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ABSTRACT

This document contains the following papers on issues related to telecommunications and online learning in preservice teacher education: (1) "Using WebQuests as an Introduction to Methods" (Sarah A. Fernald and Philip E. Molebash); (2) "The Effectiveness of Preservice Teacher Training through the Internet" (Elaine Hoter); (3) "Innovation in Using Telecommunications in Pre-Service Teacher Education and the Impact upon Distance Learning Student Teachers" (Clive McGee and Russell Yates); (4) "Using the Web To Enhance Field Experiences for Preservice Teachers" (Vicki L. Cohen); (5) "Pre-Service Music Teacher Attitudes toward Web-Enhanced Learning in a Methods Class" (William I. Bauer); (6) "What Is Happening in the Virtual Classroom?" (Beate Baltes); (7) "Online Communication Modes--What's the Difference?" (Sue Espinoza); and (8) "Connect-ME: Building and Sustaining a Local, On-Line Professional Learning Community for Elementary Mathematics Educators" (Lynda Colgan). Individual papers contain 67 references. (MES)

# TELECOMM: PRESERVICE APPLICATIONS

## Section Editor:

**Niki Davis, Iowa State University**

This millennium year brings a good crop of eight papers on the application of telecommunications in pre-service teacher education. Practice is described in North America, Israel and New Zealand. In some ways the crop does not provide the field with answers to the gaps that exist in our knowledge. One paper identifies a major gap with the following question: "Can an electronic forum provide the context in which teachers begin to understand their practices, professional growth and development?" The answer from this paper is yes; their pilot web enhanced community appears to indicate that telecommunications can support teacher development. Over the years, our annual SITE conference has seen many such reports and early evaluations. Therefore I suggest that this year's crop is a small sample of the practice that is now out in the field. For this reason I my section introduction suggests topics for discussion at SITE'00, so that we may advance the field together.

In other sections of this SITE Annual you will see indications that such activities are also taking place on other continents, where resources and access to the technology permit. I suspect that the UK is seeing a particularly strong upsurge in the application of telecommunications in response to country's ICT National Curriculum for initial teacher training and the Lottery funded training for practicing teachers. Similarly the USA's new program for preparing tomorrow's teachers is also likely to make significant use of telecommunications. Therefore we are likely to see much more in-depth research on this topic in future conferences, as the support for research catches up with the demands of national and local governments on both sides of the Atlantic.

### A more integrated approach

The strongest paper in the section comes from the award winning University of Virginia Curry School of Education. It is not surprising that greater depth of action and reflection can be achieved when an organization has progressed to a more integrated approach with technology in programs of study.

A WebQuest competition for teacher education was promoted at last year's SITE'99 conference so I am particularly delighted to see a report of their use by Sarah Fernald and Philip Molebash in the University of Virginia's

Curry School of Education. I am also delighted to see Curry's steady move towards an even more integrated model of technology in teacher education, one that aims to introduce technology in the context of the students' discipline. I can remember discussing with Glen Bull the dilemma of technology versus content, when I visited Curry about a decade ago, and I told Glen then about our work in Project Intent in the UK (Somekh and Davis, 1997). Fernald and Molebash provide an excellent overview of the structure of their course and its reasoning, including the way in which a technology foundation is built and the way in which the students can be supported to strengthen their own critical thinking skills as they create WebQuests for future pupils. Access is also provided to the students' productions on the Web.

Elaine Hoter also used the Internet in pre-service teacher education, this time in a course for teachers of English as a foreign language studying in Israel. Like others before her, Hoter pairs up student teachers to teach pupils on-line. Interestingly, classes in one school in Israel and one in the USA are the partners, probably relating to practical issues of access to use of the web. Hoter rightly describes her course as one that thoroughly integrates technology into the pre-service teacher education program and she is to be applauded for setting an excellent model. The paired assignments are available online. Of particular interest is how such courses can be more widely implemented. A discussion of the effects of using technology in language teaching might also be a stimulating point for the SITE conference, given the challenges that new technologies post to literacy of all sorts (Soetaert, 1999).

### Addressing needs for site based support

The use of telecommunications is often based on the need to increase belief by appropriate use of technology to reduce isolation. Several papers come from this angle. Clive McGee and Russel Yates tell us the story of implementing site-based elementary teacher education in New Zealand's University of Waikato, to serve their island's more rural community. Their need in New Zealand was to overcome teacher shortages where local people 'suitable for teacher education' are unable to move to the university city for full time study, due to their local commitments. Many communities will feel such a need, and this article provides a good

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model for others to follow. McGee and colleagues used research of previous programs where student teachers were based mainly in schools where they were developing professional practice to inform this new program. They therefore set clear expectations for carefully selected partners with attention to team building and communications. McGee and colleagues evaluated their program through 39 interviews with school principles, students and supervising teachers. Using the factors identified, McGee and Yates present nine guidelines for others, which they suggest is developing a theory. The first guideline notes the need for staff to believe in the merit of the program and the last guideline is that all parties need to clearly understand the roles. Between these are several guidelines relating to access and comfort with the modes of communication between the various partners and participants. This guidance will be useful beyond the use of telecommunications, as the majority of it applies wherever partnership and mentoring occur in teacher education. For this generalization I draw upon the considerable research on partnership and the training of mentor teachers that has taken place in the last few years in the UK.

Vicky Cohen decided to tackle the isolation of students and to influence their beliefs while on their teaching practice by creating a web-enhanced package to support their developing practice and research. Cohen describes a pilot for 10 students of what appears to be an additional facility for students to study together while geographically dispersed in the field in schools. The success of the pilot as shown by the pre and post assessment forms is interesting. Perhaps we could ask how the pilot could be afforded on a larger scale for all students and staff. Perhaps Cohen can confer with other teacher educators around the world to consider ways that more mature examples have been able to increase the efficient and effective use of telecomputing resources and faculty and student time in order to support the scaling up of such pilots.

