case study presents a description of the instructional strategies used by the seven High School Master Teachers at the Center for E-learning at Northern State University in Aberdeen, South Dakota. Data for this study were collected through making classroom observations and conducting open-ended interviews that were tape-recorded. The seven Master Teachers provide daily classes daily to more than 40 school districts across the state at no charge to the school. The tuition-free classes include the subjects that many small schools are not able to offer their students, such as Physics, Chemistry, Spanish, AP Calculus and French. Each class is held every day for a 50 minute class period in a fully two way audio / video teleconferencing environment, the Digital Dakota Network (DDN), and actively supported by an online component, WebCT. The system uses compressed video running over half a T1 line. Each receiving school is required to have a trained e-mentor in the classroom; there are no students in the master teacher's studio.

The e-learning Master Teachers are in a totally technology dependent environment. This dependency, in combination with their commitment to engaging the students in interaction, infuses technology into the teachers' instructional strategies to varying degrees. The teachers' expertise in teaching high school students, the depth of their knowledge in their subject matter areas, and their beliefs that students must be active participants in the learning process, contributed to the teachers flexibility with and adoption of several instructional strategies. This study will describe some of the strategies in the context of the teacher's attitude toward learning and technology.

The Center for E-learning was established at Northern State University (NSU) in the spring of 2001 and began offering high school courses in the fall of that year. During the summer of 2001, the teachers were given two weeks of training. The purpose was to give the teachers a basic level of comfort with using the technologies as well as to give some guidance on teaching at a distance. Most of the master teachers had no previous experience teaching students in an e-learning environment and many had little technology knowledge. One teacher explained, "the first day I sat in that training and I watched someone in front of me zipping through all these different screens to get to a document, I thought, 'Ohhhh, I'll never know how to do this.' And here I am. I'm doing the same things those people are!"

In addition to WebCT and DDN training by the NSU technical staff, NSU drew upon its connection with the Tecnológico de Monterrey in Mexico to share their expertise in virtual education. However, the teachers had little to no experiential knowledge of teaching in an e-learning environment and as one teacher said, "it just totally went by my head. They did make an effort to help us, but I didn't know enough." The teacher's instructional strategies seem to vary according to their subject matter area as well as by their personal beliefs about teaching and their awareness of what the technology could do.

The teacher participants:

Kathy: French 1 and 2	Joanna: Spanish 1 and 2
Mary: Senior math and AP calculus	Chuck: Chemistry
Jeff: AP American history	Deana: AP English
Jackie: Physics and AP Physics	

The teachers have different approaches and opinions about the way they function in the e-learning environment.

Deana, who has very small class sizes, opens each class by recognizing the school and the individual students. She often engages students in brief personal conversations about their school and sports activities.

> So they know that I'm looking at their classroom . . . I need their input all the time . . . I try to touch base with them a little bit personally. Because I think if I know my students a little bit personally then they instruct easier.

Kathy takes delight in planning learning activities that are truly active. She constantly seeks ways that will require students to apply their newly developing knowledge

> And I want my classroom to be interactive, hopefully we will have some enjoyment and some days I feel like that's why I came this year. And it's something kids look forward to coming to. You have to realize that seven schools in the morning show up an hour before school starts in their town, to take a class. And that you have to appreciate the fact that they're willing to do that. And that at 8:30 I have kids west river who are actually there an hour before their school starts. And I have one group of eleven in the afternoon who skip lunch to take French. So these kids are making sacrifices in order to take that class and I think that needs to be considered too. So when I say there should be something there for them, there should be some form of enjoyment there for them.

Mary emphasizes the visual nature of the e-learning environment. She uses the overhead document camera, the Elmo, in every class and frames her camera shots to convey information rather than "telling" information.

> it has to be visual first and then everything I use outside of that compliments the visual. But if it isn't visual first, I'm probably not going to make it. It may fail as a strategy if isn't visual first. I can use lots of other things like I can be enthusiastic when I talk about things, I can let kids talk about things, I can do lots of other adjustments, but if I can't make it visual first, I'm probably going to have trouble.

Jeff has began teaching AP history this year rather than American Government. He has begun using PowerPoints in his class as a way to present visual information.

> One thing that I do a lot more of now, especially with my AP history class, that I didn't do before when I taught in a regular classroom . . . I use PowerPoint a lot more because it's so conducive for this environment with the TV and the computers being right there. And so I do a lot of PowerPoints getting up paintings or pictures of people that I'm talking about so that they can see who I'm talking about while I'm talking about them.

Jacki is new this year to the e-learning environment. She has been conscious of the time delays in the DDN system and seeing things from a students view.

> First of all PowerPoint helps me to remain more focused on what I need to do but it also takes a lot more work . . . I did a lot of drawings and stuff on the blackboard. Now I find a do more of my drawings in PowerPoint . . when I started making my PowerPoints, I had no idea the room to use and space as far as within the constraints of the computer. So then I put some of my PowerPoint presentations up in one room and then go into the other room and look and see what it looked like. So I've had to be more conscious about what it's looking like at the other end. Where in the classroom, you just did it.

Joanna is frustrated by not finding ways to learn more about teaching in an e-learning environment.

> the techie part of it, the working the V-Tel tablet, all that stuff I'm comfortable with. I think we all are. For me, just from my perspective, it's the strategies of communicating, of getting the kids to interact with one another across the distance, not those within their own schools but across the distance. Getting them to interact with me more rather than sitting back and not wanting to say much. That's what I struggle with most.

Chuck discussed his strategies and underlying philosophy as being the same in the f2f and in the e-learning environment.

> students have to move from concrete to abstract. And to do that I used what's called constructivism theory. That just means that I want my students active and I want a lot of hands on. I want them to be able to manipulate laboratory equipment and materials before we talk about the explanations and the theories and the elaborations of the concepts . . . So, when I'm doing demonstrations I want to make sure that they see clearly and that the time is allotted so that they can read instrumentation even though they can't put their hands on it, they can put their eyes on it

The DDN and WebCT technologies are not part of a course delivery systems; they are new learning environments that require conscious effort on the part of the students and the teachers. Some of the teachers have strategies for guiding the students with both the tools and interactions in the e-learning environment. Deana explained, "Sometimes I will just put up some directions or "how-to's" on the Elmo. I have done it where I have taken my computer in and I have told them now this is how to get to my home page." Kathy uses activity-based strategies designed to facilitate interaction between students in different schools.

> I have people work through the system if they're isolated. For example I have one student in Redfield, one student in Canestota, one student in Bowdle. When I assign group work will ask the other people to mute

> their mikes. While they practice their conversation and those three will practice a conversation through the system. So they get the same experience of talking to students as everybody who has a pair or more in the classroom. So that's a strategy I've used a lot because I do have isolated students. Which is difficult by the way. It makes it very hard to do group work. I have even gone so far as to have kids write skits and e-mail them to each other, the conversations. One person will volunteer to type them up and e-mail it so they can do the conversation from three different sites.

The teachers have developed strategies that combine instructional management with facilitating interaction. Both Kathy and Mary use the strategy of writing each student's name on a 3X5 card. The cards help the teachers to function in the environment and they help the students to stay engaged. Kathy explained,

> When you're dealing with seven districts, it would be easy not to call on somebody because they're not all in front of you. I can only see one of them at once. So I go through those cards religiously. I call a name, I set is aside, I call a name I set it aside. I remix them so they come up differently, but I make sure that every student is called on an equal number of times in my classroom. I think that's part of a strategy and it's a strategy that works.

For Mary, the cards simplify her tasks when teaching.

> Just when I put the problem up on the document camera . . . and then I say who is going to graph and the kids' names are all on cards in my folders . . . and I just lay that card up. And again that's just a survival tool. I'm running too many things. I never did cards ever in my life. I do cards all the time now. And if there's some little thing I want to remember to tell a kid or that they've told me in e-mails or something, I jot it on the card so I won't forget it later on.

Planning time in the e-learning environment has been an unexpected change for all. The teachers must manage the e-mentors, prepare material kits for several districts, select the camera shots during each digitally recorded class and constantly update the WebCT sites. Joanna observed that, "When I took this job I thought I probably wouldn't spend as much time as I did in being physically in the class, but I spend more. There's no question in my mind that I spend more." Time consuming, as it is, all the teachers described the importance of planning in the e-learning environment. Kathy stated, "When you talk about strategies, number one you better talk about your planning." Chuck remarked about the time it takes to plan chemistry experiments in ways that will ensure problem-based learning.

> I've taught this basic chemistry class for 25 years previous to last year when I first taught it in e-learning. I didn't think I would have hardly any planning, I just felt it would be spontaneous as it has been for years and years. But every detail has to be in place. It's a production. It's no longer just a teaching situation.

Using WebCT becomes part of everyone's instructional strategies. The teachers use WebCT for communicating with students as well as the e-mentors. Chuck explains,

> It's very challenging to get high school students to use it well enough. Of course that's a developing thing with me, I still am developing a better use of it also. . . . The biggest thing I like about it, the strategy that works pretty well with me is the communication tool. Because I require my students to do all of their communications to me through that tool. It's just a more efficient way to keep track of who's communicating what and I can get back and I can keep it in an electronic file.

For Joanna, WebCT has become a time saver.

> I wouldn't be able to live without it now, after using it. It's like a focal point I can say download this document for tomorrow instead of ok I'll fax all of you this document or I'll mail all of you. It's just a lot easier. It takes time to get ready, but without it I don't know what I would do, it would be more of the old way of teaching

Mary has created a WebCT page to introduce each section in the math text book to tell the students about the main points. She has made sure that her writing has never exceeded one screen and that the writing style is very conversation, "plain ordinary English." She also uses the calendar tool.

> it's absolutely wonderful. I like the calendar; I update it every Friday. Teachers in schools usually have to hand in lesson plans to their principals on Friday. I told the kids that they were my principals and I have to have the next week up on Friday. And they expect it and I expect it to be there

Both Chuck and Mary attributed the e-learning environment at NSU as providing an ability to develop and refine instructional strategies. Mary reflected that her teaching improved because she is not pulled away for more traditional f2f tasks as bus duty or lunchroom monitoring. This year, Chuck has refined his use of e-learning technology as he travels from the NSU teaching studio to visit the high schools classes. As he learned how to edit his digitized classes the visits have fed back into his strategies.

> the other strategy that I've really changed this year is what I tape of my classes and what is taped from my studio. Now last year almost exclusively just because I hadn't branched into the area of actually being able to record more from the other sites, as well as from my own studio. So I have, my class clips are much more exciting. Why is that? Because we see more of the kids. It's the students that are on my class clips and their responses and their work and so I've relinquished a lot of time from me to them, which is a good strategy

Mary described the e-learning environment in combination with the tech support as giving more time to concentrate on teaching.

> I think environments are different and this is a very supportive environment that encourages you to do the very best. Yesterday I wrote a test for my AP calc kids and it's a test that I've dreamed for a million times in my life and never written because I've never had time to do it. And that was where I took the pieces from the first tests and added C's, D's, E's and F's that let them take what they started with in the very first chapter and apply it to what we are right now. So they could see how the whole thing, it was a progression. It all linked together. We first started with limits then we went to continuity and then we went to derivatives and they all work together. So my problems, and there were only four of them on the test, went from limits to discussing continuity and then to discussing the derivative and then to using the derivative to write the equation of a tangent line. It was all from a problem that we started before and I've just never had time to do that before.

Along with appreciating the opportunities that the e-learning technologies have made available to their students, some of the teachers have come to see the technology as enhancing their teaching strategies. Chuck explained,

> Just for example, having the capability of interfacing my computer with a screen through a projector or a monitor, I can actually just solve problems, I can demonstrate problem solutions, and then I make the same kind of mental errors students make and have to correct those and it's just really a neat way of interacting . . . I have access to three camera sources, I can play DVDS, CDs, LP disks, I just have access to every possible kind of imagery there is right now . . . again, without some technology I just can't imagine the modern classroom functioning. It's just such a powerful support to teaching, any teaching strategy can be supported with technology.

Kathy sees the technology as providing opportunities that will let her students see and interact with a world something outside South Dakota.

> I think one of the things that the distance classrooms provide for students that they did a little of in the schools that is wonderful is the way they learned to use the WebCT and technology . . . there is a worksheet on Paris where they go to three sites. I mean there's opportunities now that have never been there before . . I have an interactive weather map of France where they can go to any city in France and see what the weather is going to be for five days. And I took the vocabulary from that and made a vocabulary sheet for my second year students, of actual weather that's posted on the internet. You know, rather than the "il fait beau" and the things you learn in first year it gives them a little depth. So that if they actually looked at a weather map they'd know what they were seeing.

While appreciating the technologies, each of the teachers remarked about the things they missed having in the e-learning environment. Jeff missed the out of class contact with the students. He missed seeing students and their families at sports activities or seeing them at the grocery store. Deana missed being able to walk around the classroom and look over a student's shoulder. Joanna was troubled by the audio and video delay and missed the instantaneousness of a f2f classroom. Jackie misses being able to see all the students at the same time. Chuck missed being able to do the "real chemistry" that he could in a lab setting with students. Yet each of the teachers appreciated "specialness" of what they were doing; they were reaching students who would not otherwise have access to this kind of education.

Best Practices Congress: Stimulating Faculty Interest in Online Instruction

Paul B. McKimmy

University of Hawaii-Manoa

Abstract

In Fall 2001, Texas A&M University-Corpus Christi invited faculty to participate in a Best Practices Congress focused on online instruction. Faculty members that were teaching through web-based course tools were invited to demonstrate their courses to those who were exploring the idea of online instruction. After a structured "show and tell" period, a discussion was facilitated focusing on pedagogical issues. Participants indicated that seeing their colleagues' strategies and approaches to online instruction helped in planning their own courses. Strategies and best practices were compiled from the pedagogy discussion and distributed to participants for reference. Strategies included use of practice tests, photo rosters, assignment benchmarks, games, course logos, and third party supplements.

Best Practices Congress: Stimulating Faculty Interest in Online Instruction

Teaching using online can be a consuming experience for new users. After tackling the initial learning curve; understanding the available tools; experimenting with design activities; troubleshooting technical problems; and converting existing content for online use, it can be difficult to think about new instructional approaches. Sharing ideas and novel approaches can be an important part of improving online instruction at your institution. For this reason, Texas A&M University-Corpus Christi held its first Best Practices Congress to facilitate the dissemination of online instructional strategies.

In Fall 2001, Texas A&M University-Corpus Christi implemented Web Course Tools, WebCT, on a trial basis for a small group of faculty. Faculty used WebCT to implement a variety of web-enhanced and web-based courses. The "Best Practices Congress" was assembled to share success stories and instructional strategies. Faculty members with WebCT accounts were invited to attend and to present an idea that they had implemented through WebCT. The entire faculty was invited to view the informal presentations and to learn about online instruction.

Two sessions were held on separate days to increase faculty availability and participation. Twenty-two faculty members participated in the sessions. Each session began with an introduction of faculty, an overview of the discussion format, and live demonstrations of individual courses as designed by participating faculty members. After circulating informally to see each course design and ask questions of course designers, discussion ensued. Faculty members were asked to discuss implementation ideas as they related to specific pedagogical issues including: content organization, interactivity, multiple modes of delivery, assessment, learner involvement, technical issues, games, and simulations.

