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ABSTRACT

This action research study of electronic conferencing highlights the online portions of teacher education courses at Pace University, New York. The study explores the infusion of technology into teaching and investigates the utility of a particular type of discussion software for learning. Data sources include texts of electronic conversations, class members' accounts and reflections, students' course evaluation commentaries on the use of technology, the instructor's recollections and reflections, and interview data from faculty in teacher education and other disciplines who also use the electronic conferencing facilities. Findings are that use of this software can be improved both technically and by instructor-imposed structure. For students who have difficulties with access, increased interventions, which make the technology less formidable or more accessible, will be required to overcome resistance. Sufficient purpose must be established to overcome resistance to the lack of availability of the technology. As with other learning environments, assessing what has been learned in using the Web conferencing technology generally requires a teacher's professional judgment. This study provides early inquiry about infusing use of communication technology in teacher education. It raises questions about electronic conversations on difficult or controversial subjects. (Contains 24 references.) (SM)

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Abstract

The context of this study of electronic conferencing is in the on-line portions of the teacher education courses conducted at Pace University in New York. It is an action research study with both personal and professional dimensions: an exploration of infusing technology into teaching, and an investigation into the utility of a particular type of discussion software as a mode for learning.

The study's data sources are the texts of the electronic conversations. Additional sources of data are the accounts and reflections of the class members, student course evaluation commentary on the use of technology, the instructor's recollections and reflections, and interview data from other faculty, both in teacher education and in other disciplines, who also use the electronic conferencing facilities.

Findings are that the use of this software can be improved both technically and by instructor-imposed structure. For the students who had difficulties with access, increased interventions, which make the technology less formidable, or more accessible, will be required to overcome resistance. Sufficient purpose must be established to overcome resistance to the lack of availability of the technology. As with other learning environments, assessing what has been learned in using the web conferencing technology generally requires a teacher's professional judgment.

The significance of this study is that it provides early inquiry about infusing use of communication technology in teacher education. The study raises questions about electronic conversation about difficult or controversial subjects. Its implications will generate knowledge about appropriate uses for conferencing software as part of teacher education.

A study of the use of web-based conferencing software to enhance learning environments in teacher education

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> *"Perhaps the best way the faculty can inspire teachers-in-training to use technology is to cast themselves as learners and to experiment fearlessly in the applications of technology. The teacher education faculty can make themselves role models of lifelong learning if they create for themselves situations in which they must learn from each other and from their students . . . The results of each experiment should be assessed carefully. Encouraging faculty to be reflective about their work and evaluate results of instruction can also advance an important domain of knowledge, while building faculty competence."* (NCATE, 1997).

Introduction

This research study of the use of web-based conferencing software to enhance learning in teacher education takes its cue from the quotation above, in which the teacher educator is encouraged to experiment with new technology, and in doing so become a role model of lifelong learning. NCATE's conception of the need for teacher educators to practice and experiment with technology voices part of the impetus for engaging in this systematic inquiry. Another reason for this study is the researcher's hypothesis that meaningful learning in teacher education can be supported and enhanced by technology. The results of the particular teacher action research experiment in technology described herein are being evaluated and reflected upon to generate new understandings (Bruce, 1999; Merisotis, 1999; NCATE, 1997; Flank, 1999), and to build the investigator's and faculty's knowledge and competence with the technology as part of the instructional environment.

The context of this study of electronic conferencing is in the on-line portions of the teacher education courses conducted at Pace University in New York. It is an action research study with both personal and professional dimensions: an exploration of infusing technology into teaching, and an investigation into the utility of a particular type of discussion software as a mode for learning. This study is concerned with the utility of the electronic medium for a particular purpose in a particular setting. The study's data sources are the electronic conversations in which students are engaged; their participation in exchanges about course content, and their expressed concerns. The inquiry seeks to find ways the on-line medium can enhance teacher education courses. In addition, the study raises questions about the ability to engage in electronic conversation about difficult or controversial subjects, and the extent to which the medium can expand or limit thoughtful discourse and meaning construction. Its implications will generate knowledge about appropriate uses for conferencing software as part of teacher education.