### **Early approaches to research**

William Bower describes a questionnaire evaluation of the Web by pre-service student teachers of music. The use of two questionnaires to gain numeric information from the small class of 12 students is a bit puzzling because qualitative data could have provided much richer evidence for Bower's 'case study'. However for a researcher new to this field this is entirely understandable. I also find his use of psychologists' terminology of 'subject' rather than 'student teacher' uncompromising and so I encourage authors in our field to use the terminology that best describes their case, rather than one that distances them artificially as a researcher. In addition Bauer does not tell us that he is the students' instructor, although it is likely because he has given his affiliation as the School of Music. The study shows that the student teachers welcomed the use of the Web in their music methods class both for access to

information and to their classmates through a newsgroup. There was a significant enhancement of this welcome and ease of use for student teachers who had access to the web outside their class. I hope that Bauer will provide a richer picture of the resources and interaction during his presentation at the SITE conference using the work of the class and their instructor.

All of the papers in this section could have asked Beate Baltes question "What is happening in the virtual classroom?" In order to provide the start to an answer Baltes contrasts student teachers interaction between a course called Educational Foundations presented in two modes using the same resources: face to face in college and online. Exerts from the students interactions with the instructor and presented, although the author does not indicate how they have been selected nor analyzed nor the differences between the two cohorts of pre-service student teachers. The contrast is clear: on-line students have communicated more and less dependant on their instructor. To find out more of the context we must wait for Beale's presentation at SITE. An examination of the issues of comparing two different groups of students should be very interesting as well as looking at the issues relating to access and participation.

Sue Espinosa takes the question further by qualitatively examining online communication modes through the reflective diaries of her student teachers as they use synchronous chat and a listserv during their course. Sue starts with somewhat of a literature review, including a recent book by Palloff and Pratt as well as the updated stalwart text by Roxanne Hiltz which was entitled '*The virtual classroom*', Roxanne's trademarked the term. Espinosa's evident uses qualitative evidence from student reports with quotations that provide a rich picture of the students' views and context. Clearly both forms of communication are valued and each comes with its own issues, which have already been reported in the literature. During the SITE conference perhaps Sue will also share with us how these modes can be used to complement each other and tasks such as the required assessments. We may also consider the ways in which a teacher educator may also best research her preparation and management of such a class using these on-line communication modes.

### **On-line communities**

Lynda Colgan, Nathalie Sinclair and William Higginson provide an ambitious paper that reports the start of long-term research of elementary mathematics teachers who form a community over the Internet. They created the community through on-site workshops to encourage beginning teachers to experience the joy of mathematics and 'build a positive emotional relationship with mathematics'. This core community was then the core for an on-line community called Connect-ME, which includes users who have left

Ontario and are in their first jobs in many locations around the world. Sinclair and Higginson share with us their ambitious plans for both design and research. They recognized that they have only just started and are somewhat disappointed at the lack of use of the Web site. Perhaps the discussion of their paper will bring together a number of Web site and on-line community designers, researchers, and users and so help to refocus the next stage of this rich development. We may be able to get better use by creating a tapestry of web sites that intersect in complementary ways. For example, the Educational Research Forum that I lead (on <http://telematics3.ex.ac.uk/erf>) might enhance the value of Connect-ME and vice versa. Alternatively, there may be confounding issues such as that users get lost as web sites grow and they are unable to recognize users that they met before. Indeed Web site designers have very little feedback on changes of users' interests with time. Perhaps Colgan et al's introduction of a common experiential base and need for community interaction is a way forward.

### Concluding remarks

I hope that the authors will forgive me for provoking discussion at the SITE'00 conference and hopefully beyond. We are at an exciting stage in teacher education with increasing demands and challenges. Policy makers around the world have understood at last that it is important to ensure that beginning teachers have good experiences and models for their own teaching with technology (Davis, 1999). The Web has ensured some sort of common software standards and ease of interaction. We now need to move to a more mature understanding through research and what Linda Colgan and her colleagues call 'the empirical knowledge-base.' I look forward to conferring with you on these topics and building more intersecting and complementary communities of practice across the globe. I also look forward to receiving more papers on this topic at the SITE conference and their further development for publication in the three journals in this field: *Journal of Technology and Teacher Education*, the *Journal of IT for Teacher Education* and the *Journal of Computing in Teacher Education*, all of which now have an editor in Iowa State University Center for Technology in Learning and Teaching.

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# Using WebQuests as an Introduction to Methods

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**Abstract:** This paper describes the University of Virginia, Curry School of Education's approach for using WebQuests as an introduction to methods courses. EDLF 345, *Introduction to Educational Technology*, provides preservice teachers with fundamental technology knowledge specific to relative content areas. After eight weeks of building upon skills, students then use their technology knowledge to create content-specific WebQuests. The WebQuests offer opportunities for preservice teachers to explore content resources and organize information within a technological context. Provided is a discussion of some of the potential connections that are made during WebQuest planning and the implications of these connections on future methods courses.

## Introduction

The Curry School of Education at the University of Virginia is nationally recognized for its integration of technology into content methods courses (Perry, 1999). In applying content-specific uses of technology, preservice teachers move beyond traditional drill and practice uses of technology and instead integrate higher level thinking skills and inquiry with technology. Methods professors utilize a variety of technology tools in their courses and require that incoming students have foundational knowledge of how to use these tools. A challenge therefore exists in now to adequately prepare preservice teachers for their content-specific methods courses. Prior to taking methods courses, students enroll in EDLF 345, *Introduction to Educational Technology*, a two-unit course designed to strengthen technology skills specific to content areas. During the 1998-99 academic year, the Curry School began separating the students in EDLF 345 into separate sections tailored to the needs of different content areas—Elementary/P.E & Health, Secondary Math/Science, and Secondary Humanities. By placing students in an introductory technology course with their content peers, the instructors are enabled to focus on technology tools most often used the content area methods courses. Consequently, preservice teachers begin to cooperatively explore instructional methods as they produce materials within their content area. As a culminating cooperative project, teams of students are required to create a WebQuest related to their content area.