Participants indicated that viewing their colleagues' strategies and approaches to online instruction helped in planning their own courses. Participants found several ideas to strengthen their own use of course management tools for Internet enhanced instruction. Strategies were compiled from the pedagogy discussion and distributed to participants for reference. Those strategies are reviewed here, including the Best Practices Congress itself. The following ideas were presented as some of the most useful approaches to leveraging WebCT and related tools for instructional strategy.

A strategy proposed for assessment and involvement was the use of practice tests. The instructor creates sample tests for students to attempt when they believe themselves ready for the real exams. These shorter tests include feedback on incorrect as well as correct answers, and are required as part of the course participation grade. Automated feedback provides a degree of interactivity to this teaching tool. Using conditional release, the instructor times the practice tests to be available at an appropriate time and to disappear after the actual exam. This forces students to earn their participation points when the practice tests will help them. If the practice exam availability is not limited, students with poor time management skills might leave them unused until late in the semester. (Idea contributed by multiple sources)

Another strategy, use of a photo roster, encourages student-to-student and student-to-instructor interaction. For a hybrid format course, instructors use a digital camera to capture student images. Students create table tent nametags for themselves, using large letters. The instructor photographs each student with his or her table tent. As an alternative, the instructor can add names using Photoshop or other software instead of using nametags. Using these photos, a simple table is created in any html editing program (Claris Homepage, Netscape Composer, even Microsoft Word will do). Photos are inserted into each cell in the table and the page is uploaded to WebCT and added to the course homepage. This photo roster assists the instructor in learning student names quickly, and assists students in learning their peers' names as well. The entire process facilitates ease of discussion in subsequent meetings by allowing the instructor to learn and use student names quickly. (Idea contributed by Dr. Paul McKimmy)

Using Assignment Benchmarks, instructors are able to model quality work to students. Instructors seek permission from former students to their work on the course page as examples of strong essays, projects, or presentations. Other students will be able to quickly form an idea of the expectations involved in receiving high marks or developing a strong presentation. (Contribution source unknown)

The Strongest Link is an ingenious combination of TV game show themes with a positive spin. Using the game framework, the WebCT discussion tool is employed to develop writing skills, critical thinking, and even reduce the instructor's workload. This activity can replace some class periods due to the research and response time required. The instructor posts brief case studies that students must research and write responses. (Example: In International Accounting, a question might describe the financial War on Terrorism, asking how one could audit the accounts of suspect charities to determine which monies might be funding terrorist activities) After the responses are posted, students vote on the "strongest link" – the best response. The student who submitted the best response is then excused from submissions for the remainder of the semester! Gradually, the instructor works with fewer students and can concentrate on those that are missing the boat. (Idea contributed by Dr. Valrie Chambers)

With permission, video clips, outlines and presentations from 3rd parties can make excellent supplemental material. In many cases, textbook publishers provide PowerPoint slides, chapter outlines, and other resources with instructor materials. These files can be uploaded to the course and used by students for review. As an example, Mr. David Kendrick uses a video from the publisher of his Microcomputers in Education text to supplement his course. Email was used to obtain owner permission and Media Cleaner Pro was used to reduce the file size sufficiently for Web use. Students were able to download and view this video directly from WebCT. One of my students requested use of my lecture outlines, which I uploaded to the course page. I later observed the student studying from my outlines at our fitness center. He subsequently improved his test scores. Conditional release can be used to delay use of similar material until after class discussion in order to encourage students to use the textbook rather then depending on supplemental outlines. (Ideas contributed by Mr. David Kendrick and Dr. Paul McKimmy)

Many instructors also created a banner or logo for their courses. The banner was included on all the primary pages within the course. Those instructors who designed a graphic or "banner" for their course noted that it added a professional image to the course. Adobe Photoshop or another graphic editing program could be employed to create the log. (Contribution from multiple sources).

Perhaps the most intriguing idea for using course management tools for improving instruction was the Best Practices Congress itself. After participation, faculty indicated an increased interest in using course management tools and an increased understanding of available resources. Furthermore, they were able to identify other faculty members who were using course management tools effectively and who could act as peer support for new designers. The Best Practices Congress is recommended as a method to stimulate broader interest in online instruction.

How do Educators in High Schools Accept the Internet as a Learning Medium

Avi Cohen

Abstract

The goal of the present study clarifies the viewpoints of teachers in Israeli high schools as to how they might accept the Internet as a learning medium and education purposes.

Research Method was qualitative and the main tools were interviews, analysis of sites and documents. Twenty-two in-depth interviews and thirty-two random documented interviews. The in-depth interviews were analyzed by three analysis levels: location of categories and criteria as is accepted in the "constant comparison" method, episode analysis and analysis of the teachers' full stories.

The research deals with three perspectives: External to the school, curricular and pedagogic aspects within the school and the teacher's personal intrinsic status.

The main findings of this research show that the Internet serves as an external cultural motivator, which influences parallel internal school processes. A distinction should be made between distance learning via the Internet and education – it seems that high schools are mostly educational/social institutions. The traditional school structure and the teacher's central role in the educational process should be maintained – the teacher is in the heart of the socialization process. The Internet can influence teaching methods and by doing so can turn the teacher into a pedagogue rather than a teaching technician. The education system is responsible for the means of transferring information rather than for the supply of end-technologies. It seems that the correct phrase for high school is Distributed Learning rather than Distance Learning. Distributed Learning on the Internet pushes education and learning from set years of education into Life Long Learning and places the teacher as a leader of this change. The full version of the research findings are placed in http://www.AviCohen.info

Introduction

We have lately become aware of the promises and challenges that the Internet environment sets for teachers and of the changes they are required to make. The present study in this article focuses on the way teachers regard the changes involved in introducing the Internet into schools and how they view this medium as an educational and work tool within the didactic and curricular framework of their high school. The intention is to inspect the viewpoints of "regular" teachers that engage in traditional learning, and to examine how they cope and identify with the change processes that the Internet brings to the school culture and ethos. The question is asked how a teacher's perception of his role towards himself, his students, society, the education system and the inner-school restraints can use the cyber infrastructure as an additional teaching medium or as a replacement of existing teaching methods. The conceptual framework is supported by three components of school teaching. The first is change processes, the second is how teachers relate to and organize teaching and knowledge, and the third is maturity processes and the attitude to the Internet in the near and distant environments of the school and mainly the Israeli Ministry of Education.

The rate of penetration of computers and other digital information means in Israel is as rapid as in other advanced countries. The rate at which schools are connecting to the Internet is steadily and quickly rising.

Melamed et al (1999), quote impressive numbers of schools that are hooked up and the rate of increase and state that the penetration of computers to all walks of the economy is comprehensive and deeper. The authors laid the foundations for speeding up the computerization process in the Israeli Department of Education. The objectives set by the policy makers relate to the penetration of information technology and progress of pedagogic goals by means of the Internet at all levels of the education system. The means to creating the conditions necessary for implementation of the goals and objectives are: physical infrastructures, accessibility to computers, teacher training, material preparation, development of a national digital library, promotion of pedagogic models and their distribution. Melamed et al (1999), also claims that the introduction of computerized learning processes requires a change in the school culture, adaptation of the learning environment to the new technologies, adaptation of the pedagogic processes to the new learning environment, training and support of the teaching staff, and adjustment of the learning materials to the new processes and environment. The authors assert that there is a need to establish a network of 3000 schools and training centers to the Internet, on a line that will enable simultaneous operation of at least 20 computers. The net should enable connection of every teacher and every student from anywhere, Internet provider cost-free and at a reduced fee.

There are a number of public initiatives in Israel concerned with the development of virtual high schools. These initiatives take place within the framework of the "Aviv" School, the Hebrew University and the "Snunit" site. The Center for Educational Technology is conducting an experiment within the formal education system, in which teachers give fully virtual courses in a number of schools. Appendix 11 includes the abstract of a lecture and discussion at the Center for Educational Technology concerning innovative projects of distance learning. The opening sentence of the lecture expresses the need of introducing the Internet and distance-learning infrastructure into the education system:

> *"What we defined for the next few years relies strongly on virtual teaching… The education system is trying to see what can be gotten out of the newly emerging technologies… We think that the education system should try to discover the points that it can harness for the purpose of computer development… The first enterprise is that of the teachers' communities… (Cohen, 2000, p. 408)*

The Internet as a medium that is growing and taking an important role in educational activity has galvanized the Ministry of Education to action. In March 2000 the Science and Technology Division established a forum called the "Content Committee" the task of which it is to generally define guidelines of qualitative standards and evaluation criteria of some of the information on the Internet. The operative objective is to produce a "statement of position" that will provide goals for the consolidation of a comprehensive Department of Education policy. Division activity has permeated the schools, and the opinions regarding teaching methods and distance learning swing both ways.

Salant (1999), is aware of very rapid progress in the US, UK and Europe The American effort is now changing track from technologic connections of schools to the Internet to two new directions that include training teachers and adaptation of digital content. There is some pressure of community and business circles to increase Internet applications and integrate them in the schools. Salant (ibid) adds that the main problem facing the American education system is the training of teachers for Internet applications. An interesting point, which will be discussed extensively in the findings chapter of this study, is that contrary to expectations, novice teachers do not use the Internet more than veteran teachers.

Cuban (1999), states in the third annual report of Information Technology Applications in Education that the US has a growing problem of Internet sites compatibility with the existing learning programs. The American Department of Education is active establishing a rich and indexed database of learning materials. This project, known as FREE, is a federal initiative supported by Congress (US Department of Education, 2000). An example of some other interesting projects operated in the US is the Michigan project (Michigan, 2000).

In Britain, the rise of the Labor government in 1997 brought about a national change in the public issues, and Britain's main investments today are in education. Within this framework, the connection of British schools to the Internet has become a national priority. NGFL (National Grid For Learning) is the national British project for computerizing the education system. The Prime Minister, Tony Blair, initiated it in 1998. The NGFL project consists of three main stages: connecting schools to the Internet, establishing education resources centers for teachers (VTC), and developing education materials and databases for teachers and students. Despite the British national effort, most of British teachers still do not use the Internet for teaching purposes and do not integrate it in the classrooms, for two main reasons. First, the teachers tend to cling to a centralized curriculum, and second – relatively low investments so far in training and pedagogic projects for teachers (UK Education Department Site, 2000). We find similar policies in Germany, France and the Scandinavian countries (Salant, 1999). This Artical deliberately refrains from discussing budget details. My intention is to present trends and processes that produced the conceptual framework of the research study.

This research has a wide framework, which stems from change processes; from the way teachers regard their teaching, from how teachers act and from the entrance of the Internet to the education system. I will try to examine the teachers' statements and their specific attitudes to the Internet as part of the learning process at school within this framework.

Methodology

Research Method was qualitative and the main tools were interviews, analysis of sites and documents. The study included an exploratory study and a main study. The main study, as well as the exploratory one, was accompanied by examination of documents and material gathered from various Internet sites, which serve teachers for teaching purposes. Twenty-two in-depth interviews, thirty-two random documented interviews and sixty other random not transcribed interviews were conducted. The in-depth interviews were analyzed by three analysis levels:

location of categories and criteria as is accepted in the “constant comparison” method, episode analysis and analysis of the teachers’ full stories.

The initial category of the interviewee’s professional specialization served as the first sorting category. Common professional specialization was selected: languages, sciences, fine arts, social studies, technology and computer science. Another selection was made by role at school, age (young, middle and old), gender, and type of school (academic, technological or religious schools). The interviewees were selected so that each was experienced in Internet communication.

The planned interviews were ethnographic interviews, and guided and focused interviews were the main research tools. The interviews were later taped and transcribed in the method known as “interpreted interview”. The interviews lasted between two and four hours. Most lasted about three hours. Random interviews were also conducted, and most of the random interviews were unplanned. They occurred whenever the researcher encountered a teacher or an education official, who was able to shed light on an aspect of the study or to validate what had been said. The average duration of a random interview was half an hour. The longest took an hour and a half. The random interviews are a purifying and enhancing process for the categories presented in the findings. These interviews supply and support the generalization and validation capabilities of this research. During some of the interviews, and visits to educational institutions and the Ministry of Education, documents were received that were in some way related to teaching through the Internet, analysis regarding this matter, teachers’ work-papers, and Internet sites created by teachers while working with their students. This material served to validate the participants’ views, to construct the categories and to present the results and conclusions of this study.

This study made use of a number, or rather a combination of analytic approaches with content analysis methods befitting the nature of this study. The most suitable to the present study is “analytic induction”.

Three analysis levels were used to analyze the findings. On the first level of analysis a “statement” was chosen as the analysis unit. A statement is defined as the interviewee’s words on an issue from beginning to end. In order to develop a “ground theory” the analysis created categories and criteria for their definition. The first step is “open” coding, which means locating repetitions and their characterization through categories (coding level I). The next step is “axial” coding based on properties located by means of open coding (coding level II). The final step is “selective” coding in which the material is coded by pre-designed categories that were located in the previous steps (coding level III). Data analysis began at the very first stages of data collection. The coding steps went on in parallel throughout the data-collection process. This method allows for refinement and redefinition of the observations made at the initial stages, and prevents the researcher’s bias, which could turn permanent properties into interview questions or points to look for in documents and observations. The second level of analysis was the “episode” analysis unit. An episode is an occurrence of independent interest and content, the beginning and end of which are marked during the interview. This unit was defined as “the teacher’s account of an event or occurrence or way of teaching including background, results and related feelings”. The episodes were divided into groups by free connection to some of the categories found at the first analysis level. Random interviews, which relay episodes, played a major part. The interviewees each in their time and place did not speak about all the topics, but only of those they thought of and the situations they encountered. Their communications were very powerful and added a certain flavor to the atmosphere in which the teachers find themselves when they enter the classroom and carry the burden of the cultural environment outside the classroom. On the third level the analysis unit was a full interview with one teacher. An attempt was made to connect the teachers’ background with how they regard teaching and Internet technology as an additional layer of their own teaching and teaching in general, as reflected in their communications.

An effort was made to enhance credibility and validity in some ways. Responsiveness, fairness, trustworthiness and accuracy were used. It seems that interviewing is an appropriate tool to ensure inner validity. Comparison of the various teachers’ accounts (by “cross-reference”) and reference only to findings that were frequently repeated served this objective. Additional validation was achieved by the “tripling” method, such as document analysis. The “documents” in this work were primarily Internet sites, which the teachers referred to and which were examined as result of this and of other publications. It seems that selecting a sample of 22 in-depth interviews and 32 random documented interviews and dozens of undocumented interviews distributed by the main categories of the Israeli education system, and examining accounts of other teachers as reported in the interviews – is sufficient to ensure external validity without the power of sampling error in quantitative researches. There were adequate repetitions of the teachers’ perceptions and beliefs, so one can assume that most of what they report did indeed happen. It was therefore possible to reach conclusions about how teachers act when they are given an additional tool. A more complex problem concerning external validity is whether the conclusions are also valid for teachers in Israel and worldwide who are not exposed or accessible to Internet technology. Apparently for some the answer is yes. The detailed presentation of findings by a method of "thick description" enable to discover conclusions valid for other teachers as well, by means of comparison and contrast. The entry level of a subject into the sample population is low and general enough to include most teachers in the category. At the conclusion of the study it is apparent that with time, more and more teachers can become part of the appropriate population.