Teacher Education and the Press for Technology Integration

Present day emphasis on the importance of technology in education has resulted in a call for programs of study that prepare teachers to implement technology in their classrooms in new and effective ways.

> *There is no longer a question about whether the new technology will be used in schools. Nearly everyone agrees that students must have access to computers, video, and other technology in the classroom. Many believe these technologies are necessary because competency in their use is an important feature of career preparation; others see equally important outcomes for civic participation. Most importantly, a growing research base confirms technology's potential for enhancing student achievement. What is less certain is how and when these technologies will change the nature of schooling itself.* (NCATE, 1997).

Although under attack as "filmstrips of the 1990's," (Oppenheimer, 1997), the importance of computing in education cannot be denied. Distance education is a fact of life in higher education, with both positive and negative opinions voiced about its effects on student learning and on faculty work (Ehrmann, 1999; Feenberg, 1999; Maloney, 1999; Martin, 1999; Newson, 1999). Technology acquisitions by school districts and higher education institutions represent astronomical amounts of money, and governmental and business-led education initiatives have fueled these acquisitions. Study of an innovation, such as discussion software's use in distance education, needs to include multiple effects and in this case, its impact on learning. Since these innovations are relatively new, questions about priorities, purposes for the technology acquisitions, and the underlying issues of concern about technology integration into the curriculum have not yet been sufficiently addressed in the literature. However, recent literature suggests a movement toward contextualizing educational technology as part of what teachers do in classrooms, and as something they need to know about (Budin, 1999; Jonassen, Peck & Wilson, 1999). The concept of infusing technology into teacher education (McLaughlin, 1998) has become even more important as pre-service teacher preparation programs are being restructured to support comprehensive school reform.

The National Council for Accreditation of Teacher Education (NCATE, 1999, 1997), implemented standards for teacher education requiring that teacher education programs have a vision and plan for technology that reinforces their conceptual framework. "Teacher education programs should be guided by a vision of what their programs might become if they took full advantage of information technology." (NCATE, 1997). NCATE stressed the importance of technology, because knowledgeable teachers are the most important factor in providing quality instruction. Standards promulgated by the International Society for Technology in Education (ISTE) were adopted by NCATE beginning in 1998. ISTE's Recommended Foundations in Technology for All Teachers set expectations for all teachers to become competent in basic computer and technology operations and concepts, to be competent in their own personal and professional uses of technology, and to be competent in the applying technology in instruction. ISTE's NETS (National Educational Technology Standards) Project (ISTE, 1998; Thomas & Knezek, 1999) has developed sets of standards for

technology in education for K-12 classrooms, which have major impact on teacher education. Additionally, state education departments have included technology in state teacher certification requirements (Northrup & Little, 1996).

New York State moved to become an NCATE partner in 1998, and the Regent's requirement that all teacher preparation institutions become nationally accredited by 2004, made it imperative that the Pace School of Education quickly move toward implementation of the NCATE/ISTE standards. The Pace School of Education's responses to the Regent's certification requirements, the promulgation of technology standards and the acknowledged need for establishing comfort with technology for students and faculty, was multifaceted. The School of Education began to invest in technology acquisitions; at present, each faculty member has a desktop computer linked to a dedicated server with access to the web. Other forms of technology were also acquired, including digital still and video cameras and the hardware needed to convert the recorded images for presentation use, projectors, and other equipment. Small faculty development grants, and the hiring of two technology specialists as administrative staff have increased the School's ability to use technology in its operations and instruction.

Another avenue for the School to advance technology was to support application and acceptance to a Microsoft-sponsored grant program for teacher training, starting in 1997. Activities resulting from the Microsoft grant served as a catalyst for increasing the role of technology in the teacher education program. As a result of the availability of the Microsoft software as well as the proliferation of computers at the University and among the students, the use of computer technology by education students has greatly increased. The number of integrated technology assignments education professors now expect to see has also risen, as technology is now an expected aspect for both content and process in most, if not all, education courses. Additionally, these students have become aware of the abundance of lesson ideas available on the World Wide Web. Education students are now expected to become adept at finding lesson plans and information for their subject areas and grade levels by using search engines on the Internet (Rhodes & Flank, 1998).