## Course Objectives

While the primary objective of EDLF 345 is to ensure that preservice teachers have a foundation level of technology expertise in content-specific contexts, a secondary objective of the course is for participants to begin producing instructional materials that integrate technology into their content area. An additional goal of the course is to improve self-confidence in applying technology to teaching. In order to meet these objectives, the instructors of the course plan hands-on activities that allow for exploration of technology tools while simultaneously requiring students to apply the tool to their specific content area. Out of class exploration is facilitated through the completion of weekly competencies. These competencies provide course participants with open-ended opportunities to explore application possibilities while developing instructional materials compliant with Virginia Standards of Learning. Participants also cooperatively present produced materials to their peers in class, giving other class members ideas regarding appropriate application. The WebQuest project assists in meeting course objectives on all fronts. Participants utilize the majority of skills acquired during the competency portion of the class, integrate

technology into their content area, and improve self-confidence as a result of completing a large and professionally functional project.

## Course Participants

Students at the Curry School of Education earn a bachelor's degree in an academic major in addition to a Masters in Teaching through the Curry School's five-year teacher education program. The majority of the students enrolled in the class are in their third year at the University and have a firm understanding of their content area, as they have completed many courses towards an academic major. These same students, however, are often lacking knowledge regarding teaching methodology, as content methods courses are not offered to these students until the second semester of their third year. Entering EDLF 345 with limited understanding of educational methods leaves room for the instructors to gradually expose students to practical teaching applications of the technology learned in weekly classes. To stimulate discussion on teaching methods, the course instructors introduce technology applications using content specific examples of the applications use. By doing this, the instructors hope to model appropriate uses of technology within a specific content area that course participants will in turn model to their future students.

Many of the students in EDLF 345 participate in a three-week technology course offered through the Curry School. This course, EDIS 288 *Field Experience*, is required of all second year students applying for admission into the Curry School. Here, students develop basic, prerequisite technology skills over three class meetings (approximately six hours of technology instruction). Topics addressed in the field experience course include desktop publishing, web search strategies, evaluating online instructional resources, and multi-media presentations. As students enter EDLF 345 with this technology foundation, the instructors are then able to concentrate on applying these technology skills to specific content areas, therefore, better preparing students for upcoming methods courses.

## Building the Technology Foundation

To provide preservice teachers with a foundation level of technology expertise in content-specific contexts, the instructors reinforce a variety of technology skills including: desktop publishing, spreadsheets, databases, creating multimedia presentations, paint programs, digital imaging, and web design. Each skill includes an introduction with a hands-on activity followed by student-generated suggestions for practical application within the context of the classroom.

Technology skills and weekly competencies build upon each other week to week and are capped off with a three-week long WebQuest project. A WebQuest is "an inquiry-oriented activity in which some of all of the information that learners interact with comes from resources on the Internet, optionally supplemented with videoconferencing" (Dodge, 1997). While researching and creating WebQuests, preservice teachers are addressing the recent technology/content dilemma, as presented by the Institute for Research on Learning. There, researchers have found

"...a pattern where the technology is front and center stage, rather than the academic content ... the learning about the technology often takes over, and it is only after several rounds of integrating technology with content that content emerges in strong ways." (The Secretary's Conference on Educational Technology, 1999)

In EDLF 345, preservice teachers work cooperatively in groups of three or four to plan, revise, and present a WebQuest project that complies with the current Virginia Standards of Learning (or other similar state requirements). This constructivist approach requires that preservice teachers be accountable for content knowledge first, while secondly incorporating the technological skills taught during the first eight weeks of the course. As they share in the experience of creating useful WebQuests, they are exposed to and participate in a variety of teaching methods covered in detail in their methods courses. WebQuests ultimately prepare preservice teachers for their future content methods courses on two fronts. On one hand, WebQuests require a high proficiency working with a variety of technology tools. For example, preservice teachers utilize online resources to compile the majority of their information. From here, they construct

instructional web sites leading the user through a variety of tasks involving technology. In order to construct an effective WebQuest, the preservice teachers use many of the technology skills learned during the first eight weeks of the course, including: desktop publishing, digital imaging, creating multimedia presentations, and of course web design.

WebQuests additionally give preservice teachers a "jump start" on the content they will cover in their methods courses. During methods courses, class participants become intimately familiar with the Virginia Standards of Learning. EDLF 345 gives these students their first exposure to these standards. This is accomplished by having students address individual standards in their weekly competencies and culminating with the WebQuest, instead of merely requiring students to read and memorize standards in their content area. Also, WebQuests typically incorporate more than one standard, and often they incorporate standards from more than one subject area, thereby making interdisciplinary connections.

## **The WebQuest Connection**

As beginning preservice teachers have not yet created structured lesson plans, WebQuests provide an opportunity for students to begin thinking about the components of planning a lesson while addressing each of the various levels of Bloom's Taxonomy (Ellis, 1995). As the goal of WebQuests is to encourage inquiry-based learning, teachers are then required to prepare activities which move away from the traditional drill and practice models of technology use and instead promote higher-level thinking skills within tasks. While creating WebQuests, preservice teachers are faced with issues such as addressing higher-level thinking skills, preparing for varying student responses, and evaluating completed student work.

Preservice teachers, while developing higher-level thinking activities within the WebQuests, simultaneously strengthen their own critical thinking skills (Clarke, 1990). In asking the WebQuest's audience to make higher-level "connections" while completing the tasks of the WebQuest, the preservice teacher must consider in advance the intent of the activity and how these connections will assist in meeting the overall objective of the project. Additionally, the teacher must also consider the diverse responses the students may give when completing tasks, allowing for variability among student groups and how to accurately evaluate these responses.