Analysis validity was performed in two stages. First, 2 judges who are specialists in analysis of qualitative research methods were requested to analyze two interviews each, to identify the validity of the categories located by the researcher. At the second stage the same two judges were asked to use the previously formulated "properties" system to analyze two interview texts. The properties system was duly corrected following the judges' remarks at both validation stages. The initial correlation was nearly complete. Structure validity was enabled by seeking the assistance of readers, some of who were not teachers, to validate the final conclusions and the general picture that evolved from the analysis. There was almost full agreement about the conclusions and the theoretical model presented.

All participants were assured full anonymity, to prevent their own or their school's identification. The researcher alone kept any personal details. All names mentioned in the work are fictitious and other details were made general so as to avoid identification. This item was fully examined with the assistance of the readers. Full consent of all participants was ensured, as well as the prerogative to withdraw at any stage.

Main findings and discussion

The first perspective of the findings in this article is external to the school. This perspective deals with the influence within a global social framework and the teachers' relation to the school's external interested parties. The main findings that deals with the external perspective are:

1. The Teachers' Perception of the Cyber World as a New Culture – The teachers (*namely the interviewees in this research*) view the Internet as a new culture. The topics that characterize culture are: language, democracy, and a way of life, relevance and common interests. The degrees of relevance and accessibility presented by the teachers constitute the enabling environment of this culture with all its advantages and disadvantages.
2. The Teachers' Perception of the School Struggle to be Relevant as a Result of Internet Assimilation Into Everyday Existence – The new culture is not threatening and should be allowed in the schools. The teachers feel that at times the pedagogic consideration is not the only one. Principals and headmasters take advantage of the Internet process for populist purposes and as a recruiting tool. The teachers view the procedure as a battle for the students' attention.
3. Traditional Teaching in High Schools Versus Distance Learning Possibilities in Higher Education – In high school, traditional teaching should continue with the Internet. The teachers stated that high schools and universities have different attitude. They expressed the need for traditional learning in high school as a social need, youthful exuberance that must be controlled, responsibility, maturity and motivation. Those that rejected distance learning in universities did so for reasons of socialization and isolation. Most of the teachers displayed dissatisfaction with the pressures, the problems and the conflicts of the new culture and the social needs of high school.
4. The Teachers' Perception of the Government's Role in Supporting and Sustaining the Process – The teachers stated that the government and the Ministry of Education must take responsibility for Internet penetration into schools. Three integrated areas were diagnosed: pedagogic, organizational and social. The teachers claim that the government should deal with curriculum, staff, hardware and software, help to the weak and training. They expect the Ministry of Education to supply pedagogic and organizational management, and believe that Internet assimilation should become a national project. The teachers lay some of the responsibility at the parents' door.
5. Perception of the Internet by the Ultra-Orthodox as a Tool of Agitation – The orthodox education system in Israel rejects the Internet by a number of degrees. The severest level is total and unqualified rejection. But, cross-reference and further examination of the orthodox teachers' statement revealed internal differences attributed to various rabbinical followings. Some orthodox communities allow the Internet for livelihood purposes. Others allow selected sites with special control and censorship mechanisms. The central objection to the Internet is a moral one. Many religious educationalists avert their eyes from the rabbinical decrees

The second perspective of the findings in this article is aspects of Internet integration in schools from a curricular-pedagogic viewpoint, while examining the limitations and relationships with internal interested parties within the realm of the teacher's job and responsibilities at school. The main findings of the inner perspective are:

1. Methods of integrating the Internet in teaching as a "giant library" or a "sea of information" – The characteristics of the information sea are focus, orientation and validity. There is no clear decision between interviewees who regard the textbook with nostalgia and see it as solving the three problems created by the characteristics of the "information sea" and those that view the Internet as a new replacement to the irrelevance, limited number of pages and the non-updated state of traditional textbooks.
2. Ways of Combining Asynchronic Communication and Excluding Synchronic Communication in the Formal Teaching Alignment – It seems that the teachers side with asynchronic communication (i.e. e-mail and forums) and oppose synchronic communication (chats). The arguments are usually seriousness versus the shallowness created by chats.
3. The advantage of incorporating subjects that require long intervals of interaction over subjects that require short interaction intervals and the advantage of English teaching – The teachers divided their attitude to teaching via the Internet into three categories: humanistic and social subjects, technological, realistic and engineering subjects and languages. The humanistic and social subjects are superior both in synchronous and asynchronous learning. The advantages of teaching English by means of any technique offered by the Internet are clear.
4. The preference of using the Internet in writing study-papers as an addition to traditional examinations – The teachers find that the legitimate mode of evaluation is an examination or a paper. The teachers opposed traditional examinations via the Internet, but were considerably in favor of papers that use the Internet as an addition to traditional exams. The main argument was lack of trust in the pupils' integrity and honesty. On the other hand, there was no problem concerning lack of trust when it came to study-papers.
5. The rejection of acknowledgement of pupils who studied by means of distance learning in high school – It seems that teachers neither trust nor legitimize high school pupils who studied via distance learning, and would want to examine the quality of the learning by a traditional synchronous exam. The teachers' statements were full of contradictions. At the start they expressed support of distance learning and at the end mistrusted the acquired knowledge. Nevertheless, the teachers seem to give more legitimization to distance learning performed by acknowledged and physically real institutions (with walls).
6. The incorporation of Internet censorship in school versus its rejection in the pupils' homes – The teachers regard sex as the Internet's main evil. Accessibility enables entry to problematic sites while preventing censorship. Most interviewees were in favor of (politic) censorship of sex sites in schools, but against it in the pupils' homes. The ultra-orthodox block the Internet due to this evil. Some interviewees raised issues of anti-humane sites or copyright, but were mostly against censorship due to these reasons.
7. The integration of the Internet as an informal and casual communication channel with pupils and colleagues – The teachers pointed to Internet sites as possible forms of notice-boards about learning procedures, messages concerning meetings or cancellations, and of placing procedural responsibilities with the pupils. Communication of messages through the Internet would work only if the regular information channels were not functioning. Some of the problem of strengthening the administrative and pedagogic ties is due to an assimilation problem that also exists with the pupils.

The teachers spoke of the school and the internal interested parties on two main levels: the pedagogic level, which is concerned with ways to integrate the Internet in learning and learning control, and the organizational level, which is concerned with the transfer of messages between teachers and pupils and the organization of learning. The two levels are connected and intertwined, which at times creates accord and at times – conflict.

The third perspective discusses how the teacher views himself – how he sees himself in a changing world, his status versus his pupils and society as a whole, his position as a leader of processes, the characteristics of camp leaders, and the fears of teachers in their contact with the Internet. The main findings of the intrinsic perspective are:

1. The teachers' perception of themselves as pedagogues and leaders of learning as opposed to the ignorance and incompetence that might be perceived by the students – The status change of teachers as a result of the introduction of the Internet in schools involves two contradictory processes. The first

is how the teacher perceives the role. Role perception is manifested by how the teacher sees himself versus his pupils, personal development opportunities, and his relationships with his colleagues. The second process of change is the teacher's perception of the role in the pupils' eyes. That is to say, how the teacher thinks the students will see him and how they will behave following his change of status. The first process is perceived as joyful, creative and optimistic. The second process is frightening and causes aversion, and the interviewees sought a way to justify their difficulties.

2. The teachers' perception of their role as irreplaceable educators – All interviewees without exception expressed adamant opinions about the teacher's role in the classroom. It is the interviewee's belief that the high school teacher is irreplaceable. They want to see their pupils' eyes and to feel their proximity. This finding may have long-range significance in that the interviewees' standpoint is not dependent on technology.
3. The teachers' perception of technical expertise combined with unexplained phobia as an obstacle to using the Internet – Two strata of technical computer problems influence the teachers. One stratum concerns technical problems of uncomfortable interfaces (familiarity with software, switches, etc.), operating expertise (familiarity with Internet options) and technical problems (non-functioning computer or printer). It appears that good training would solve these problems. The second stratum pertains to psychological fear (one interviewee called it "the wall"). It is quite likely that the first stratum enhances the second.
4. Perception of the Internet as a media that requires additional time and effort during the teaching process – There is no doubt, all interviewees think that the Internet does not save effort. They feel that they are not rewarded for their additional endeavors. We found two opinions regarding effort and reward. One is frustration that cannot see the light at the end of the tunnel. That is, they do not foresee that the system will appreciate their hard work in the future. The second is optimism that is sure the efforts will pay off. It seems that the teacher considers himself as fulfilling a mission. The teacher sees his work as thankless and his success as a mission.
5. There is no characterization of teachers who lead the process of introducing the Internet in schools – The interviewees' statements indicate that entering the subject is dependent upon the teacher's personality, his motivation, the school the teacher teaches in, the type of pupils, available technical means, and other factors that are related to the teacher's personality and workplace. There are two references to "young in age" versus "young in spirit". The leaders of change are usually "young in spirit" and also determine organizational policy. They are not necessarily "young in age".

Conclusion, discussion and suggestions of findings as an Entirety

The aim of the study was to examine the teachers' viewpoints regarding the influence of the Internet on high schools and the way by which they would want to include it as a teaching tool. As an entirety we can distinguish the following attitudes:

1. The Internet serves as an external cultural motivator, which influences parallel internal school processes.
2. A distinction should be made between distance learning via the Internet and education.
3. The traditional school structure and the teacher's central role in the educational process should be maintained.
4. The Internet can influence teaching methods and by doing so will turn the teacher into a pedagogue rather than a teaching technician.
5. The education system is responsible for the means of transferring information rather than for the supply of end-technologies.
6. The teacher as a leader of change processes and as a leader of life-long learning.

The Internet serves as an external cultural motivator, which influences parallel internal school processes

Sharan et al (1998) describe the school as based upon a concept of community. That is to say, the community directly influences the learning context and processes. Indeed, a major part of the findings revealed community aspects and processes congruent with this concept. The influence of the Internet is reflected in social processes without and within the school in the following attitudes:

- <u>Multi-culture</u>: The Internet enables varied communalism in the community inside the school and on the outside.

- Survival: The Internet creates new alternatives to schools, as well as new alternatives to school subjects. Thus, a battle is waged over the student's heart within and without the school.
- Censorship: There is a social dilemma concerning the ban on pornographic sites outside the school, and a pedagogic struggle to create barriers to such sites within the school.
- The "information ocean" and the "giant library": The Internet has become a relevant tool of daily life outside the school and a pedagogic tool within.
- Communication: Communication, mainly asynchronic, is a significant factor in the transfer of information outside the school and a tool of distance teaching that can change teaching styles inside the school.

The teachers perceive the very same multi-cultural environment that envelops the school as an unpredictable radical cultural change. A significant ingredient of cultural change is the opposition of the ultra-orthodox to the Internet in their schools. The telephone, which includes elements of cultural change, was not blocked, whereas the Internet is. Cultural change induces uncertainty that is evident throughout the study. "We are flooded with fragments of information about the accelerated changes we should expect without the ability to connect them or to establish a structured and clear pattern…" (Shalom, 1999, p. 6). It is obvious that the Internet is not a "product" or a process that can be isolated.

A distinction should be made between distance learning via the Internet and education

In the teachers' statements, in professional literature, in the press and in the remarks of those concerned with education we find a confusion of terms and a dilemma, the essence of which is the difference between education and teaching. The discussion of findings requires us to make a distinction between these two terms:

- Education: A social process concerned with imparting and assimilating moral values that are affined with society (according to the definitions of Aristotle and Dewey). "Education is a tool of carrying morals into effect" (Rotshtriche, 1951, p. 111).
- Teaching: A process of imparting information and skills in a disciplinary context, in the ancient meaning, which states "discipline is a study subject aligned for the purpose of teaching" (Lam, 1999b).

The present study reveals in this article that one of the significant applications of the Internet is in the area of teaching, as opposed to the area of education. This mainly becomes obvious when examining the interviewees' statements that make a clear distinction between academic and high school studies in the first research question, which deals with the environmental aspects, and in the discussion of the teacher's role in the third research question. The study illustrates that a distinction should be made between the attitude to distance learning in institutions that are not high schools and high school teaching (Cohen, 1999). It appears that the approach in high schools is to student socialization, whereas universities put the emphasis on knowledge, scholarship and research. Apparently, teachers see themselves first and foremost as educators and the role of the high school to educate.

Methodical inspection of virtual schools all over the world (The Virtual High School Site, 2000) shows that the phenomenon of distance learning is spreading – enabling the high school student not to be physically present at school (Salant, 2000a), but the trend is less widespread than in higher education institutions. That is to say, high schools seem to be educational institutions worldwide. Nevertheless, it is possible that that the growing trend of distance learning for high school students fulfills needs that were not examined in this work.

According to the teachers, the socialization process – an educational one – prevents the Internet from replacing traditional learning.

The traditional school structure and the teacher's central role in the educational process should be maintained

Most interviewees expressed a fairly solid conviction throughout the study that high schools should be kept in their traditional mode with some pedagogic modifications. The modifications involve turning frontal teaching into experiential teaching and that the teacher move from the front of the stage to a supportive role in the learning process. Namely, the Internet as an extremely rich source of information will cause teachers to transfer the responsibility for obtaining information to the students, whereas the teacher will instruct them as to search, selection and verification methods of the relevant information. This is true whether teachers find social (that is to say, educational), pedagogic or personal justifications or whether they see the need to adjust to progress.

Aviram (1996) discusses three attitudes to the advent of technology – the conservative, the moderate and the radical. It seems that the teachers in this study represent the moderate approach, which is supportive mainly of changes in teaching technologies and didactics. But, there also appear to be radical elements in the very wish to transfer responsibility to the student. It is possible that the key statement of this study is the one that states the teachers' interest in introducing the Internet into the school and refusal to take the school out to the Internet, namely that the schools not become virtual schools. The saying that "many things will pass from this world, but not schools: they will change but not cease to exist" (Topler, in Cohen, 1997, p. 97) is furthermore justified by the teachers' attitudes in this study.

The interviewees claim that the teacher is the center of the socialization process of youths at school and that "all the ills of society are on their conscience" (Granot, 2000, p. 18). That is, maintaining the traditional school structure is a reflection of the wishes of society. In both the in-depth interviews and the random ones we found a consensus on this issue. Social needs, youthful exuberance that must be controlled, responsibility, maturity, motivation and pornography (Itzhaki, 1998) serve as the central arguments for keeping pupils in school under teachers' supervision. The teachers present one aspect of the profession as described by Aloni (1997).

It is likely that the legitimate decline of school as an institution that the students must come to every morning derives on one hand from the cyber success of distance learning in the business world (as is apparent in the literature review and the press review in the appendices) and on the other hand from the fact that at present the student is surrounded by ideological systems additional to school that are unable to justify "education on behalf of…" or education "for better life" (Aviram, 1996). In our world, a respectable income is connected with abilities that involve learning and education skills (Hecht, 2000; Izenberg, 2000). This is in contrast to a survivalist role that dictates behaviors passed on from father to son, such as agriculture and other trades. The child's place in school originates in the needs of a powerful social order (Lam, 1999b).