Telecommunications as an aspect of technology can offer significant advantages to educators, as it provides a way to transcend the limited classroom interface time as well as to share information. Telecommunications supports the reform movement in education by facilitating interactive and cooperative learning. According to Jonassen et al. (1999), telecommunications fosters learning communities by enabling three distinct types interaction: interpersonal exchanges, information collections, and problem-solving projects. Another aspect of the telecommunications environment is that reluctant or shy students are encouraged to participate (Forcier, 1999). Leu and Kinzer (2000) predict the occurrence of accelerating convergence of literacy instruction with the use of networked information and communication technologies. The effect of this prediction, will be that in order to take advantage of the computer's telecommunications abilities, as in all instruction, teachers need to become aware of the information available, to gain knowledge of and experience with email, electronic conferencing, commercial information services and networks, and to begin to experience for themselves the benefits of communicating electronically. Thus, teacher educators need to prepare themselves and their students for the infusion of networked information and telecommunication technologies into the instructional climate.

Assessment of technology projects

There is a growing body of literature that addresses how technology necessitates change in evaluation strategies (Bruce, 1999; Flank, 1999). Bruce's discussion of reasons why information technologies require new evaluation approaches was used to inform the method for the evaluation of the electronic conferencing software use by this instructor. The fact that early adopters of new technology have different experiences than later adopters is reasonable, with results for evaluation strategy being that "evaluations have to be understood with respect to the community of users and cannot be assumed to refer to the technology per se." (Bruce, 1999). What Bruce calls "scalability," or how the number of users impacts the use of technology is another factor that has influenced the method of inquiry for this study, in which the number of users is relatively small, confined to the course registers. However, if the number of users was much larger, then the findings from this study might be considerably different.

Bruce states that, "New information and communication technologies must be understood, not merely as discrete tools but as components of complex systems." The impact of this statement on the method of inquiry for this study is to remind the investigator that there may be other systems effected by ideas that are generated. Bruce stated that in his own experience with technology, there are few educational programs involving information technologies that remain unchanged for long, often not even until the evaluation report appears. Software often does not track information that may be important to the evaluation. Tracking and evaluating quality of usage by individuals can be difficult and time consuming. This has been true for experience with this technology project. Although the program keeps data by user, it does not individually track use by course or conference, so that users who are part of more than one class would be miscounted unless the conference is tallied by recording each user's postings. Since formulating this study, the *WebBoard* software has been upgraded twice, and the system management has deleted the inactive users. These types of upgrades and modifications to the system environment have the effect of making evaluation of the use of the software a moving target, or as Bruce states, "perpetual formative evaluation."

Assessing learning gained through using technology generally requires a teacher's professional judgment (Jonassen et al., 1999). Developing rubrics of evidence of learning, or the types of demonstrations of knowledge gains from using the technology has been difficult, and is only partially accomplished. In using this software, use reports are available for monitoring of the electronic conversation. Evaluation of students' performances can be quantitative and qualitative. Participation can be evaluated by copying the text of a discussion thread into a word processor. When the text is in a word processing file, one can perform a search for each student's name, and count and evaluate the student's contribution. Although quantitative contributions are important to develop a minimum level of participation, more often qualitative inferences based on holistic criteria are the basis for judgments of effectiveness in learning through electronic conversation.