While planning WebQuests activities, students also consider classroom management issues such as time and environment constraints, clear and concise directions, and the appropriate organization of content materials, all of which are covered in more depth during methods courses. These realistic technology issues challenge preservice teachers as they prepare to integrate technology within their own classrooms. WebQuest preparation encourages preservice teachers to be conscious of realistic management issues within the classroom while preparing content-appropriate material which strengthens higher-level critical thinking skills.

## **Discussion of Student-Produced WebQuests**

The WebQuests for the fall 1999 semester are available at the following URL:  
<http://curry.edschool.virginia.edu/curry/class/edlf/345/students.html>.

In this year's sections of EDLF 345, a higher emphasis was placed on the content of the WebQuests than during the previous year. Course participants required very little technical assistance in the production of their WebQuests. This was in part due to two previous competencies that required the students to create a "favorites" web page and an instructional web site. These competencies can also be found at the URL above. Generally speaking, the WebQuests are technically sound and are well developed. It is expected that as a result of taking methods courses, students will be able to build upon the knowledge developed in EDLF 345 and be capable of producing WebQuests richer in content. However, the authors believe that the experience of creating WebQuests in EDLF 345 prior to taking methods courses is essential to this process. Had the class been a stand-alone technology course, students would be technically capable of producing a WebQuest in subsequent methods courses, but would not be experienced in linking this technical expertise with content-area knowledge.

## The Next Step

Curry School of Education faculty are currently exploring the possibility of phasing out EDLF 345, *Introduction to Educational Technology*, and instead providing technology-based introductory methods courses for each content area. These courses would focus on core technologies for specific content areas, but would be more focused on content than EDLF 345 currently is. A pilot course for math and science preservice teachers was implemented this year and will provide necessary data to further evaluate this possibility. The trade-off in this procedure is that preservice teachers will be provided with less of a foundation of technical skills as they enter methods courses, making it necessary to continue to build on this foundation in methods courses. As methods faculty across all content areas adopt more uses of technology into their courses, the math and science model started this year is likely to expand into other content areas. For now, WebQuests serve as an important bridge, connecting technology proficient EDLF 345 students to their content-specific methods courses.

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# The Effectiveness of Preservice Teacher Training Through the Internet

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**Abstract:** This paper discusses a collaborative model developed for a distributed learning course in which preservice teachers learn and teach through the Internet. In this model the preservice teachers, who are learning to be teachers of English as a foreign language, act as mentors for EFL pupils to help improve their literacy skills, while, at the same time collaborating with the pupils to carry out joint assignments. Their combined efforts are published as webfolios on the Internet. This model aims at giving the preservice teachers teaching practice through the Internet, in order to prepare them for effectively incorporating TML into their future classes. This paper will present initial results from the study as to the effectiveness of this type of course. Initial data will be presented which seems to point to a change in the preservice teachers' perception of how they see their role as teachers.

## Introduction

Many educational professionals are concerned about the effectiveness and quality of preparation preservice teachers receive in integrating technology mediated learning (TML) into their future classroom practices (Beisser 1999). There is a tremendous disparity in the technological preparation of preservice teachers, many of whom feel unprepared for their future task of creating new instructional environments (Persichitte, Caffarella & Tharp 1999). New teachers often feel bewildered by the new options open to them and fail to capitalize effectively on the new technologies. One prime reason for this is that most university faculty are neither modeling the use of technology nor requiring students to use technology in the preservice phase (Blanche, Matthew, & Thomas, 1998; Bauer, 1998; Drazdowski, 1995; Vagle, 1995; Wetzel, 1993). As the Office of Technology Assessment (1995) reported to the US Congress, most technology instruction in colleges of education involves teaching about technology as a separate subject, not teaching with technology by integrating it into other coursework to provide a relevant model for instructional use. This description is also applicable to teachers colleges throughout the world.

Research shows us that even when the new teacher has computers with Internet connections available in their classrooms they are not effectively utilized, being used in the main as a word processor or for operating pre-packaged learning ware. Pelton and Pelton (1996) studied the correlation between teacher attitude and the acceptance of technology. Their research led them to conclude,

"Although many teachers believe computers are an important component of a student's education, their lack of knowledge and experience lead to a lack of confidence to attempt to introduce them into their instruction. This lack of confidence then leads to anxiety and reluctance to use technology" (p. 167).

Research also shows that personal confidence building should be an essential part of a technology course. Knowledge about computers and technology do not guarantee that a teacher will integrate technology into a course of study. A key component is attitude. "Educators need to strive to light a fire and motivate preservice teachers to understand the influence educational technology can have in their lives and classrooms: (Gunter, Gunter and Wiens 1998).

In order to raise the confidence and computer competence level of the preservice teachers, a new model was developed based on the "learning by doing" theories. In this experimental based model preservice teachers participate in a distributed learning course while simultaneously teaching pupils through the Internet.

## Background

### Technology Integrated Models

Aside from designs for general computer literacy courses (Leh, 1998), a number of models exist for teaching distributed learning courses. Mason (1998) divides the existing types of on-line courses into 3 categories: the content+support model where there is a "strong division between content and support" and the online activity is about 20% of the course; "the wrap around model" in which tailor made materials are wrapped around existing materials and online activities amount to 50% of the course; and the integrated model which consists of collaborative activities, learning resources and joint assignments. As Mason says, in this third model the distinction between content and support dissolves and a learning community is created. In addition to Mason's three models, there is also "anchored instruction" in which technologies are taught through a theme or anchor" (Bransford, Sherwood, Hasselbring, Kinzer & Williams, 1990, Bauer, 1998).

A typical online component found in courses in the teaching colleges seems to be of the type shown in the diagram below. However in many cases the content is the technology.