It is therefore possible that a multi-directional social compromise will be reached. On one hand, the Internet will enable communality of students in places where they cannot come to school (Salant, 2000b). Within the schools, the Internet will enable communality in which the teacher coaches pupils in smaller frameworks (as described in the literature review), of the kind that were common the far past (Heppell, 1999). That is: "A pedagogue in Greek is a leader – that's just it. Teachers should go back to being what they originally were…" (Nur – interviewee).

The Internet can influence teaching methods and by doing so will turn the teacher into a pedagogue rather than a teaching technician.

At the background of the interviewees' positions regarding technical means, pedagogy and socialization we find society's expectation of success in the matriculation exams. This in addition to the education system's demand to maintain severe procedures (Sharan et al, 1998; Ben-Eliyahu, 1998). The stability and rigidity of the system and the failed attempts to change the structure of the external examinations can be observed in the General Manager Operatives (Ministry of Education, 2000), which testify to a system of constraints and balances that derive from social gaps and economic interests beyond the scope of this discussion.

The interests of external interested parties put teachers to a social and personal test together with their students (Suan, 1997; Ezra, 1991). Matriculation exams dictate the full attitude to learning. As was found in the discussion of findings, teachers have no choice but to enforce a regime that enables students to cope with the parameters that were presented in the external perspective, which involves pedagogic aspects as characteristics of the external exams (the official matriculation exams). The external exams dictate major parts of the teachers' attitudes to the learning materials and to their personal problems. As opposed to the interviewees' dissatisfaction with the exams, Tamir (1997) states that in teachers' view an exam produces motivation, restraint and healthy concern for the student, that is to say, dissatisfaction despite necessity. In their aim to guide students to succeed in matriculation exams, teachers harness the Internet to the task. The "giant library" described in the inner (in campus) perspective is the desire to bring the textbook model to the Internet. This model involves clear, undiluted, reliable and filtered learning materials with unchanged linear texts. This model is indicative of external exams. The textbook is a convenient conduit of the learning process that serves as a filter, with the world at one end and the pupil at the other (Horowits, 1999).

The dissatisfaction with the external exams also creates anxiety on part of the teachers when dealing with the computer in the research question that addresses the personal aspects of the teacher's status in the classroom. In addition to the personal psychological block, we find unwillingness to perform pedagogic processes, which require some form of gamble that could damage results. The fact that the interviewees perceive the informal communications systems via the Internet as valid only when the regular school system encounters difficulties, explains the wish to maintain the traditional education system that is structured to guide the pupils towards external exams.

It is not surprising that the teachers seem to prefer a combination of papers with external exams or instead of them as a possible escape route, which maintains the system's stability, enables teacher autonomy and rescues pedagogy from its deterrent stability. It appears that the difference between high school learning and real-life learning is motivation, that is to say "learning through doing" (Heppell, 1999, p. 16).

> *The decisive factor of learning is neither intelligence nor the didactic system, although both play some part in it, but motivation (Lam, 1999a, p. 170).*

As students also find greater interest in writing papers (Zilbershtein and Geva, 1992), the teachers' opinions become more legitimate. "Distributed Learning" (Saltzbert and Polyson, 1995) combined with the statement that "the school will become integrated in the information sources outside it" (Flided, 1999, p. 4) is the suggestion that is reflected in the interviewees' inclination to use external Internet sources inside school. It is our impression that the organizational, cultural, economic and social alignment in Israel, as presented in this study, aims at this solution.

The education system is responsible for the means of transferring information rather than for the supply of end-technologies

A connection is found between the attitude towards government intervention in the external aspect and adjustment problems to computerized systems in the teacher's intrinsic aspect. Our era is renowned by the fact that schools should supply the technology in order to improve the students' achievements and autonomy (Peled et al, 1989).

This phenomenon is also evident in the US:

> *"Our ... challenge is to provide Americans with the educational opportunities we'll all need for [the 21st] century. In our schools, every classroom in America must be connected to the information superhighway with computers and good software and well-trained teachers. We are working with the telecommunications industry, educators, and parents to connect ... every classroom and every library in the entire United States by the year 2000. I ask Congress to support this educational technology initiative so that we can make sure this national partnership succeeds." (President Clinton, US Department of Education, 1996, www)*

The education system is dealing with changes imposed by the supply of expensive technology (US Department of Education, 1996; West, 1996), the addition of standards for computer maintenance, training in technical topics that change with the upgrade of computers, investments in designated infrastructure for a certain type of computers, and the creation of social gaps that evolve due to increasing demands from the students.

But the discussion of findings that deal with the pedagogic and intrinsic aspects, together with the evidence in that deals with the press review (that was part of this research presented in this article), raise the possibility that the characteristics of Internet technology can be disconnected from traditional table-top computer systems, namely systems such as cellular phones, palm pilots with Internet capabilities and other means that will be developed in the future. That is to say, advancing technology will enable teachers to focus on how they essentially see themselves – as pedagogues.

It is possible that the remedy for this situation is privatization, which would facilitate the supply of Internet tools to the pupil (not the school) by financial means. At the present, the Ministry of Education or the schools supply the computers and they are situated only in educational institutions. Explicitly, the pupil will purchase his own Internet tools (just as he does textbooks, copybooks, pens and pencils), whereas the school will supply the teachers, the social environment and the curriculum, which will integrate Internet information sources. In other words, the school will nurture pedagogy – which, as is indubitably evident in discussions of all perspectives, is where the teachers want to find themselves. The concern expressed by the interviewees about social gaps is most likely the point at which the government should intervene. The fact that the pupil should supply the technology is not all encompassing. The supply of technical means to poorer populations is seemingly necessary.

The teacher as a leader of change processes and as a leader of life-long learning

We come across statements such as "training future generations for the future" (Shalom, 1999, p. 8) or as proposed by Minister Shimon Peres "…to teach the history of the future…" (Lecture at a conference of the Science and Technology Administration, Jerusalem, 2000). But this study illuminates swift cultural and pedagogic changes, some of which are unforeseeable. Pessig (1999), a futurist, presents us with the inability to cope with the future and the irrelevance of anything we might see fit to include in the curriculum.

There is a contradiction here. On one hand, the meaning of these statements is that young people carry the burden of change. And, on the other hand, we find teachers to be "young in spirit" leaders of change.

It is possible to settle this contradiction if we change our outlook of education and adopt the approach that advocates "whatever the future may be", we teach what is updated today, and mainly "teach our students how to learn" as stated Baal-Schem. At the same time, we adopt the educational approach that supports life-long learning, namely – instead of learning for four years, we learn for forty years (Moe et al, 1999). For, every age and every generation can produce leaders of change. An ability to adjust to change and strategies for the development of appropriate learning skills will evolve throughout one's life.

> *"Our ability to be information literate depends on our willingness to be lifelong learners as we are challenged to master new technologies that will forever alter the landscape of information" (Plotnic, 1999, www)*

This is a realizable proposal with a learning and life program. This is a declaration that can place educators in a convenient and worthy position with clear boundaries of responsibility that enable examination and feedback. The findings reveal pedagogic ideas, which could find a solid basis in the proposed social, learning and teaching structure. The more creative educators could then present the fruits of their teaching and win the recognition of their colleagues and of the external interested parties.

Last words

At the conclusion of this article, it should be stated that it dealt with the teachers' perspectives. It is their view that they are the ones who carry the burden and that they are the centrals factors in applying social and educational ideologies in high schools. The teachers want a status of professional pedagogues. The Internet is a tool that the teachers want to use, despite the technical and emotional constraints, because it includes pedagogic characteristics as well as technical ones. It seems that the Internet will generate a change in teaching methods, but the interviewees are certain that high schools in their present administrative format will continue to exist for a long time.

References

Aloni, N. (1997) Professional ethics for vteachers and their functionality as an elite in the community, In Paldi, A. (editor): Education trail in time, Tel Aviv, Ramot.

Aviram, Roni, (1996) Self guiding via introversion social patterns as educational aims in post-modern society, in Danilov, Y. (editor): Danilov, Y. (editor): Planning of educational strategy. Jerusalem: Ministry of Education, p. 283-342

Ben-Eliyahu, Shlomo, (1998) Evaluation of school echivments and Matriculations, Theories in Education 3 (1), p. 105-118

Clinton, B. (1996) President of USA, Educational Technology and the investment paradigm, US department of Education, http://www.ed.gov/pubs/techinvest/chap1.html [23.9.2000]

Cohen, Avi, (1999) Instructional Technology and Distance Learning on the Internet, Educational media International, Volume 35, Number 3, September, p. 218-229

Cohen, Avi, (2000) How do educators accept the Internet as a study medium, Ph.D. thesis, Anglia Polytechnic University

Cohen, Adir, (1997) The was future: talk about future schools that was and gone, in Paldi, A. (editor) Education trail in time, Ramot, p. 96 – 102

Cuban, L. (1984) How Teachers Taught: Constancy and Change in American Classrooms, 1890-1980. New York: Longman.

Ezra, Anila, (1991) The contribution of tests to improving teaching an schools, Tel-Aviv, Tel-Aviv Universuty, School of Education, 65 p.

Granot, Moshe, (2000) In honor of the frontal lesson, Kesher-Aien, The Teachers Organization in High Schools – Israel, p. 18-19.

Hecht, J. (2000) Changes and developments in the world of labor, Ofek 2000, The annual third conference of science, p. 15-22

Heppell, Stephen, (1999) The Heppell Effect, Design, p. 14-16

Horowits, Guy, (1999) Internet and the Education Syatem, Discussion in Technology and Science, Journal of Technological-Scientific education – ORT - Israel, Vol. 31. December 1999. p. 39-41

Itzhaki, Moshe, (1998) Censorship in High School libraries in Israel: An exploratory field study, in Shoham, S.; Yitzhaki, M. (editors): Education for all: Cultur, Reading and Information. Ramat-Gan: Bar-Ilan University, Department of Information studies and Librarianship, p. 265-275

Izenberg, Eli, (2000) Demanded skills in global employment, Ofek 2000, The annual third conference of science, p. 13-14

Lam, Tzvi, (1999 a) Mind and ignorance as outcome of school: The hidden dimension of teaching in Bar-Lev, M. (editor), Values and education to values. Jerusalem: Ministry of Education, Hebrew University, School of Education, p. 169-177

Lam, Tzvi, (1999b) Power/Knowledge or Advantageous/ Knowledge, Significance/ Knowledge, Curiosity/ Knowledge, In Gur-Zeev (editor): Modernism, post modernism and education. Ramot, p. 143-164

Melamed, U. and Dayan, R. and Gal, M. (1999) Computing the Education System in Israel – Suggestions for accelerating learning methods through computers, Education Department, Science and Technology Administration.

Michigan State, (2000) Technology Plan, http://www.mde.state.mi.us/tplan/ [10.2.2000]

Ministry of Education, (2000) General Manager Operating, http://www.educatrion. Gov.il [23.8.2000]

Moe, T. M. and Bailey, K. and Lau, R. (1999), Investing in the Growing Education and Training Industry, In-depth Report, The Book of knowledge, MerrillLynch.

Peled, Elad, and Peled, Zimra, and Alexander, Gad, (1989) New information Technology in education: A challenge to educational policy in Israel. Jurnal of research on computing in education 22 (1), p. 90-106

Pessig, D. (1999) The balance between knowledge and skills – The curriculum structure – Directions of the education system in Israel, Ministry of Education, Pedagogic secretariat: Conference, Anave Center, Tel-Aviv

Plotnic, Eric, (1999) Information Literacy, Eric Digest, http://www.ed.gov/databases/ERIC_Digests/ed427777.html [17.9.2000]

Rotshtriche, Natan, (1951) Education and Morale, Megamot, B (2), p. 111-120.

Salant A. and Tirosh, T. (1988) Computer Phobia: psychology and bio-physical aspects, Actual information and data, 1, p. 2-30

Salant, A. (1999) Tendentiousness in the Internet in Education, AMAL Pedagogical Center.

Salant, A. (2000a) Computerized planes in education systems in the world: trends and review, Ver 2, MAPAT AMAL, Tel-Aviv.

Salant, A. (2000b) Virtual Schools – The future is here, International Information Sources on the Internet - MAMBA vol 26, Pedagogic Center – AMAL, P. 5-8 http://amalnet.k12.il/mamba [14.9.2000]

Shalom, Hana, (1999) Technological Education in uncertain era. , Discussion in Technology and Science, Journal of Technological-Scientific education – ORT - Israel, Vol 31. December 1999. p. 6-11

Sharan, S. and Shahar, H. and Kevin, T. (1998) The modernistic school: Organization and Teaching, Ramot, Tel-Aviv

Suan, D. (1997) The Responsibility of Teachers – The Demands of the Society and Teachers' Perceptions. Education in Environment, p. 125-136

Tamir, P. (1997) What teachers think about evaluation and achievements, Papers24, MOFET institution p. 7-19

The Virtual High School site, (2000) http://www.vhs.ucsc.edu/vhs/casestudies.htm [14.9.2000]

UK Education Department Site (2000) Computers in Schools – The National Grid for Learning (NGFL) http://www.bracknell-forest.gov.uk/council/departments/education/computers.htm [14.2.2000]

US Department of Education, (2000) Official Web Site, http://www.ed.gov [12.2.2000]

Zilbershtein, M. and Geva, A. (1992) Autodidact learner: Translation of an idea into practical terms of achievements measurement, Practice of curriculum p

Multimedia CD-ROM Based Course Creation: Instructional Design Considerations for Teacher Educators

Timothy E. Morse and Taralynn Hartsell

The University of Southern Mississippi

Abstract

This paper is a report of the instructional systems design issues the lead author has confronted as he has created a multimedia, CD-ROM-based preservice teacher education course. The course, which introduces students to the field of special education, is comprised of 10 multimedia CD-ROMs that were developed solely by the lead author. While existing technologies enable a single teacher educator to create such a course, teacher educators need to be aware of the numerous issues they will have to address before embarking on such an endeavor. Consequently, the purpose of this paper is to identify some of the issues teacher educators will have to address if they want to independently create a multimedia CD-ROM-based course, and provide these instructors with some guidance for addressing these issues. Additionally, some of the advantages and disadvantages associated with this work are identified.

Introduction

Innovative uses of computer technology to deliver college courses have proliferated in recent years as access to this technology in both schools and homes has increased. In particular, online course offerings have become more prevalent as both the Internet and World Wide Web have become more popular. However, online instruction is only one type of technology-mediated instruction that can be used to present a college course. In fact, since no one technology will address the needs of every University instructor (Vattorn, 1998), it is necessary for these individuals to explore the use of any type of technology-mediated instruction that is this suited for their specific purposes, and then report their work so that others may learn from it.

Existing and emerging technologies now permit college instructors to develop one type of technology-mediated instruction - multimedia CD-ROMs - that heretofore was not possible given the resources (both equipment and personnel) that were needed to create this type of technology-mediated instruction (Ludlow, 2001; Ludlow, Foshay, & Duff, 1998). For the purposes of this discussion, the term multimedia refers to a computer-based environment that utilizes multiple media (e.g., motion video, sound, graphics, and text) (Poole, 1997). For more than a decade special education teacher educators have used computer-based multimedia instructional materials to present instruction about select special education topics (Blackhurst & Morse, 1996; Langone, Malone, & Clinton, 1996; Semrau & Fitzgerald, 1995; Thorkildsen & Lowry, 1997). Consequently, it is appropriate to explore the possibilities of using this medium to present instruction for an entire college course, particularly since this medium can offer the convenience and asynchronous access that students often report as being an advantage of online course offerings.