Impetus for using *WebBoard*

Electronic conferencing software became a part of the learning environment at Pace during 1998, when the University Library acquired *WebBoard* software. *WebBoard* (Duke Engineering/O'Reilly & Associates, Inc., 1995/1999) is an Internet conferencing software package. *WebBoard* was initially designed for global businesses, but was adapted for educational institutions and has been in use by different types of groups as means to develop and maintain communication between distant entities. The software provides a scheme for conducting asynchronous discussions by providing a structure, ordering, and tracking asynchronous text entries and responses on different topics. *WebBoard* messages can link to web pages, or have file attachments. *WebBoard* provides a framework for following the development of messages using a system of "threaded discussions," where the first message on a topic is responded to by later messages, and the responses to the later messages are linked with both the first message and the specific message that triggered the response. It creates "conferences" that hold discussion threads and keeps track of conferences and topics within each conference. It also offers a live "chat" feature for synchronous communication.

The Pace University Library made *WebBoard* available to instructors in 1998. Upon learning of its availability, this instructor and other professors opted to try to use *WebBoard* in response to a perceived need to provide additional infused technology in teaching, model teaching practice, and to explore the capabilities of the available electronic conferencing software. *WebBoard* became an integral part of the Global Perspectives course during the Fall, 1998 semester. *WebBoard* also was employed in Literacy: Processes and Practices the following Spring, 1999. Since then, this instructor has used *WebBoard* in courses at both the graduate and undergraduate levels. As of the Spring 2000 semester, undergraduate literacy courses use *WebBoard*. The graduate literacy courses are using *Courseinfo*, a more comprehensive instructional software environment, supported by the University's academic computing department.

Students use the *WebBoard* to introduce themselves to each other, to "brainstorm" at the start each week's work, to follow up on in-class discussion, and to discuss the readings and assignments. Since links to websites are possible, students create "Webliographies" (LaVerde, 1998), a portfolio of Web sites and online news articles, or to add to a frequently asked questions section as a help file. The primary uses for *WebBoard* were for the students to communicate about topics that caught their interest – either in the readings or something they did in class, such as viewing a video or participating in a field experience.

Over the last few semesters, use of *WebBoard* in classes has increased across the University. One of the major reasons for this was the construction of electronic classrooms (Coppola & Thomas, 2000), in which state-of-the-art equipment provides opportunities for students to use the software in class, with use of both the asynchronous discussion board feature and the synchronous chat feature. The electronic classroom was the setting for at least one class early in each semester, in which students were introduced the *WebBoard* feature. Meetings in the electronic classroom resulted in positive comments from students about using the professional looking facility.