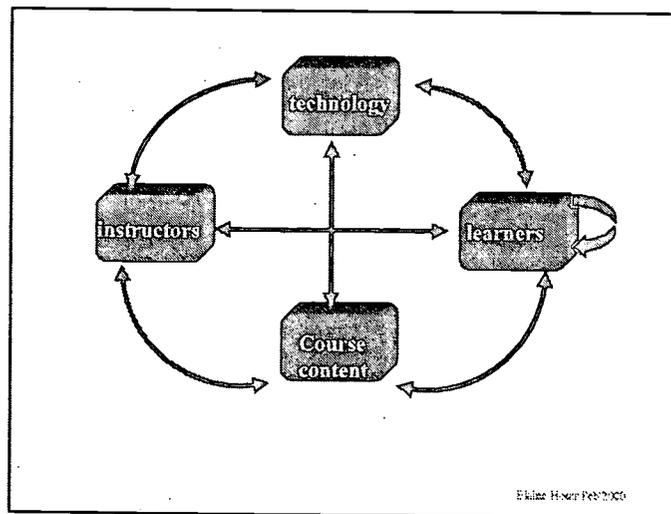


Figure 1: the Learning Process in a standard TML course

### Changes in Concepts

Today with changes in technology and pedagogy we envisage "a new teacher" prepared to carry out various roles in the technology enhanced classroom. This new teacher is no longer the sole source of experience and information for the learners. It is no longer enough to teach preservice teachers how to be computer literate, (using email, searching the net etc), nor is it sufficient to merely teach students about integrating technology and about the tools of the Internet. Rather, they have to experience and practice actual teaching using TML themselves as both learners and teachers in a protected setting, before they can be expected to manage a classroom in the age of technology. We have to prepare our preservice teachers for the challenges of the age of technology where we can expect to find computers in every classroom. Teachers have to know when and how to appropriately integrate the technology. "Teaching training programs must recognize the need for training in technology, taught across the curriculum" (Beisser 1999). The national curriculum in the UK for Information and Communication Technology (ICT) aims, in particular, to equip every newly qualified teacher with the knowledge, skills and understanding to make sound decisions about when, when not, and how to use ICT effectively in teaching particular subjects. ... It is the responsibility of the initial teacher training provider to ensure that the ways trainees are taught to use ICT are firmly rooted within the relevant subject and phase, rather than teaching how to use ICT generically or as an end in itself. (DfEE/WO, 1998, Annexe B) The standard courses don't seem to prepare the teachers for this future.

## Description and Implementation of the Model

The new model was developed in the framework of a course in teaching advanced literacy skills. After piloting the course in 1996, the course was given twice in 1997-8 to two groups of preservice teachers, and with revisions is being taught in 2000.

### Project Participants

The 1997-8 project involved two separate classes of preservice teachers. One group consisted of 18 university graduates from Anglo-Saxon countries who as new immigrants to Israel were retraining to be English teachers. The other group of 9 consisted mainly of 2nd and 3rd year students studying towards a B.Ed degree specializing in TEFL with the addition of a few mature students returning to complete their B.Ed degrees. The course ran for a semester course involving 14 meetings of 4 weekly academic hours. At the time the course was given, few students had access to Internet connections from home, thus block time was needed in the computer room at the college. The students also had computers available to them outside of class time for the purpose of practice and to complete assignments.

Each group of preservice teachers teamed up with a different group of EFL learners. One group consisted of ninth graders in the Gymnasia junior high school in Jerusalem Israel, and the other group consisted of foreign visiting students at Snow College Utah USA. Each preservice teacher received a pupil partner for the duration of the course. Each pair collaborated through the Internet to complete joint assignments working through the various modules of the course.

### Course Rationale

Each of the 8 modules of the course consisted of 2 topics, one always in the realm of the topic area, which was teaching advanced literacy skills. This included, for example, the skills and strategies of skimming, scanning, summarizing, differentiating between fact and opinion, and vocabulary development. The second topic of each module was learning about a tool of the Internet. This included email, advanced searching, use of database, MOOS chats and IRC etc. Each module had collaborative assignments that ensured the preservice teachers and the pupils became familiar with and competent using the various tools of the Internet while working in the content area. The pupils practiced their English and developed their literacy skills with the help of their on-line partner who became their buddy and mentor. The preservice teachers got to learn about literacy skills through the on-line bibliography of the course, learn and practice the tools of the Internet, and also to put their new found knowledge to practice on their personal pupils.

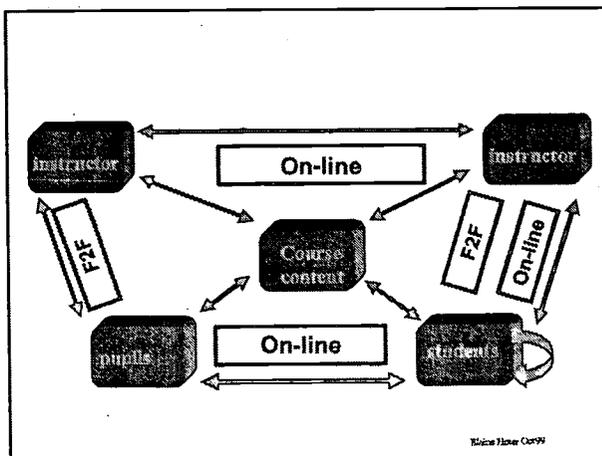


Figure 2: Interaction in the New Model

The course, as depicted in figure 2, is classified as a distributed learning course because all the work on the content area was mediated through the Internet as were the discussion groups. The class meetings were spent individually completing assignments on the computers. The F2F component was the component in which the technology was demonstrated discussed and technical problems were sorted out. Today with the advancement in technology, fewer technical problems and the availability of Internet connected computers off campus, the actual amount of class meetings could be drastically reduced. In 1997, however, the student all felt that they needed the support of the F2F meetings.