During the past two years the lead author has been independently developing a directed study, multimedia CD-ROM-based course: Psychology and Education of the Exceptional Individual. The course, which introduces students to the field of special education, is comprised of 10 multimedia CD-ROMs. As was noted above, when such development efforts are undertaken, they need to be reported so that others can learn from the experience. More specifically, since existing and emerging technologies permit a single instructor to create such a course, potential course creators need information that will assist them in determining whether the reasons for doing so are outnumbered by the arguments that can be offered against an individual completing this work independently.

Given these circumstances, the purpose of this paper is to identify for teacher educators some of the issues they will have to address if they want to create a multimedia CD-ROM based course, and to provide these instructors with some guidance for addressing these issues. This is accomplished by first describing the multimedia, CD-ROM-based preservice teacher education course the lead author has created (and continues to develop since this course is being offered for the first time during the Fall 2002 semester). This course description is followed by a discussion of some of the instructional design issues the lead author has identified a teacher educator will have to address if this individual wants to independently create a multimedia CD-ROM-based course. The paper concludes with a discussion of the advantages and disadvantages associated with such an endeavor.

Overview of a Multimedia CD-ROM Based Course

Rationale for course creation

The multimedia, CD-ROM-based preservice teacher education course that the lead author created serves as the University's introductory special education course and is the only required special education course for all preservice regular education teachers at The University of Southern Mississippi. The purpose of this course is to teach basic information about students with disabilities and the operation of special education programs in the public schools. While a number of sections of this course are offered each semester at the University, the multimedia CD-ROM-based version was created to meet the needs of a particular group of preservice teachers who complete their coursework at one of the two campuses that comprise the University, which is a dual campus institution. The largest campus is located in Hattiesburg, while the second campus (where this course is offered) is headquartered approximately 75 miles south on the Mississippi Gulf Coast in Long Beach. Additionally, courses are offered at three satellite locations along the Coast. The preservice teacher educators for whom this course was created complete the majority of their classes at two locations along the Coast: either Long Beach or Gautier, which is approximately 40 miles east of Long Beach. Since the CD-ROMs present confidential information about special education students, the CD-ROMs are housed in a library at Long Beach and a computer lab at Gautier in accordance with an agreement between the University and the public schools.

Most of the students who attend school on the Coast are non-traditional college students. Consequently, the Gulf Coast faculty make a concerted effort to ensure that their course offerings meet the unique needs of these students. For the past three years an online version of the introductory special education course was available to all of the University's students. Still, some of the Coast's students requested the creation of a section of this course that offered them even more flexibility. The reasons for their request included not being available to attend the mandatory online sessions (e.g., weekly chat sessions), previous negative experiences with online courses, scheduling conflicts between the online version of this course and other classes the students had to take, and not having access to their own personal computer.

Obtaining and creating course content

The course is contained on a collection of 10 CD-ROMs. The CD-ROMs include video, audio, graphic, and text files that present: (a) the instructor's lectures; (b) special education activities being performed in local public schools; (c) key special education documents, such as a student's individualized education program; and (d) interviews with school personnel. Hence, the creation of the course was a collaborative effort between the University and four public school districts.

The lead author obtained all of the video and audio source material by videotaping and creating audio recordings of his lectures, and videotaping special education activities being performed in local public schools as well as interviews with school personnel. A Sony DCR-TRV 17 Mini-Digital Video Camera and a Sony ICD-BP 100 IC Recorder were used for these purposes. The source material was converted to video and audio files on a Sony PCV-RX463DS VAIO Digital Studio computer using Sony's DV Gate Motion software to capture video and MGI Videowave III SE to edit it. Audio files were both captured and created using Sony's Digital Voice Editor software. Graphic files of key special education documents were created using an HP ScanJet 5300C and its accompanying software. Text files in which additional lecture materials, a study guide, and information directing the students how to use the CD-ROMs were created in Microsoft Word 2000. The video, audio, graphic, and text files were appropriately assembled as interactive multimedia instructional programs using the multimedia authoring program Lectora. These instructional programs were then "published" as the 10 CD-ROMs that comprise the course.

The lead author used grant monies he secured from the University's Preparing Tomorrow's Teachers to Use Technology (PT3) grant to obtain all of the needed equipment and software. Likewise, the course was constructed during the Summer 2002 term after the lead author secured a grant from the University that expressly permitted him to create the course. The University annually awards "Summer Grants for the Improvement of Instruction." These grants release a professor from all teaching responsibilities during the summer semester so the professor can create an innovative way to present instruction.

Course implementation

Students complete the course by viewing the CD-ROMs. The students can view the CD-ROMs any time the facilities where the materials are housed are open. Each student must present proper identification (i.e., their driver's license) to use the materials. Each collection of 10 CD-ROMs is contained in one 3-ring binder equipped with plastic storage pages. A total of six 3-ring binders are available for the students' use.

The entire class met with the instructor the first Friday of the semester, and will meet with him three additional Fridays. During the first class meeting the syllabus was discussed and use of the CD-ROMs was demonstrated. Three more class meetings will be held so the students can complete examinations that pertain to the CD-ROMs. Additionally, each student must complete a take-home exam that is based on the course's required text, and write a philosophy of special education paper. These assignments must be submitted to the instructor by their assigned due dates.

The instructor and students remain in touch via telephone, postal mail, student-scheduled meetings, and e-mail. The instructor called each student individually during the first two weeks of the semester to conduct a follow-up conversation to the first class meeting. Approximately three weeks prior to each CD-ROM exam the instructor will send a letter to the students reminding them about the upcoming exam as well as the due dates for the take-home exam and philosophy paper. Students can call or e-mail the instructor when necessary, or visit him in his office.

Multimedia CD-ROM Based Course Creation Issues

Existing technologies now make it possible for one teacher educator to create a multimedia, CD-ROM-based course tailored to meet a specific need. Before engaging in such a worthwhile endeavor, a teacher educator must determine whether the reasons for doing so are outnumbered by the issues that must be addressed in order to create such a course. Potential course creators will be better equipped to decide whether, and how, to proceed with such work if they have a general understanding of these issues. Thus, the next section of this paper focuses on five central issues that the lead author has determined must be addressed when a multimedia, CD-ROM-based course is created.

Rationale and stability

The lead author learned, as have others (Ludlow et al., 1998), that creating multimedia instructional materials, especially an entire course that consists of a collection of multimedia CD-ROMs, can be a very time and labor-intensive process. Therefore, before a teacher educator commits to such an endeavor she must first establish a clear rationale/need for developing the course. Simultaneously, she must determine how long this need will exist, and assess whether other factors indicate that, once created, the multimedia course will be used enough to justify the effort associated with its creation. Relevant questions that need to be asked at the outset include: (a) will enough students enroll in the course each time it is offered so that the class will not be canceled; (b) will the course's creator be permitted to teach the course each time it is offered, and not be bumped by a more senior faculty member or re-assigned to teach another course that requires the course creator's expertise; and, (c) will the major issues and content that are taught in the course remain relatively stable and only have to be revised/updated periodically? A related matter that must be addressed at this time is whether necessary course updates can be completed with the resources and personnel who will be available at that time.

Equipment

An array of equipment (e.g., cameras, videotapes, microphone, computer) and computer software will be needed to create the course. Afterwards, appropriately equipped computer systems will be needed for viewing the course. One key issue that course creators should attend to from the start is the seamless operation of all of their assets (i.e., will every piece of equipment and software be compatible with every other piece of equipment and software). Manufacturers may advertise that their equipment possesses certain multimedia capabilities, but these capabilities may only work when the equipment is paired with other equipment that is made by the same manufacturer. Thus, mixing and matching equipment from different manufacturers may prove to be problematic. Another advantage of achieving seamless integration by purchasing all equipment from the same manufacturer is that the course creator will only have to go to one entity to pose questions, as well as to report problems. A course creator may have to pay more for a particular item by sticking with one manufacturer, however, for all of the reasons just discussed, this may be a cost worth incurring.

A second equipment consideration pertains to how the multimedia CD-ROMs will be viewed. Relatively old computers may not possess the processing speed, RAM, and screen resolution that is needed to view full motion videos as they are intended (and expected) to be seen. Hence, students who use these computers to view the course's CD-ROMs may be thwarted in their attempts to achieve the learning objectives and become dissatisfied with the class. To address this issue a course creator may have to designate a central location, such as a computer lab, where students can go to view the CD-ROMs. If a course contains confidential material that is restricted for the use of only the students who are enrolled in a course, this fact may dictate the need to locate a course in a central location.

Funding

Funding may be needed for several purposes. First, funding may be needed to obtain the necessary equipment (e.g., hardware and software). Course creators should be mindful of the fact that, even though they may prefer to purchase top-of-the-line equipment across the board, nowadays they will be able to complete their work with much less expensive equipment. The key is to purchase equipment that meets one's needs and then get the most out of it by becoming an expert user of it.

Second, funding may be needed to purchase release time for the purpose of obtaining source materials. This should include the time one will have to spend planing exactly what source material will be obtained and how it will be obtained. For instance, before conducting an interview one should settle upon the questions that will be asked, the order in which they will be asked, and the setting in which the interview will take place. Related expenses that will be incurred include the cost of transportation for going to and from the University and the school (or similar location) where the source material will be obtained.

Third, funding may be needed to purchase the release time that will be necessary to construct a course. This involves placing the source material in appropriate video, audio, graphic, and text files, compiling these files in the multimedia authoring program, burning the CD-ROMs, and constructing the 3-ring binders (or similar storage device) that will hold the CD-ROMs.

Source material acquisition

When a potential course creator considers the material she wants to place in the CD-ROMs that will comprise her course she will be well served to remain mindful of the statement, "Content is king." While multimedia offers the possibility of generating lots of "bells and whistles," these entertaining features may only serve to distract the learner from attaining the desired learning objectives. Thus, the main focus of the course creator should be to present quality information that is tied to the attainment of stated learning objectives.

In their quest to obtain the highest quality content possible teacher educators must plan for how they will obtain source materials ethically. Since teacher educators need to teach preservice teachers about what is occurring in schools, the employees and students who populate the schools will be the centerpiece of the source materials and they, or their legal guardians, will have to grant permission for their participation in the project. When a course creator obtains this permission, she will be best served if she explicitly states how the source material is to be used. In the lead author's project, he drafted participant permission letters and had them approved for his use by the University's legal counsel. Potential course creators are encouraged to do the same.

Undoubtedly, addressing all of these issues will entail a lot of work. In the end, however, this work will, more likely than not, result in a quality product. Additionally, strong, long-term working relationships will be established with the school personnel who contribute to the project.

Creating computer files

As was noted previously, software will be needed to create the video, audio, graphic, and text content files, as well as compile these files in the interactive multimedia instructional programs. Given the central importance of this software to the project, it should be relatively easy to learn how to use (in other words, the operation of its features should be intuitive), stable (free from frequent crashes), compatible with the hardware and other software the course creator is using, and be able to work across platforms (i.e., Windows and Macintosh). This last point is particularly relevant to the multimedia authoring software program.

Advantages and Disadvantages to Self-Made Multimedia Instructional Materials

Ludlow et al. (1998) have argued in favor of using a development team to create multimedia instructional materials, saying that the use of such a team allows it to create better materials since each team member can use his expertise to enhance the development of these materials. Yet, existing technologies now permit individuals to independently create multimedia instructional materials, and there are advantages associated with independent production as compared to the use of a development team. Below is a brief discussion of the potential advantages and disadvantages of having one person -in particular, the course's instructor - independently create a multimedia CD-ROM based preservice teacher education course.

Advantages

Scheduling course creation activities. As has been noted elsewhere in this paper, a number of activities must be performed to create a multimedia, CD-ROM based preservice teacher education course, including videotaping school activities, creating needed video, audio, graphic, and text content files, and creating and revising interactive multimedia instructional programs. These activities may be much easier to schedule and complete when the course creator works independently rather than as a member of a development team.

Obtaining course content. If the course creator is also the content area expert, when she obtains all of the source material independently - particularly video and audio - there is a greater chance that she will obtain content that is particularly suited to her needs. For instance, since this individual knows what she wants to highlight in a video, she can be sure to capture this information in her source material. Later, when she creates the video, audio, graphic, and text content files, she can take necessary steps to emphasize key points displayed in the source material.

Course creation. When the course's instructor is developing the interactive multimedia instructional program she will be in a position to determine how best to present and integrate/link the content. These actions may occur as a result of systematic planning or perhaps by happenstance as the course creator learns about the multimedia authoring software's capabilities during the course creation process.

Professional development. By going to schools to videotape lessons and related activities, and interview school personnel, the course creator will be participating in a professional development activity throughout the course creation process.

Build University/public school partnerships. When a University instructor works with public school personnel to create multimedia instructional materials, she will have the opportunity to establish a long-term, positive working relationship between the two entities.

Disadvantages

Time and resource commitments. Multimedia CD-ROM-based course development is a time and labor-intensive process. Thus, at the outset the course creator must determine whether she will have the time necessary to devote to all aspects of the project. University personnel in particular must determine whether their work in this regard will be valued by their employer and counted appropriately towards tenure and promotion.

Technical skill requirements. A single course developer will need to possess quite a number of technical skills across many areas, including operating a video camera and audio equipment, as well as computer hardware and software. Noteworthy deficiencies in this regard may result in (a) the acquisition of poor quality source material, (b) the production of poor quality video, audio, graphic, and text content files, and (c) an inadequately developed multimedia instructional program (e.g., inadequate links between related concepts and limited interactivity).

Instructional design training. If a course developer has limited or no training as an instructional designer the resulting course may present less effective instruction than would otherwise be the case. Areas in which an instructional design background would prove helpful include (a) how to best use video and audio to enhance student learning and (b) multimedia CD-ROM design, to include individual screen designs, sequencing of content, and navigating among the content.

Conclusion

Existing and emerging technologies now permit teacher educators to create multimedia instructional materials tailored to meet their particular needs. For instance, teacher educators can create a multimedia CD-ROM-based course similar to the one that was created by the lead author and reported upon in this paper. However, given the numerous issues that need to be addressed in this type of project, the fact that existing technologies permit this type of development does not mean that the reasons for doing so will outnumber the arguments against doing so. Hence, potential course creators are encouraged to explore all course creation issues, including the ones addressed in this paper, before deciding on the appropriateness of creating and using this form of technology-mediated instruction.

References

Blackhurst, A. E., & Morse, T. E. (1996). Using anchored instruction to teach about assistive technology. *Focus on Autism and Other Developmental Disabilities*, 11, 131-141.

Langone, J., Malone, D. M., & Clinton, G. N. (1999). The effects of technology-enhanced anchored instruction on the knowledge of preservice special educators. *Teacher Education and Special Education*, 22, 85-96.

Ludlow, B. L. (2001). Technology and teacher education and special education: Disaster or deliverance? *Teacher Education and Special Education*, 24, 143-163.