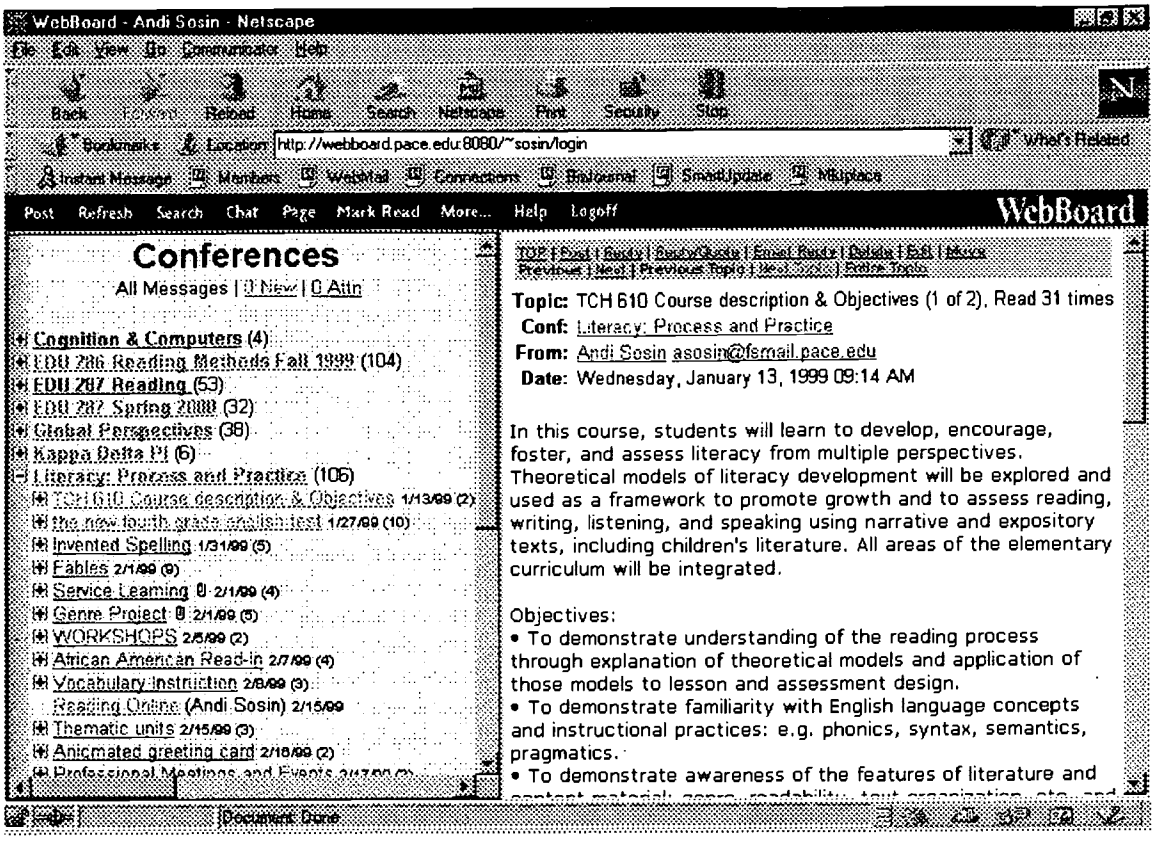

Figure 1: The Webboard Screen. The left side lists each conference and discussion threads within the conference. The right side of the screen displays the text of the message.

Modes of Inquiry

Integration of electronic conferencing into Global Perspectives, then into Literacy: Processes and Practices, and then into later courses thus presented opportunities to learn about the use of this software for enhancement of course objectives. Assessment of what the electronic medium contributed to both the students' understanding of the course content, and the students' perceptions of technology use within the teacher education program became self-reflective topics. Some of the issues now being considered include the elements of constructive learning with technology, how to support students' efforts to engage in meaningful discourse, and how the content and structure of the electronic conversations influenced students' satisfaction. Additionally, this experience provides knowledge about what the strengths and weaknesses are of the particular software and the time and effort to maintain and augment electronic conversations that are required by both students and instructor.

This study began with some questions about the content of the curriculum, and extended them to the electronic medium:

- What are the ways that the students' construct and interpret meaning in Global Perspectives and in Literacy? How do they reveal their issues,

questions, and problems? What concerns do they express about their progress, their experiences in schools and their future role as teachers?

- Has a forum for electronic conversations helped the process of gaining a global perspective or of developing a coherent conception of Literacy?
- Will this type of technology infusion make a difference in the students' approaches to technology as teachers?
- What differences exist between graduate students and undergraduate students in their attitudes and acceptance of electronic communication?

Technical research questions that arose during the study were:

- What instructor input, structure and moderation are necessary to develop substantive content conversations?
- What types of intervention or support are needed to sustain the electronic conversation?
- What are the time and effort requirements by instructor and by students?
- What are student observations about the use of the electronic conferencing system?
- How can the instructor make best use of the advantages offered by the ability to communicate distantly?
- What are the benefits or drawbacks to using conferencing media in this course?
- What are the technical issues or barriers?
- What types of communication does the electronic medium allow, promote or inhibit?

Data Sources

In this study of electronic conversations on the *WebBoard*, the electronic entries themselves are the primary sources of data. Additional sources of data are the accounts and reflections of the class sessions in which students were introduced to the software in an "electronic classroom." Students' course evaluations, where they comment on the use of technology in the course also are data sources. The instructor's recollections and reflections about moderating the *WebBoard* facility and interacting with the technical support personnel are also included as data, as are interviews with other faculty, both in teacher education and in other disciplines, who also use the electronic conferencing facilities.