The EFL pupils also met with their class teachers for 4 hours a week for the semester. Their class time was spent working on assignments through the Internet and the F2F component, which was also devoted to teaching the tools of the Internet. Both the instructors of the EFL classes worked online with the instructor of the preservice teachers to discuss the course development as well as to solve technical difficulties. There was minimal intervention by the instructors in the course content area and in the ensuing interaction between the preservice teaches and the EFL learners. The instructors interacted with the preservice teachers in the form of comments and feedback to reactions to the reflective dialogue journals.

### Course requirements

The preservice teachers were required to communicate on a weekly basis with their EFL partner throughout the course giving feedback and encouragement while working together and helping their partner in carrying out joint assignments. In addition the preservice teachers had to read and relate to a bibliography on the Internet site and were required to take part in the class online discussion group. They were also required to write a weekly reflective dialogue journal with the class instructor in which the preservice teacher reflected on the process they were going through and the critical incidents observed along the way. The EFL pupils had the responsibility to prepare an online webfolio of the pair assignments, (examples can be fund at <http://www.macam98.ac.il/~elaine/eti/Mod8.htm>)

The assignments were all geared to encourage communication, foster collaboration, develop proficient language use via process writing, widen students' horizons and develop a sense of a learning community. For example one of the initial writing assignments was for each pair to write a bio-poem about each other. In order to carry out the assignment the participants interview each other, thus encouraging asking and answering questions via email communication.  
( <http://www.macam98.ac.il/~elaine/eti/Mod2.htm#A> fun writing )

### Collection and analysis of Data

Data was collected throughout the course in order to examine the process the preservice teacher goes through while taking the course. This included pre and post assessment tests on motivation to using technology (based on Warschauer 1996) on the subject matter, attitudes and teaching beliefs. An end of course questionnaire was carried out as were follow up interviews a year and a half after the course on use of technology in teaching. Data was also collected during the course via the analysis of dialogue journals, emails with pupils and contributions to the discussions. The data is in the process of being analyzed, but initial results of pre and post tests in course content and use of technology show a marked improvement in many areas. Ironically enough the participants from the retraining course who did not show improvement in the content area (teaching literacy skills) have left the teaching profession, some to work in the computers field.

Initial analysis of the follow up a year and a half after the course shows that when the teachers have access to computers with their students, they are integrating the tools of the Internet in their EFL teaching and some have become the school leaders and "experts" in this domain. However, many of the teachers lack basic computer equipment in the schools, so apart from using the Internet from home for material and interaction with colleagues, haven't been able to apply their knowledge in the classroom. One very positive item of feedback is that all participants said that they would use parts

of what they tried out and practiced in the course in their own teaching and 35% said that taking the course changed the way they teach.

## Summary

Obviously this model suggested is not the answer to all the issues of teaching how to integrate technology in the schools, but it does allow preservice teachers to acquire and practice the skills in a supportive environment while obtaining first hand teaching and learning through the Internet.

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# Innovation In Using Telecommunications In Pre-Service Teacher Education And The Impact Upon Distance Learning Student Teachers

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**Abstract:** A teacher education program at the University of Waikato provides for student teachers to do most of their study away from the university. The Internet, several block university weeks and study in local elementary schools are the main sites of learning. Data from interviews about the effectiveness of the school-based component are reported. The responses of principals, tutor teachers and student teachers revealed several major issues: teacher workloads and university expectations on teachers, support for student teachers, organisational requirements, colleague relationships, benefits for tutor teachers, power relationships and negotiated participation, and multiple demands and pressures on student teachers. An analysis of these issues provides the basis for a possible theory of school-based teacher education. Several propositions are advanced as the basis of an emerging theory that may impact on future policy development.

## Background

In recent years there has been considerable expansion in teaching various academic courses electronically. To date much of the effort has been in designing course materials to make them more appealing to the students, often spurred by a desire to achieve a greater market share. Increasingly, attention is turning to what happens to the student teachers when they engage with course materials. How do they respond to the materials? Do they have needs that are different to other students? What strategies are needed to help them succeed?

Teacher education is a field that has extended into teaching with information technology (e.g. papers in conference proceedings of Teleteaching '98 and the 3<sup>rd</sup> International Open Learning Conference, 1998). Knowing how student teachers engage with materials is a matter of considerable importance for teacher educators and policy makers. Pre-service teacher education students have to learn a considerable amount of content that can be achieved through electronic means. But they need to learn much more that cannot be learned through Internet access, in particular, many aspects of a teacher's job in school-based settings. This paper examines the way in which course materials interact with the school-based practice of student teachers and their mentors.

The teacher education program discussed in this paper is offered by the University of Waikato, located in Hamilton, a regional city in New Zealand. The region of the university includes several small cities, numerous small regional towns and villages, and rural districts with low population densities. The motivation for this new form of delivery was primarily educational politics revolving round the issue of how schools in rural communities could overcome teacher shortages. Local leaders in teacher shortage districts have pointed out to the university that local people suitable for teacher education are unable to move to the university city for full-time study because of family and other commitments.

Confronted with the above issue, the university decided to offer an alternative form of delivery of teacher education to 'immobile' student teachers in local districts, principally through online computer communication. (Campbell, Yates & McGee, 1998; Yates, 1999). Advances in technologies associated with

distance teaching and learning aided this decision. Credibility was to be maintained by teaching the already-established degree and diploma in primary teaching.

It was decided to teach courses by a combination of delivery through Internet, school-based work in the home district and several short (one-week) blocks of attendance at the university for face-to-face teaching. The degree is made up of 21 courses or papers: three in professional practice (coursework and school practicum); nine in curriculum methodology and issues; one in each of human development, special education, classrooms with linguistic and cultural diversity, social issues in education; three content courses; and two options. Many of these courses, and especially the professional practice and curriculum ones, required practice in elementary schools.

The innovative aspects of the teaching are: (a) student teachers spend most of their study time at home, using information technology to communicate with their teachers at the university, and engaging in study group interactions with fellow student teachers via their computers; (b) attendance at the university for three separate weeks of face-to-face teaching per year; and (c) location in an elementary school to carry out coursework tasks and assignments.