Ludlow, B. L., Foshay, J. D., & Duff, M. C. (1998). Developing interactive multimedia modules to train rural special education personnel. *Coming Together: Preparing for Rural Special Education in the 21st Century. Conference Proceedings of the American Council on Rural Special Education*. (ERIC Document Reproduction Service No. ED 417 881)

Poole, B. J. (1997). *Education for an information age*. New York: McGraw-Hill.

Semrau, L. P., & Fitzgerald, G. E. (1995). Interactive case studies in behavior disorders: Looking at children from multiple perspectives. *Education and Treatment of Children, 18,* 348-359.

Thorkildsen, R., & Lowry, W. (1997). Producing accessible video-based training on assistive technology. *Journal of Special Education Technology*, 13 (3), 45-53.

Vanttorn, R. (1998). Visions: Enabling technology for programs of distinction. *Phi Delta Kappan*, 79 (5), 477-478.

Directing a Dynamic Student Managed Technology Lab

Juanita Ikuta

University of Wisconsin Eau Claire

Purpose

The purpose of this manuscript is to offer practical experience from the University of Wisconsin-Eau Claire's School of Education Technology Lab and Projects Studio (referred to as the Lab) and research-based information on the need for and the management of student run, self-contained computer labs.

Intended Audience

This manuscript is intended to provide practical information on justifying and managing a student run, self-contained technology center. This information may be used to discuss individual approaches with others and as a catalyst for examining alternate systems. The information is intended for higher education administration and faculty, along with K-12 administrators and media specialists.

Content Description

Justification

The concept of a education computer lab is well-founded in research. One study identifies recognition of need for pre-service teachers to have a dedicated environment for learning technology skills. This study found that the acknowledgement of the relevance of information indicates a progression in technology adoptions (Oleson, 2000). Another study concludes that pre-service teachers using technology in a supported lab show an increase in computer usage, express a higher level of confidence in using computers and indicate that they would use computers more extensively in the future (Castleman, 1995). Yet another study, focusing on integration, indicated the need for more hands-on experience for pre-service teachers coupled with increased modeling of technology. (Panel on Educational Technology, 1997; Office of Technology Assessment, 1995). All this research suggests that a pre-service teacher computer lab with trained support staff increases confidence, skills and may impact future integration of technology in the classroom.

Strategic Planning

The foundation for building a pre-service teacher computer lab is a strategic plan. It is important to devise rudimentary components of a strategic plan, revisit and carry them out. Lack of a collective vision may result in the inability to prioritize an overall operational mode during changes in administration. Varying operational styles may exist as coordinators, platform administrators and staff change from semester to semester. Operational styles could range from casual, unstructured operation to more procedural and structured. A lack of consistency could unsettle staff resulting in an aversion to change and the emergence of power struggles amongst staff.

Roles

Another important element in a student managed technology lab is the roles that provide consistency from semester to semester. Suggested roles include: faculty liaison, coordinator, PC administrator, Mac administrator, patron relations' software specialist administrator, assistant administrators and lab workers. The reporting structure and degree of responsibility assumed at each level should evolve and responsibilities may emerge as a technology lab matures.

Recruitment

Finding students to fill technology positions is a key issue for any computer lab. Several strategies at the Lab were successful. First, collaboration with a financial aid representative to determine students with federal work-study money identified potential candidates that do not have to be paid from lab funds. Second, professors teaching technology classes were a rich source of possible candidates. Professors recognized students with potential and interest and informed them of employment opportunities. Other recruiting was performed by hosting open houses, giving presentations in selected classes and dedicating a page on a web site.

Staffing

Successful recruitment efforts are essential to providing adequate staffing for dedicated support. Research indicates that when teachers are given dedicated support they allocate time to develop technical expertise and plan to effectively integrate technology into their classrooms (Colburn, 2000). One quantitative staffing method Lab administrators used analyzed the number of patrons on an hourly morning, afternoon and evening shift and daily basis. Peak usage times were identified and staffing numbers adjusted.

Training

Just having a staff is not enough – a trained staff is a necessity. Two training methods for Lab staff have been tested in the Lab. Initially, a learning matrix was established. This matrix listed frequently used computer programs with sequential skill levels. Lab staff was responsible for mastering specified skill levels to obtain pay raises. This style failed because minimal pay raises did not entice staff to advance in the matrix nor was there any effort made to consistently encourage the staff to use the matrix.

A second method began with gathering syllabi from professors with technology related assignments and assembling a table that indicated what the assignment was, when it was due and the relevant professor. This tool provided a quick reference so staff could anticipate patron needs. In order to ensure that the staff had the necessary technical skills to assist patrons, training was prioritized according to technical skills required for assignments and the due dates for these assignments. The emphasis was on recognizing that training systems can rapidly become stagnant and the Lab must be able to quickly change training priorities to meet changing needs and technologies.

Focus Groups

Keeping abreast of the dynamics of technology is challenging. Reports indicate that many teachers are not making effective use of technologies that are present in classrooms and lack the necessary expertise to integrate technology into curriculum instruction (Colburn, 2000). To address this issue, Lab interest groups were created to increase the staff's technical expertise. Accessibility, Equipment/reservation Check-Out, Learning Matrix, Web and Lab Modernization comprise current focus groups.

How the Webmaster Almost Lost His Job: Reflections Upon a Usability Study for a Health Care Consortium

LeAnne K. Robinson

Western Washington University

Abbie Brown

California State University, Fullerton

Abstract

To determine whether a Web site was poorly designed or the users of the site had inadequate skills to make proper use of the site, a test of the Consortium of Multiple Sclerosis Centers Web site's "usability" was constructed and conducted over a five-month period.

A formal usability study of the "Professional Resources" section of the MSCare Web site (www.mscare.org) was conducted between September, 2001 and January, 2002. A usability study is an evaluation of how well a design works in practice. Usability testing is a standard, time-tested evaluation protocol among engineers and has been adopted by software developers (beginning in the middle 1980s) as a means of determining how well a design works in practice. This particular test attempts to determine if the "Professional Resources" portion of the Web site, MScare.org works as it was designed to, to be accessible to the general public, if a user's hardware limits accessibility to portions of the Web site, and to begin to understand why individuals may not be participating in the Virtual Roundtable portion of the site.

Follow up questions and tests of the site on various computers showed that, although the site is generally well regarded by the test subjects for making content of its kind available on the World Wide Web, the navigational setup and links, aspects of the visual design, as well as security protocols currently in place within the Professional Resources section need to be re-examined before the site is able to meet the goals outlined by the CMSC Web Site Management Team.

Introduction

"I must be doing something wrong." This statement and others like it seem to be uttered regularly by people attempting to navigate their way through the World Wide Web. Many people seem willing to blame themselves when it comes to using computing tools, instead of considering the possibility that the tools are poorly designed. The authors of this study found themselves in casual conversation with health care professionals who, while blaming themselves for their inability to access information on a Web site that was important to their professional growth and their patients' well-being, seemed to suspect that something else might be affecting the situation. As researchers, the authors were intrigued and interested in discovering more about why these highly educated and competent people were made uneasy by software designed especially for them.

After continued discussion with the health care professionals (who ultimately became the clients of this study) the question to consider became: Could a usability study reveal whether the problems reported in using a specific Web site were the result of the users' lack of computing skill or the result of poor software design?

The Client

The MSCare Website has been developed for the Consortium of Multiple Sclerosis Centers (CMSC) as a vehicle for disseminating information to its members, MS professionals, patients and the general public. The organization was founded in 1986 under the direction of neurologists who were interested in the clinical care of multiple sclerosis (MS). Since then, the organization has developed into a multi-disciplinary organization providing a network for all healthcare professionals and others specializing in the care of persons with MS. A management team was formed in 1999 to oversee the development of a Web site and to insure that the site reflects the mission and goals of the CMSC.

The MSCare Web Site

The MSCare Web site has been divided into three sections providing information for: CMSC members, patients, and professionals. Professional Resources is a subsection of the Professionals' section and has been created to serve primarily as a resource for consortium members and secondarily as a resource for professionals interested in MS patient care. The Professional Resources is divided into four areas: On-line CME's, On-line MS Presentations, Book Reviews and Articles on MS by CMSC Affiliates. The Virtual Roundtable, which was initially included as part of the Professional Resources section, was moved to CMSC Members section during the evaluation period.

On-Line CME's include several links to sites where individuals can take classes via the Internet for continuing medical education credits. Articles on MS by CMSC Affiliates are a series of papers presented at conferences, written by Consortium Members or by other professionals.

The On-Line Presentation section consists of several presentations that were given at recent conferences and are presented in an outline and notes format. A narrative outline is generally on one half of the screen and the notes elaborating on the points presented are on the other. Posted presentations include a multitude of formats, some requiring *Real Player* (www.real.com) installation for video viewing of the actual presentation.

The Virtual Roundtable was created as a forum where consortium members can log on and participate in on-going discussions regarding the posted article. All viewers are able to read the article, but only registered members may participate in and have access to the on-line dialogue. The intent of the selected article is to provide thought stimulating discussion around professional interests.

The director of the Web Site Management Team, who is also editor of the Professional Resources section, requested that the Professional Resources be tested for usability. The primary evaluator held an initial interview with the director of the Web Site Management Team on November 11, 2001 to gain an understanding of the evaluation objectives. From the conversation, several evaluation questions were posed and then confirmed by the director.

Method

A participant-oriented program evaluation design (Worthen, Sanders & Fitzpatrick, 1997) was modified to meet the client's evaluation objectives. Although the original request was for a usability test of the Web site, discussion between the primary evaluator and the Web Site Management Team director revealed that not all of the client's evaluation objectives could be met using standard usability testing procedures. The client had identified at least one objective that a usability test cannot help to answer: the question of who is using the site cannot be answered through standard usability testing (in discussing the issue with the site's Webmaster, it was determined that no information is currently available as to who exactly has visited the Web site). Only the first objective, determining whether or not the site is usable and accessible may be determined using standard usability testing procedures. Another of the client's objectives may be answered in part through standard usability testing protocols: determining why there had been no participation in the Virtual Round-Table may be achieved by determining whether or not the Virtual Round-Table functions as it is intended to and is understood as such by site visitors (however, if the testing reveals that it functions correctly and is understood, the reasons for why it is not being cannot be determined).

Few pre-created formats or protocols that address client-centered requests are currently available in the public domain. Checklists and generic rating forms that are available do not seem appropriate as a valid means of accessing the desired information requested by the client (Dumas & Redish, 1999; Nielson, 2000; Small & Arnone, 2001). Thus, a formative, client-centered evaluation approach was selected and evaluation was designed around the client's requests. The validity of this approach was checked by the primary evaluator in consultation with a university professor who specializes in usability testing. Once the plan was determined as valid, specific protocols were developed for use.

Evaluation Plan

Table 1: Evaluation Plan

Evaluation Questions	Information Required	Source of Information	Method of Collection	Participants	Analysis Procedures
1. Is the general public able to easily access information on the web site?	Interface/Navigation Design	Navigation (Usability) Test	Evaluator Observation during test	Solicited participation from professional individuals (10)	Quantitative: descriptive statistics generated. Qualitative: subject comments coded and interpreted.
2. Does a user's hardware (computer, browser, etc.) limit accessibility to the posted information?	MAC – computer laboratory: Macintosh G4 and "legacy" computers. PC – Dell Pentium IIIs (?)	Available computers throughout Cleveland Hall at Washington State University	Evaluator Trials on multiple computers (Expert review) "Break it" testing.	Evaluator(s) (2) "Super-User" level computer users.	Quantitative: specific problems identified and listed. Qualitative: subject comments coded and interpreted.
3. Why aren't professionals participating in the roundtable? (Is the topic controversial enough?)	Review by Consortium Members	Phone Interviews	• Send Letter • Phone Call/Email Test • Phone follow up	Consortium Members (6)	Qualitative: subject comments coded and interpreted.

A final, and crucial, question posed by the client is, *Will people return to the Web site if they have difficulty using it?* A standard presumption is that people do not return to a Web site if they find it difficult to understand or navigate (Nielson, 2000); nor will they return if the site design is such that the user's computer cannot support the software employed by the site (e.g. javascript, shockwave files…etc.) (Nielson, 2000). There are exceptions to this, particularly if there are no other sources of reliable information available or if visiting the Web site is part of one's vocational or avocational responsibility. Assuming that MS professionals have other, similar sources of information available and that the majority of the site's visitors do not have any obligation to use the Web site, it can be argued that finding the site difficult to understand or use will cause users to avoid the site in the future. Conversely, the fact that the information is available on a Web site and accessible through a personal computer may have induced a "novelty effect" that causes users to return to the site regardless of how easy the site is to use.

Ten test subjects were asked to participate in the usability testing. Subjects worked in pairs – this is a recommended protocol for usability testing since pairs need to speak aloud to each other in order to negotiate the tasks involved in the evaluation, allowing the evaluator to "listen in" on the subjects' thought processes. Four of the pairs were selected because of their medical background and the fifth pair was selected based on their advanced ability to use the computer for the purpose of comparing and validating the results of the testing. Two pharmacists; three RN's; two LPN's completing an RN degree and one special education instructional assistant comprised the initial teams. All of the subjects had some, if not extensive, experience working with individuals with MS, with the exception of the final pair, who were both graduate students and "Super Users" (a common term used by Information Technology professionals to identify individuals with a high degree of computing sophistication; not necessarily programmers, these are people with extensive skill using computer applications).

Testing occurred in private homes between January 5 and January 20, 2002. Each pair was given a list of tasks and follow up questions that were to be answered after the completion of the test and were observed by the principal evaluator. Notes were taken on the length of time pairs spent on each task and on the perceived difficulty or ease of completing each task. Dialogue that occurred between the individuals was also recorded. Each participant received a $25 gift certificate from a national bookstore chain and an MScare.org *Post-It* pad as a thank-you gift for completing the test.

After all of the tests were completed, the data from each test was compiled into a comprehensive set. Both positive and problematic comments and observations were coded and then matched with a usability checklist. Responses to the follow up questions were consolidated and contrasted with the results of the observations from the actual testing. Responses from the observations made by the principal evaluator were matched to the follow-up responses from the subjects as a means of triangulating the data. It should be noted, however, that most individuals attributed problems with the web site to their own computer skills or to the computer that they had purchased, not to the site. Even the Super Users, who had difficulty with navigation gave positive comments on the ease of using the site. Users who could not find information, or answered informative questions incorrectly concluded with such comments as, “Seemed to have a lot of useful information for someone who uses a computer”. Both evaluators then tested the Web site for navigability issues related to color, screen size and links on both Macintosh (MAC) and PC platforms in *Netscape Communicator 4.7*, *Internet Explorer 5.0* and *America Online* (4.0 on PC; 5.0 on MAC). Data from all three sources was again consolidated. The site was also tested for ADA (Americans with Disabilities Act) compliance using *Bobby* (a standard evaluation protocol available free of charge). Although this was not specifically requested by the client, the information was included for consideration.

Findings

Interface and Navigation

Interface and navigation refers to how the set up of the site assists the user in moving from page to page and how the structure contributes to the ease with which a user is able to access information. All of the users were able to understand what the site was designed for, and several commented on how much they liked the division of information in the home page: Information for Patients, Professionals, and CMSC Members. No comments were recorded on either a cognitive match or disconnect between the content and the personality of the site.