Method

Amount and content of electronic entries on *WebBoard* were analyzed in reference to the research questions. The structure of the Global Perspectives course conference, the graduate Literacy course and the undergraduate Reading course *WebBoard* conferences were analyzed for the number of entries, the numbers of student postings, and the types of entries. Excerpts from the electronic conversations were analyzed for substantive discussion of the types of discourse subjects and topics.

WebBoard in Global Perspectives

Global Perspectives is a class designed to help pre-service teachers become aware of diversity and world concerns as they relate to curriculum and school culture. (Sosin & De Lawter, 1999). During the Fall 1998 semester, the students had the option to use the *WebBoard* for their discussion of texts, their service learning experiences, and for their dialogue journals. A topic thread about service learning gave the students an opportunity to engage in reflective on-line conversation about events that occurred in their service learning contexts. Each text also provided a topic thread for student discussion as they read the texts. These topics generated much of the conversational content, as well as informational content.

As a part of the course requirements in Global Perspectives, students are assigned journal partners with whom they are expected to maintain a dialogue journal concerning their readings of the texts, reactions to in-class activities, and their thoughts about teaching. The journal's structure is up to the partners to decide, with a suggested format that asks the students to organize their entries chronologically. They discuss insights they have about the facts or issues, citing supporting texts or other sources, and to suggest activities with which to engage prospective students. They write about what they believe to be true about children, knowledge, curriculum and the school in order to design such activities, making their beliefs and presuppositions explicit.

Some Global Perspectives students volunteered to put their journals on line, as a way of acquainting their classmates with their experiences and thoughts regarding the course topics. Each journal was set up as a topic thread, e.g. Rebecca and Eric's Journal or Penny and Jennifer's Journal. The journals contain lengthy narratives about service learning experiences and reactions to the course readings, which extend the conversations that began in the class. Although these were public journals, they could have been kept private. The interpersonal exchange use for the electronic discussion board was more an adaptation of the pen or word-processed dialogue journals used by others in the class, but had the advantage of making the writers' experiences known to all class members. The on-line journals served as examples for the entire class.

Using WebBoard in Literacy Courses

Literacy: Processes and Practices is a very different course than Global Perspectives, although they share attention to students' constructions of meaning and conceptions of schooling. The Literacy course is mainly concerned with the graduate students' development of methods and materials for teaching reading in elementary classrooms. One important aspect of the course requires study of the features of different genres of children's literature. This course was also a site in which *WebBoard* was employed and studied as a forum for students' communication.

The *WebBoard* discussion in the literacy courses focused on the topics that the instructor and students generated as they read course materials and discussed the topics that appeared in the news. The following figure displays the *WebBoard* screen with a sample of the communication from the Literacy class that discusses invented spelling:

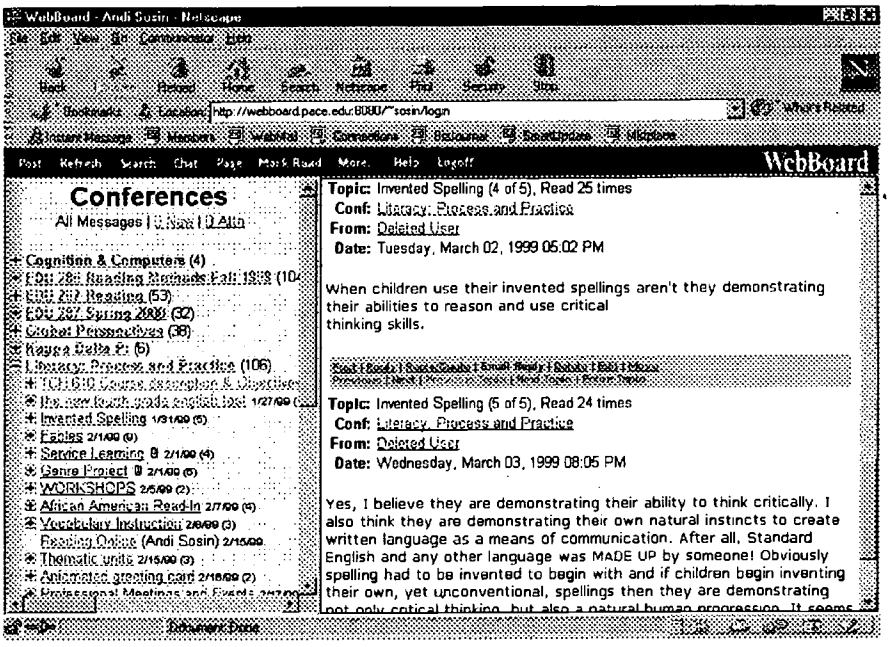

Figure 2: Sample *WebBoard* discussion

A second example of the use of the electronic discussion board in the Literacy class was for news analysis. In this example, a student began a topic on advertising in textbooks with the following entry:

> In today's New York Times, there's an editorial "Classrooms for Sale" which discusses the controversy with McGraw Hill's textbooks, which contain brand names of products, namely Nike, Sony Play Station. Companies are using the textbooks to market their products to a captive audience – schoolchildren who must use these textbooks each day. It seems that these and other companies sponsor events at schools or "donate" educational materials, but the catch is that the materials have their product names splashed all over the place. And schools are actually signing contracts with
>
> these companies and allowing their schools to be infiltrated with these brand names. Everyone should read the article. I found it really interesting. I knew their was some commercialism in some books but I did not think it was to this extent. If anyone likes, I can try to bring in copies of the article.

A second student replied to the entry with the following entry:

> I wound (sic) really like to read this article please bring it to class. I have never heard of that before.

The instructor replied to the entry with the following:

> Did you know that California was supposed to get the textbooks for free? This is part of a much larger issue – how commercialism is part of the education world . . .

The student subsequently brought in the article, which stimulated a class discussion of commercialism in schools.

The above example demonstrates how the *WebBoard* was typically used to extend the class communication environment, as well as how instructor moderation operated to extend or shape the discussion.

WebBoard in Undergraduate Literacy Courses

Undergraduate literacy courses are very different from the career-change graduate courses, in that the students are mostly traditional-age undergraduates. The class meets at a school during the day, so it is much more experiential than the similar graduate course. The undergraduate opinion of a similar use of technology, however, is very different than that of the graduate students. The undergraduate students expressed a greater amount of resistance to using technology, as demonstrated in the following data.

Analysis of WebBoard Course Evaluation Data in Undergraduate Literacy

The instructor asked the undergraduate literacy students to complete an end-of-course evaluation question that specifically asked about technology. Twelve students answered the question.

Question: Please comment on the use of the webboard as an electronic discussion medium. What do you think using the computer did for your learning?

Answers:

- I have limited access to a computer. Unfortunately, I did not get to use the webboard as often. I think it is a good reinforcer but I feel the webboard should not be the main focus of any discussion.
- I think that the idea of webboard was really not relevant. What we wrote on the webboard could have been discussed in class.
- It helped, but maybe you (the instructor) could go on webboard and touch on those things we don't have time to go over in class time.
- Computer literate. But I think that we should not forget the book and emphasis (sic) computer because unfortunately not everyone has access to a computer. This becomes a problem always having to go on webboard.
- Enhance technology which is quite important.
- I think the computer helped my learning.
- Webboard was fine.
- It was a good idea but perhaps if you (the instructor) pointed out questions for us to read and answer it would have been more helpful.
- It was definitely an aide but it was enforced too much.
- I feel as if it was manditory (sic) and it really did not teach me anything at all. It just assured me that we all, as a class, had mutual feelings.

- Discuss issues with the prof. and other students
- It should be used but not made as a mandatory means of teaching/learning.

Of the twelve submitted answers, only three are completely positive evaluations. Two are completely negative. Seven make both a positive and negative comment. That so many of the answers include negative statements is worthy of investigation. It is obvious from this data is that the imposition of a technology requirement met with resistance from the students. The students' indicated their resistance with statements which discuss limited access to computers, or that complaints about the mandatory use of *WebBoard.* It should be noted that all the students had access to the system through the Academic Computing facilities at the University, if they did not have a computer in their homes.