These innovations were developed after reviewing international attempts in distance teaching. The 'home' or 'base' elementary school was willing to provide mentoring and supervision for a student teacher. For a small fee, a teacher in the school agreed to create teaching opportunities and provide feedback to student teachers on their classroom performance on tasks required by the university. All student teachers had to negotiate with the school and tutor teacher over times and dates to teach lessons in a subject currently being studied, for example, times to teach several lessons as part of the curriculum mathematics course. Every student teacher was expected to spend one-day equivalent in a school every week. International research focus on school-university partnerships has identified certain effectiveness factors. For example, Sealey, Robson and Hutchins (1997) showed that setting clear expectations, team building, communication and carefully selecting partners were crucial to success. Factors like this form the basis of a theoretical framework by which to assess the quality of the school-based experience, for the success of it relates to the broader issue of developing 'professional self'. School mentors and student teachers working together are crucial (Edwards & Ogdén, 1999).

The response to this placement approach has been significant. Student teachers gained much from being placed in schools where mentors provided them with appropriate role modelling, advice and guidance and collegial support. Each of these aspects built on the course materials that were electronically accessed. The student teachers generally selected the schools for reasons such as geographical proximity, size and known approaches to teaching and learning. Most schools had only one student teacher placed in them but a small number had up to five student teachers. The university negotiated and supervised each placement by making a visit each semester and more frequent contacts through telephone and email.

In spite of these strategies the school-based part of the degree program was probably the most contentious component. University staff raised issues like: How could quality of school-based practice be maintained in remote schools? How could the quality of mentoring and supervision be assured? Could all student teachers be placed in quality schools and classrooms?

To answer these questions, the coordinator of this alternative degree delivery, called mixed media program (MMP) and the director of university teacher education embarked on a series of observations and interviews in a sample of MMP elementary schools. They interviewed a sample of school principals (N=12), tutor (supervising) teachers (N=12), and student teachers (N=15) in a variety of schools.

From the resulting data, the following issues were identified as the most pressing:

1. tutor teacher workloads and university expectations,
2. quality of support for student teachers,
3. organisational matters,
4. in-school colleague relationships,
5. perceived benefits and constraints,
6. power relations and negotiated participation, and
7. multiple demands and pressures on student teachers.

Using data collected from school visits and interviews, each of the above issues is discussed.

## **Tutor Teacher Workloads and University Expectations**

At the commencement of the program all participants were advised of the expectations of the university, officially through letters, visits and some limited use of email from the university and "unofficially" by the student teachers in their weekly contact. The student teachers were asked to be responsible for transmitting the nature of the content in each course to their school, to assist building and consolidating the relationship between teachers and student teachers, and to ensure that the student teachers were clear about the nature of the task and able to explain it through written material and oral discussion.

It was found that all participants faced initial adjustment problems, for they were working in an unfamiliar situation. The student teachers were new to online learning. University teaching staff, all volunteers, had subject knowledge but no online teaching experience, and the school tutor teachers in schools were largely unfamiliar with the use of information technology. When interviewed, some school tutor teachers commented that they felt insufficient guidance had been provided and they were uncertain of what was expected of them. Some suggested that they believed direct contact on a regular basis should have been made between the university and the school, rather than having student teachers as the "messengers." It was also suggested that the school tutor teachers should have been provided with professional development similar to that provided to other teachers who supervised regular practicum placements for on campus student teachers. In contrast, some school tutor teachers were satisfied with the amount of information provided by the university and the way it was disseminated. They commented that their student teachers had been clear about their expectations and the nature of the tasks and that the process of having the student teachers explain was beneficial for all parties.

The reason for the variation in the reactions to student teachers can be explained in part by the attitude of the schools and partly by the effectiveness of the student teacher in developing their own independence. Some schools were more receptive to the task of providing an interface for student teachers between their course materials and the school based setting while other schools relied on what might be called an "official" line. These schools were less receptive to the idea that student teachers could be responsible partners in their own learning process and had to be told what to do.

## **Quality of Support for Student Teachers**

The second issue that emerged about the school-based part of the program was the quality of school support for the student teachers. An important consideration was that the student teachers were placed in schools that until then had only limited contact with the university because of distance. Many tutor teachers were not experienced in tutoring student teachers and this added dimension to their work was unsettling for some. Attempts to provide professional development were frustrated by a lack of replacement teachers for tutor teachers while they participated. While some professional development with teachers was undertaken no real resolution has been achieved. However, an interesting side effect that became apparent was the way the tutor teachers gained professionally from their contact with the student teachers. Some principals commented on the enervating influence that enthusiastic and well-organised student teachers brought into schools, with new skills, initiatives and particularly ideas from their coursework. On their own, rural schools lack consistent contact of this kind. Suggestions such as liaison teachers based in some regions, a lead teacher fee being offered and other possibilities such as free call phone in lines have been considered, but not implemented at this time.

## **Organisation**

It seems self evident that an effective program needs to be based on sound organisational procedures. In spite of this assumption, organisation was noted as another issue in the research. From the data it became clear that having clear guidelines reduced the amount of anxiety experienced by the school tutors. First the ability of student teachers to negotiate was integral to the success of the program from the student teachers' and teachers' points of view. Student teachers who were already known to the school generally found it easier to negotiate school access for their tasks. They did not have to establish their own relationships and credibility. However, there were some student teachers who were unknown to the school. As the program commenced some student teachers found difficulty but were soon able to establish strong relationships in the school.

As student teachers negotiated their school access several key factors arose. Flexibility was needed to provide classroom time for teaching by student teachers. They needed to fit in with the classroom program and teachers needed to make time for them to carry out their tasks. Student teachers who showed initiative in developing an effective time-line for each semester and communicated it to schools were able to achieve effective school - student teacher relationships. Last minute requests leading to tensions were therefore avoided. The way in which student teachers managed their time was further highlighted when they had employment that impacted on both themselves and the schools. The question of how much part-time paid work is possible while studying for a degree as a full time student, remains a problematic issue.