Numerous users had difficulty with window size. Several pop-up windows would not enlarge during the testing and the users had to scroll through a very small area in an attempt to complete tasks. It was also noted that the pop-up windows would sometimes entirely cover the previous window, and, without navigation clues, users could not figure out how to return to the previous page. This was often exacerbated by the unavailability of the “back” button in the browser window.

Further confusion resulted when the majority of users were unable to figure out where, in the site they were; when the users were asked to go to “Presentations on MS”, they were not always able to determine if they were actually in the correct section. This was also compounded by the incongruity among the wording of the home page, the left frame and the Presentation Index. For example, on the initial page for Professional Resources, the links are named Articles on MS, Online MS Presentations, and Online CME’s. On the left frame, however, the wording changes to: MS Articles, Presentations, and CME Online. This is further confounded by a link that appears underneath several of the online presentations entitled “Presentation Index”. Users did not always know where this would go and were hesitant to use it. When they did, multiple problems resulted.

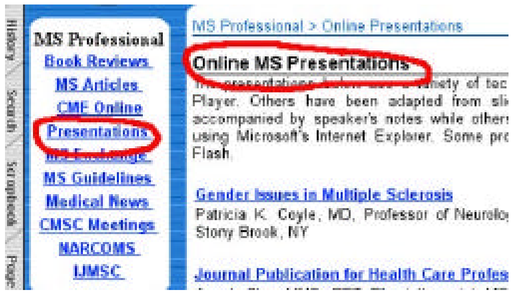


Figure 1. Incongruently Labeled Links

Links

Because users were unable to easily determine how to navigate, many would completely close out of the program and start again by retyping the address. Sometimes in an attempt to navigate they would inadvertently close the program. Three of the initial four pairs were unable to locate the "home" icon.

The Presentation Index link in Angela Chan's article, "Journal Publication for MS Professionals" did not work on any browser in any platform. It often resulted in the display of a "New Site Certificate" dialog box. Several links that failed repeatedly were "Evidence Based Treatments for MS", "Swallowing Disorders", "Emerging Role of Nursing", and both articles on "Thinking Critically about Web Resources". Often when one of these was opened and the user returned to the index, the page could not be re-opened.

There was no consistent distinction between general labeling and the links. Sometimes links were underlined, sometimes they weren't. Links were confused with underlined blue headings that were intended to show the users where they were within the content. This resulted on two separate occasions in random clicking by the users. The Slide Navigator in the On-Line Presentations was difficult for users to follow. They were not sure how to move from one slide to the next and did not always readily grasp that the slides could be changed by clicking on the arrows and often attempted to click on the bullets in the actual presentation. It was also noted that the numbered links were not all available in the presentation.

Only one user pair was able to access the Virtual Office Roundtable article, and, even when doing so, had great difficulty finding the article or viewing the posting. As these were the Super Users, it is likely that any other users would have had the same, if not more, difficulty using this section.

Text

One subject commented numerous times on the difficulty of reading the small print. Re-examining the subjects' demographic information revealed this individual was significantly older than the rest of the sample subjects. Print size may need to be adjusted to be easily read by all ages of the population and to meet ADA criteria. Two of the pairs commented on the periodic use of blue text on black background that often appeared in a navigation bar. Blue text on a black background is widely recognized by design specialists as a particularly unreadable combination. This was also noted when both evaluators conducted follow-up tests.

Graphics

Graphical use was limited. The one picture that was used, (a photograph of an article's author Patricia Cole), was clear on the PC in both Internet Explorer and on Netscape Navigator. On other platforms, however, the picture was pixilated or had strange colors, such as green spots.

Content

One pair commented on the wordiness of the articles. Most of the pairs reported on how much they liked the presentations, even though there were issues with the slide navigator. Three of the four groups commented on how much they liked the organization of the On-Line Article section entitled "Web Resources".

As stated earlier, users did not always recognize where they were or what they were viewing. For example, Patricia Cole's "Gender Issue in MS" is located under both On-Line CME's and On-Line Presentations. When users came across the same link a second time, they questioned themselves and often left the site.

Multi-Platform Testing

Both evaluators examined the links on multiple computers using the three most popular Web browsing tools: Internet Explorer, Netscape Navigator and America Online. Minimum configuration standards were agreed upon by the two evaluators that included the following technical specifications: Monitors set to 256 colors (the lowest common denominator setting for all color monitors); 800x600 pixel screen size (the standard size of a laptop computer. Results of the testing were provided to the client. The main problem common to all platforms was the appearance of New Site Certificates.

New Site Certificates

The appearance of New Site Certificates caused great concern for several users. When they appeared, users quickly closed to the site and created a fear for further site use. One user shouted, "New Site Certificate! This is baloney." after having encountered them several times and then refused to continue in the Virtual Office section. New Site Certification is intended for use with authentication and identification of users when confidential information, such as credit card numbers, is being transmitted. It was unclear to the evaluators the need for such security.

Recommendations

Evaulation Question 1: Is the general public able to easily access information on the web site?

As stated earlier, the usability test was completed by ten subjects in groups of two (five pairs). The fifth pair were Super Users, atypical of the general public, and used for evaluative purposes to see how problematic initial findings were. The following recommendations are given in list of importance in assisting the general public; most of whom are not Super Users.

1. **Problem**: Inconsistent Labeling of information between home page, left frame index, sites and individual links.
   Solution: Consistent language should be used to identify all of the pages and for navigation. For example, the link Articles on MS by CMSC Affiliates on the first page of Professional Resources should be identified as Articles on MS in the left frame as opposed to MS Articles.
2. **Problem**: The home icon is consistently not recognized
   Solution: Change the icon. It was not recognized as a "home" and created many navigational problems for all users. The use of a symbol alone is also inconsistent with the rest of the navigation, which is in text format (easiest solution would be to generate a text link that says "MScare Home Page").
3. **Problem**: Numerous Dead Links
   Solution: Correct or remove them. Dead links were deemed very frustrating by the subjects and are generally considered problematic by design specialists. In this case, the subjects became confused and would close out of sites and site extensions. Correcting or removing dead links may help to eliminate many of the navigation problems.
4. **Problem**: Inconsistent ability for user to return back to previous page.
   Solution: Create a persistent navigation bar that allows the user to return to the previous page, or use consistent wording and available links so that users can return easily to the previous page or the menu that they started in.
5. **Problem**: Readability of some links and identification of links
   Solution: Change black background with blue text links that appear in some pages. Many users do not see that these links. Linking text color should differ from non-linking text. Currently, all headings are blue and all links are blue. Some headings are underlined, some are not. Some links are underlined, some are not. Application of a consistent standard that identifies and differentiates links, viewed links and content headings should solve this problem.
6. **Problem**: Pop-up windows cover previous page entirely or are too small to easily view the information and cannot be adjusted. Users become lost and confused.

Solution: Re-size new windows so that users may easily return to the previous section and make sure that windows are large enough to scroll through a sizeable amount of information.

Evaluation Question 2: Does a user's hardware (computer, browser, etc.) limit accessibility to the posted information?

After testing the site in six different configurations, it appears that accessibility limitations are due more to site design, as opposed to a users' hardware or software. Most of the issues observed occurred cross-platform and may be solved with addressing the problems outlined in the previous section. There are some minor issues with graphics that were identified on a few MAC platforms. (Charts with specifics were provided to the client).

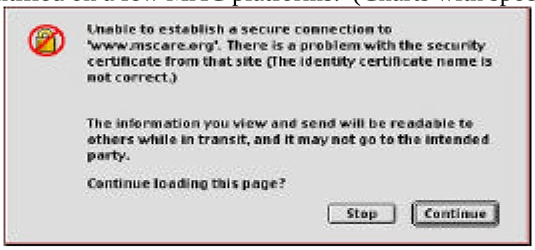


Figure 2: New Site Certificate

One problem that occurred at different places on different platforms was the appearance of Site Certificates. General users quickly exited out of the site when these appeared. In some situations, the evaluators were able to accept the certificates and move forward, in others, the evaluators were not allowed to view the contents of the site. This security protocol should be removed if the intent is for the site to be available for public use and is not being used to send and receive confidential information.

Evaluation Question 3: Why aren't professionals participating in the Virtual Roundtable?

The initial evaluation plan included time to interview consortium members. It was later determined that interviewing members was beyond the scope of this evaluation. However, results of the Virtual Roundtable section's usability can be addressed. For the majority of the evaluation, users were not able to access the Virtual Roundtable. The one pair that could was unable to open the article. When the Super User's came to the Virtual Roundtable task, they were able to open the article, but had a very difficult time determining how to read the postings. While the client's concern was initially over the topic, the ease of use of the Virtual Roundtable should be addressed and a separate and thorough test of usability should be conducted prior to questioning the topic. The evaluators postulate that a Roundtable that is not easily used, or whose purpose is not clearly identified, will not be used no matter how interesting the topic.

At the conclusion of this report, the link the Virtual Roundtable (Virtual Office) led to a separate site, (www.mscare.net) and was no longer available.

Discussion

The MsCare Web Site has some highly appealing characteristics and has the potential to be an incredibly informative and oft-visited site. Participants all commented on wanting to return to find information and several commented that they had wanted resources that they might refer to family and patients. The Profession Resources section, which is the focus of this evaluation, was often difficult to navigate and users became frustrated and bogged down. Their interest in viewing the site diminished as they could not complete simple information finding tasks, and most users began to blame themselves, a lack of computer skill (which was not generally the case, most had very good general Internet skills), or their computer. If a site is difficult to navigate it is likely that users will not return or use the site consistently.

Some of the Professional Resources components that the users expressed interest in were difficult to find. In particular, the initial four pairs all were delighted to find "Web Resources for Professionals", but, when the testing was over, most were not able to relocate this spot. With some slight reorganization, and a minor re-design of some navigational elements, the goals outlined for the MsCare Professional Resources Web Site should be easily met.

Conclusions

The original hypotheses was confirmed: a formal usability study indicated whether a specific Web site (in this case, www.mscare.org) was inherently difficult to use, or whether some of its regular users lacked the skills necessary to make use of the site. The study revealed flaws in the site's design, which served to explain why the users had felt themselves to be personally inadequate to the tasks involved in accessing information on the site.

This study further demonstrates the need for continued development and implementation of usability testing protocols in software design. Were it not for the study, the constituency of the MSCare organization might well continue to blame themselves for their inability to make use of the World Wide Web, causing them to feel disenfranchised from this powerful medium and making them feel inadequate to the tasks of navigating through and retrieving information of importance to them as professionals, and to the patients who rely on their knowledge.

Furthermore, results of this study indicate that a usability study team may be of tremendous help to Webmasters and software developers by allowing them a means to tailor their designs to the needs and skills of a particular user group (in this case, medical professionals with moderate computing skills). The results of this study strongly suggest that usability testing is critically important part of creating useful software, and that more research on the protocols and practices of usability testing are both required and recommended.

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References

Dumas, J.S., & Redish, J.C. (1999). A practical guide to usability testing: Revised edition. Portland, Oregon: Intellect Books.

Nielson, J. (2000). Designing web usability. Indianapolis, Indiana: New Riders Publishing.

Small. R.V., & Arnone, M.P. (2001). Web motivational analysis checklist instruments. Center for Digital Commerce. Accessed via the World Wide Web on November 10, 2001 http://istweb.syr.edu/~digital/CDC/Resources/resources.htm

Tollett, J., Williams, R., & Rohr, D. (2002). Robin Williams web design workshop. Berkeley, California: Peachpit Press.

Worthen, B.R., Sanders, J.R., & Fitzpatrick, J.L. (1997). Program evaluation: Alternative approaches and practical guidelines, second edition. White Planes, New York: Longman

Addressing NCATE Standards for Technology, Pedagogy, and the Curriculum

Heidi L. Schnackenberg

Margaret D. Maughan

This paper outlines one university's attempt to integrate technology and pedagogical practices. Through the interweaving and co-teaching of curriculum and media courses, the college of education attempts to meet the National Council for the Accreditation of Teacher Education (NCATE) standards. The combination of these courses demonstrates how various computer and peripheral electronic tools can be utilized to support teaching practices, subject matter instruction, and overall classroom environment. The courses were taught both in a computer lab and a non-computerized classroom. Faculty and candidates interacted with the technology, and shared lesson ideas, classroom management techniques, and pedagogical practices. Twelve Adolescence/Health Education majors were enrolled in the combined courses.

Overview

Plattsburgh is one of 13 university colleges operated by the State of New York. The 64-member system also includes community colleges, technical colleges, and doctoral degree granting institutions. The campus is located in a historic, rural area in the northeast corner of New York, situated on the western shore of Lake Champlain, east of the Adirondacks and about twenty miles south of the Canadian border. The greater Plattsburgh area contains about 40,000 people. Founded more than one hundred and ten years ago as a "Normal School" or teacher preparation college, SUNY Plattsburgh has expanded to offer undergraduate degrees in nearly fifty academic disciplines with an undergraduate enrollment of 5,048 students. There is also a sizeable graduate program in Education. Within the School of Professional Studies, there are four specialized courses of study: Elementary Education, Adolescence/Health Education, Special Education, and Literacy Education. The number of students enrolled in these programs total 1,328 or about one in six students at SUNY Plattsburgh. The faculty is substantial, including 29 full time instructors and 44 part-time instructors (Plattsburgh State University, 2002).

The Adolescence/Health Education program at Plattsburgh State University requires a core course entitled "Curriculum and Instruction for Secondary Schools." It provides intensive training in the planning and implementation of instruction at the middle and secondary levels. Utilizing the state and national standards, students formulate behavioral objectives to address a wide range of cognitive and affective processes. They construct instruments to measure intended outcomes of instruction and design teaching plans that they implement in a classroom setting during their field experience. Instruction includes the areas of critical and creative thinking as well as problem solving. Students learn to adapt materials to meet individual differences and levels of ability.

Another required core course for Adolescence/Health Education majors is EDU 359, "Integrating Technology into Teaching Practices." Candidates in this class earn one-credit, which is 15 hours of contact time. The class is based on the incorporation of technological resources and tools into pedagogical skills. In the course, candidates develop and implement lesson plans that utilize technology to support instruction and learning. The implemented lessons are then videotaped so that candidates can watch them at a later time and self-evaluate their teaching skills. The instructor meets with the candidates regarding the self-assessments and together they identify areas of success and strategies for improvement. Web-based showcase portfolios are also developed by the candidates in order to illustrate their learning and accomplishment in the overall degree program. Finally in this course, with the cooperation of Plattsburgh State University Student Support Services, adaptive and/or assistive technologies are discussed and explored.

The ways in which EDU 395, "Curriculum and Instruction for Secondary Schools," and EDU 359, "Integrating Technology into Teaching Practices" meld technology, teaching, and learning are numerous. From the teaching perspective, the course instructors frequently use Power Point to illustrate lectures and the Internet to supplement information given in class. Also, instructors communicate with candidates via email to notify them of resources, events, or homework. (These notices are sent as attachments as well as in the body of the text.) As well, instructors capture good and bad examples of candidate "teaching moments" (with candidate permission) using a digital camera. These pictures are then used as the basis for discussion about effective or ineffective teaching styles/techniques.