Point of View

Since the Global Perspectives course is structured to encourage students to converse in and out of class, and to reflect in writing on their experiences, it was well suited for technology integration. This was true as well of the Literacy: Process and Practice course in which the *WebBoard* was used during Spring 1999. During the Fall 1998 semester, a total of thirty-eight topic entries in Global Perspectives were generated, while in the following Spring 1999 semester, in the Literacy Processes and Practices course with the same instructor, a total of one hundred and six entries were generated.

This increased number of entries was due to a number of factors. Some of these factors were:

- Graduate students anticipate using technology in their teacher education courses. Many graduate career changers use information and communication technologies at work;
- students in the graduate Literacy course had prior experience with the *WebBoard* in Global Perspectives, and expected to continue using it;
- instructor's previous experience influenced the emphasis placed on participating on the *WebBoard* in the Literacy course;
- guided class sessions in an electronic classroom introduced students to the *WebBoard* in a supportive environment.

Although the graduate course evaluations did not include a specific question about technology, most graduate students who commented in the open-ended section of the course evaluations on their experiences with the technology were positive about using it. However, there were a number of students who declined to, or were unable to, sign on and to participate in on line conversations, more in Global Perspectives than in Literacy. These problems were even more evident in the undergraduate Literacy section, where the students voiced their resentment at having to use the discussion board as part of their course requirements.

The question of why so many of the undergraduate students were negative about using *WebBoard* is not easily answered. Maturity may be a factor in appreciating the extension of a learning environment. A broader question, which includes the graduate students who had problems of access or negative comments about content, becomes

whether the purpose for usage of the electronic discussion medium was not sufficient to justify the students' inconvenience. The problem then becomes a matter of content, rather than a technical problem. The major use for the *WebBoard* in the undergraduate Literacy classes was to continue class discussions and to communicate about the readings, as distinguished from the graduate Global Perspectives journals and topic discussions or the graduate Literacy topic discussions.

Was the content of the communication not sufficiently purposeful? If not, then what is a sufficiently purposeful reason for an electronic discussion? If a sufficient purpose were established, would the undergraduate students be as resistant to using the electronic medium? These questions are not yet answerable, without further reflection about the content of the messages, and how the course materials and time factors effect the content.

Conclusion

The use of the electronic conferencing software, in this case *Webboard*, is in the process of adaptation within teacher education. The use of this software can be improved both technically and by instructor-imposed structure. For the students who had difficulties with access, increased interventions, which make the technology less formidable, or more accessible, will be required to overcome resistance. Additionally, sufficient purpose must be established to overcome resistance to the lack of availability of the technology.

This study of web-based conferencing software integration in teacher education made clear that there are variables in the design of teacher education coursework that can be used to determine whether the electronic conversational technology will be effective in enhancing the students' learning experience.

Some of these variables are:

- Attitudes toward distance learning by both instructor and students, training with the particular software and agreement about the technology's role in the course requirements;
- Accessibility, technical characteristics, and support for the electronic product;
- How the instructor purposefully structures and integrates the software use into the course requirements;
- How the content of the course lends itself to establishing sufficient purpose for using the electronic discussion;
- Recognition of the need for continual feedback during the semester about the use of the software and of the content within it to students to maintain enthusiasm for using the software;
- Continual attention to the moderation of the conference by the instructor so that conversations proceed logically and understandably, with attention to expectations for substantive content;
- Time and effort one can devote to develop and maintain the electronic component of the instruction.

NCATE (1997), in its report on technology in teacher education, states that, "What is required (to effectively integrate technology) is a transformation of the culture

of teacher education, one in which technology is seen as changing relationships between students and teachers and between learners and knowledge . . ."

The educational importance of this study of the use of an electronic communication and discussion medium for learning provides impetus for further integration of this type of technology into teacher education. How the technology can best be used to promote meaning construction, and whether use of the electronic conferencing medium makes a difference in both undergraduate and graduate teacher education students' approach to technology in their future teaching work, will remain for a longitudinal study.

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