Candidates utilize technology as a part of their coursework and professional development as well. World Wide Web tutorials and assignments are used as in-class group and/or individual activities to reinforce concepts, skills and ideas covered in the two classes. Candidates are required to videotape brief presentations and/or demonstration lessons and analyze their performances with the guidance of an instructor. Questions are asked and assignments are submitted via email. Some assignments are also burned to CD-RW and turned-in. Instructors correct the assignments on the CD-RWs and return them to the candidates. A portion of candidate research is done via the Internet and lesson plans are developed which incorporate a wide variety of technologies – from graphing calculators to e-pals. As a terminal activity in their "Block II" coursework (which incorporates EDU 395, EDU 359, and several other courses), candidates create showcase portfolios which incorporate, for example, their teaching philosophy, interdisciplinary lesson plans, and resume. Candidates can then use these portfolios as they apply for teaching jobs after student teaching. Finally, candidates are introduced to a variety of adaptive technologies and learn about them in tandem with Individual Education Plans (IEPs).

EDU 395 and EDU 359 are entwined and co-taught in order to better facilitate NCATE (2001) standards for the candidates. The NCATE standards, International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) and Performance Indicators (ISTE, 2000), National Council for the Social Studies program standards (NCSS, 1997), National Council for Teachers of Mathematics program standards (NCTM, 1998), National Science Teachers Association program standards (NSTA, 1998), and the National Council for Teachers of English program standards (NCTE, 1997) that the two courses attempt to address together are shown in Table 1 below.

Table 1
NCATE Standards Addressed in EDU 395 and EDU 359

Technology Standards		**Secondary Education Standards**
NCATE standards with expectations for knowledge and use of technology	**ISTE NETS and Performance Indicators**	***NCSS, NCTM, NSTA, NCTE Standards***
Standard I.C.1 Content Studies for Initial Teacher Preparation	III.A Facilitate technology-enhanced experiences that address content standards and student technology standards.	NCSS #1. Provide substantial instruction in academic areas within the social studies field.
	III.B Use technology to support learner-centered strategies that address the diverse needs of students.	NCTM#1. Identify, teach, and model problem solving. NSTA#8. Use prior conceptions and student interests to promote learning.
	III.C Apply technology to develop students' higher-order skills and creativity.	NSTA#1. Structure and interpret concepts, ideas, and relationships that are defined by state and national standards. NSTA#2. Know and understand scientific inquiry. NCTE#7. Engage students in discussion for the purposes of interpreting and evaluating ideas presented through oral, written, and visual forms.
	III.D Manage student learning activities in a technology-enhanced environment.	NCTE#9. Use instruction that promotes understanding of varied uses and purposes of content.

	V.A Apply technology in assessing student learning of subject matter using a variety of assessment techniques.	
Standard I.D.2 Professional and Pedagogical Studies	II.A Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.	NCSS#2. Implement a course or courses in the teaching of social studies, including the nature of the discipline and ideas, strategies, and techniques for teaching social studies. NSTA#5. Use diverse and effective actions, strategies, and methodologies to teach.
	II.B Apply current research on teaching and learning with technology when planning learning environments and experiences.	NCTM#2. Use a variety of physical and visual materials for exploration and development of mathematical concepts in grades 7-12. NCTM#5. Use instructional strategies based on current research as well as national, state, and local standards relating to mathematics instruction.
	II.E Plan strategies to manage student learning in a technology-enhanced environment.	NCTE#3. Organize classroom environment and learning experiences that promote effective whole class, small group, and individual work. NCTM#4. Know when and how to use student groupings such as collaborative groups, cooperative learning, and peer teaching. NSTA#6. Organize and manage activities in different student groupings.
	IV.B Use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.	NSTA#7. Use advanced technology.
	IV.C Apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.	NCTE#2. Design instruction to meet the needs of all students and provide for students' continuous progress and success. NCTE#6. Incorporate technology and print/non-print media into instruction. NCTE#11. Provide students with appropriate reading strategies that permit access to and understanding of a wide range of print and non-print texts.

	V.B Continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of learning.	NCSS#3. Interact with exemplary teachers and scholars in the field of social studies and social studies education. NCSS#4. Have multiple clinical experiences in social studies classrooms and supervision by qualified social studies education professionals.
	V.C Apply technology to increase productivity.	
	V.D Use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.	NCTE#10. Engage students in making meaning of texts through personal response.
	VI.A Model and teach legal and ethical practice related to computers.	
	VI.B Apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.	
	I.A Demonstrate introductory knowledge, skills and understanding of concepts related to technology.	NCTE#1. Examine, evaluate, and select resources, such as textbooks, other print materials, video, film, recordings, and software that support the teaching of English language arts.
Standard IV.B Resources for Teaching and Scholarship	I.B Demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.	
	II.C Identify and locate technology resources and evaluate them for accuracy and suitability.	NCTM#6. Work on an interdisciplinary team and in an interdisciplinary environment. NCTM#7. Introduce and involve perspective teachers to the professional community of mathematics educators.
	II.D Plan for the management of technology resources within the context of learning activities.	NSTA#13. Use community, human and institutional resources to advance the learning of science in the classroom and field. NSTA#21. Work willingly with peers, supervisors, and others in a professional manner.
	V.A Use technology resources to engage in ongoing professional development and lifelong learning.	NCTE# 4. Develop interdisciplinary teaching.

	VI.C Identify and use technology resources that affirm diversity.	NSTA#18. Know and participate in professional organizations and activities of the science education community.
	VI.D Promote safe and healthy use of technology resources.	NCTE#5. Create learning environments, which promote respect for, and support of individual differences of ethnicity, race, language, culture, gender, and ability.
	VI.E Facilitate equitable access to technology resources for all students.	

Technology, Teaching, and Learning

Technology supports teaching, learning, and the classroom environment through specific techniques and procedures. In the area of teaching, technology encourages educators to remain current with trends and developments in learning theories and practices through on-line lesson plans. Teachers, even in isolated areas, can participate in chats and forums, and obtain information on conferences or competitions. Professional growth is possible through on-line journals. Learning is enhanced when students are able to explore beyond their own sphere of influence through such activities as internet-based research projects. Class presentations can incorporate video, audio, clip art and downloaded images from museums, galleries, or historic sights.

In the area of learning, technology provides opportunities to develop critical thinking skills through evaluation of web sites. Students can gain experience in problem solving by employing a variety of resources, for instance utilizing a drawing program to design an invention that resolves a challenge. Likewise, students can communicate instantaneously across the country or around the world, i.e. sending email to the scientists working in Antarctica. Using maps online, students can create a cross-country trip to visit national parks and historic sites. The unit could include math concepts such as mileage, a photo journal using pictures imported from web sites, a word processing diary, and a science component that incorporated investigation of geology, meteorology, or botany along the way. Social studies could follow a bill through the legislature by reviewing the *Congressional Record* (2002) each day via the Internet. As a culmination of these activities, students could present a collaborative interdisciplinary project by locating primary source documents, historic photographs, recordings, statistical data, and antique maps from the Library of Congress' *American Memory* project (2002).

In the area of classroom management, technology can be employed to streamline routine activities such as a seating chart, attendance reports or the recording of grades. Moving students' seating is just a "cut and paste" away. Specific software programs both document and analyze such data as absence and tardy records thus discouraging truancy and selective absenteeism. Grading programs offer full class scatter plots or an individual student's success presented in graph form. These techniques are all methods to assist educators in determining areas for remediation or enrichment.

Technology and Assessment

While the Plattsburgh State University Adolescence/Health Education program is currently infusing technology into teaching practices and learning strategies, it has also been one of the forerunners in technology-enhanced programmatic assessment. As part of the degree in Adolescence/Health Education, students are required to create a digital portfolio showcasing much of their work from the various courses in their program. Students may include such items as a statement of educational philosophy, interdisciplinary lesson plans, resume and contact information, letter of introduction, and links to useful resources. The portfolio may also include digital pictures or video of the candidates and is (usually) created in Microsoft FrontPage and uploaded to the Plattsburgh State University student web server. This activity proves both enjoyable and challenging to candidates as many have never created a website before and for those that have, this project is much more in-depth and time-consuming. The intent is that the web-portfolios are to be viewed by potential employers so a good "electronic impression" is essential**.** Additionally, the activity reinforces to candidates the importance of saving, refining, and reflecting upon many assignments in their various education courses. It is impossible to successfully complete the portfolio without incorporating work from previous classes. Moreover, by incorporating these works into their web portfolio, it gives candidates the opportunity to visit the previously completed work and revise or refine it. Certainly, most candidates reflect on their previous thoughts and writings as they are incorporating them into their digital portfolios.

As well being assessed via an electronic format, candidates are also instructed on ways to assess 9th-12th grade students who participate in technology-enhanced lessons. Candidates are taught how to use portfolio-based assessment and grading rubrics with their own future students. While various types of testing and grading methodologies are covered in EDU 395 and EDU 359, candidates soon realize that technology-infused lessons lend themselves best to project-oriented activities and rubric and/or portfolio/presentation style assessments. These types of assessments also fall within the sorts of assessment activities encouraged by NCATE and important in the current educational climate.

Challenges

While the combination of the technology and curriculum courses certainly added breadth and richness to the overall Adolescence/Health Education program, it was not without its challenges. One of the primary difficulties of successfully combining any two courses is in the planning. Units and individual lessons need to be fleshed-out and coordinated well in advance of a normal preparatory timeline. In the life of university faculty, finding time to collaborate on each and every lesson taught within a course is difficult. Often, as in this case, more than one planning session for any lesson needed to occur as resources were obtained and materials created. Most faculty do not plan lessons weeks in advance and keeping a rigorous planning schedule can be quite taxing and time-consuming. In our estimation it is worth the benefits, but it is also important to be aware that extra planning and collaboration time must be accounted for.

Similarly, for faculty to successfully combine courses, a bit of education must occur on the part of the course instructors. While the technology teacher and the curriculum teacher each had a good amount of knowledge of the other's area, neither were experts in both fields. Therefore each needed to take time and explain to the other methodologies and tenets within the two fields in order for the course collaborations to make sense. This sharing was extremely valuable from a professional development standpoint and it would behoove educational institutions to consider co-teaching as a form of professional development for truly, it is.

Other challenges that we faced in this endeavor were regarding lessons that simply didn't mix the concepts or objectives of the two courses well. It is difficult to find a way to enhance every lesson with technology and to be sure, not every lesson should incorporate technology. However, what initially seemed to us to be a frustration actually became quite an effective teaching tool. Emphasizing through modeling and practice the types of lessons that did not lend themselves well to technology improved the students' learning of these issues.

Lastly, while ordinarily descriptions of technology experiences include occurrences of "when the technology fails" as a challenge or aggravation, we choose not to do that. In fact, we think that failing technology in a class of preservice teacher candidates is a "teachable moment." Too often when teacher education candidates are taught about infusing technology into their teaching practices it is in a well-equipped university computer lab with media maintenance people only a phone call or office away. This is clearly not what these candidates will encounter when they become teachers in public or private K-12 schools. Very often the technology will not be up-to-date nor easily repaired in the K-12 setting so the opportunity for the "technology to fail" is very real. It is better for faculty to have that happen in a university class so that trouble-shooting techniques and classroom management skills can be modeled and discussed. Failing technology is a very real part of a K-12 teachers professional life and should therefore be addressed in their professional training in a healthy, competent manner.

Future Directions

One critical area that our practice has not addressed is how technology can be used to enhance teaching and learning in content specific pedagogical techniques. Part of the reason for this is that content area expertise at the secondary level is quite advanced and is taught by faculty outside of education programs at Plattsburgh State University. While liberal arts faculty educate candidates in their subject matter, education faculty then cover literacy education, educational philosophy and theory, and curriculum issues. Although this system encompasses much of what future teachers need in their repertoire prior to student teaching, one critical area that is not sufficiently addressed is the specific pedagogy used to teach a content area or specific subject. This is because it is difficult to find faculty who have advanced expertise in a subject matter (i.e. physics, calculus) as well as the pedagogical techniques that facilitate knowledge and skill understanding and acquisition. Currently at Plattsburgh State, a course entitled EDU 420, Seminar in Content Specific Methodology, endeavors to address this issue. The course, which is fifteen hours in length, covers standards, content-driven pedagogy, and assessment theory within each of the four major disciplines: English, math, science, and social studies. As well, the course provides an opportunity for candidates to observe a secondary classroom teacher in action. Our concern at present regarding this course is twofold: 1) There is little consistency among the cooperating teachers regarding objectives, activities, and assessment for this course. 2) Fifteen hours, of which six is solely for observation, is insufficient to provide pre-service teachers with adequate content and opportunities for practice. However, at this time specialized faculty are being sought in order to strengthen the Adolescence/Health Education program and comply with the NCATE accreditation process. Once this faculty is identified, only then can the area of technology-enhanced content area pedagogical techniques be comprehensively addressed.

Finally, while combining Plattsburgh State University's EDU 395, "Curriculum and Instruction for Secondary Schools," and EDU 359, "Integrating Technology into Teaching Practices" in order to improve preservice teacher education candidates and address NCATE standards was not without it's trials, the overall endeavor was successful and continually evolves to improve.

REFERENCES

ISTE (2000). (ISTE) National Educational Technology Standards (NETS) and Performance Indicators: Educational Technology Foundations for All Teachers. Retrieved November 5, 2002 from http://cnets.iste.org

Joint Committee on Printing, Congress of the United States (2002). Congressional Record Index: Online via GPO Access. Retrieved November 5, 2002 from http://www.access.gpo.gov/su_docs/aces/aaces190.html

Library of Congress (2002). American Memory: Historical Collections for the National Digital Library. Retrieved November 5, 2002 from http://memory.loc.gov/ammem/ammemhome.html

NCATE (1997). Program for Initial Preparation of Teachers of English Language Arts for Middle/Junior High and Senior High School Teaching prepared by the National Council of Teachers of English (NCTE). Retrieved November 5, 2002 from http://www.ncate.org/standard/new%20program%20standards/ncte%202001.pdf

NCATE (1998). Program for Initial Preparation of K-4 Teachers with an Emphasis in Mathematics, 5-8 Mathematics Teachers, 7-12 Mathematics Teachers prepared by the National Council of Teachers of Mathematics (NCTM). Retrieved November 5, 2002 from http://www.ncate.org/standard/new%20program%20standards/nctm%202001.pdf

NCATE (1997). Program for Initial Preparation of Teachers of Social Studies for Middle/Junior High and Secondary Teaching prepared by the National Council for the Social Studies (NCSS). Retrieved November 5, 2002 from http://www.ncate.org/standard/new%20program%20standards/ncss%202001.pdf

NCATE (1998). Program for Initial Preparation of Teachers of Science or Science Specialists prepared by the National Science Teachers Association (NSTA). Retrieved November 5, 2002 from http://www.ncate.org/standard/new%20program%20standards/nsta%202001.pdf

NCATE (2001). Technology and Teacher Education. Retrieved November 5, 2002, from http://www.ncate.org/accred/projects/tech/current.htm

Plattsburgh State University (2002). Plattsburgh State University of New York. Retrieved November 5, 2002 from http://www.plattsburgh.edu

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