### **In-School Colleague Relationships**

Establishing positive relationships between student teachers and school personnel was a major issue that emerged from the interviews. A key factor was continuing contact with the principal, tutor teacher and student teachers and this was crucial to successful school-based work. Effectiveness seemed to drop when contacts were spasmodic. The way in which the student teacher approached the principal was critical for a strong relationship and supportive principals resulted in student teachers being more positive and achieving better. In many cases the student teachers became integral parts of the school community. Actions such as inclusion in staff photographs and celebrations of high grades are examples of this. However, there was evidence that some principals inadequately consulted their teachers after negotiation between the principal and the university coordinator. Consequently the tutor teachers felt "dumped upon" and had a less positive attitude towards the program and the student teachers. Fortunately, this was a small minority and the overall view was one of a strong partnership between the schools, student teachers and the university.

### **Benefits and Constraints**

A number of benefits and constraints emerged from the interviews, which is hardly surprising in a new program of teacher education taught through mixed media for the first time at a particular university. The first benefit and probably the most obvious, was that student teachers quickly became familiar with the realities of teaching. They were able to engage in the life of a school on a regular basis and readily develop relationships that are crucial to teaching. This seems to be a more "natural" path towards socialisation into teaching compared to university-based student teachers who spend less time in schools. On the other hand there are dangers of pressures to conform which reduce student teachers' initiative (McGee, 1996).

A second benefit was that student teachers introduced and shared new ideas with their tutor teachers and even more widely in the school. New Zealand schools have been exposed to major curriculum revisions in the last decade and the scope and pace of this has been daunting for many teachers. Even those who were strong in their professional development found that the added impetus from the student teachers, mainly in curriculum matters, provided numerous opportunities for sharing. Not only did the course materials add to the professional development of teachers but it was also significant that the student teachers were able to clarify their understandings and make links between theory and practice.

A third benefit was the way children were able to benefit from having extra teaching time from a student teacher. Although they were still in training, their increasing knowledge and skills meant that they were able to make a useful ongoing contribution to learning in classrooms and schools that is not always possible in the on campus program. Classroom life in New Zealand has changed a lot in recent years, and inclusive education policies have been implemented in a way that means that there is often more than one adult in a classroom. The student teachers were able to work successfully alongside teachers in a professional capacity.

A fourth benefit was to do with teaching approach. Achieving reflective practice in student teachers has been a major goal in teacher education for some years (Zeichner, 1993). The need for student teachers to systematically reflect on their practice is frequently discussed with teachers but some tutor teachers remain dubious about the practicality of this approach in the mixed media program. Teachers and principals, it seems, were gradually seeing the benefits of the tutor teachers developing reflective practice, behaviours that showed up in the quality of their modelling, feedback and support.

Finally, a side effect of this mixed media teaching, has been the way in which the student teachers have been able to demonstrate and use their information technology skills. While New Zealand schools have long been regarded as innovative, adaptation to information technology skills especially those for computer usage has been slow. Teachers have commented that because of the accountability demands that emanate from recent educational reforms, they have been very pressured for time to gain the required computer skills. Often the children in their classes have been more proficient. However, the introduction of student teachers into classrooms in the base schools provided some teachers with the opportunity to become more skilled. They achieved this by working with the student teachers who were not only willing to help them but often made contributions to the wider school community through their knowledge of information technology.

Taken as a whole the data showed that the school-based placements were largely successful. However, there were a number of constraints. The first was that the size of the school is important. Some schools are very small with only two or three teachers and the demands from a student teacher placement means that there can be extreme pressure placed on all teachers in the school. They may be very willing but they also need to cope with the normal demands of teaching. Thus, the approach has been to limit the number of student teachers placed in a school to match with its size. Small schools have been limited to one student teacher while the larger ones have up to five. It is difficult to match the need to be realistic with what a school can cope with against their enthusiasm and desire to be involved with a program, which is innovative and will bring rewards to their local education needs, by supplying more teachers.

A second constraint was teacher changes. The most crucial was several changes of principal where existing teachers had been involved in the program yet the new principals were not as committed to the program. This required considerable consultation with some schools to ensure that continuity was retained. Classroom teacher changes also effected continuing commitment. The final constraint was the student teachers themselves. They needed to be well organised, motivated and show initiative for their placement to be successful. This was generally true but some advice and guidance was necessary for student teachers who put their placements at risk by not showing these characteristics.

#### **Power Relations and Negotiated Participation**

Power relations and negotiated participation have been referred to in discussing the above factors. But it did arise as a separate issue. The way in which principals, teachers and student teachers interacted was dependent on the effect of power relations and the way the student teachers were able to negotiate their participation. Principals were generally welcoming of student teachers and regarded their participation in the life of the school as beneficial. However, there were some principals and teachers, who recognised the competence of the student teachers by giving them more responsibility than they should have had as student teachers, thus bordering on exploitation. Even if the student teachers were aware of their needs they found it difficult to negotiate in these circumstances. An implication is that all involved needed to be aware of their respective roles and to abide by them.

#### **Multiple Demands and Pressure on Student Teachers**

There were multiple demands on student teachers to carry out their various roles which, impacted upon their participation in school-based activities. Many had an economic need to be in part time employment, often for a considerable number of hours per week. Many had to balance the needs of being a student teacher with that of managing their own family life. It was not always recognised by schools which, surprisingly, sometimes lacked tolerance. In addition, the student teachers felt under pressure to achieve at a high level. Multiple expectations from school, the university and their own family, as well as themselves made balancing all the demands it very difficult to maintain their participation. A feature of this program is the very low drop out rate.

Taken as a whole, the findings were reasonably positive. Student teachers were gaining mainly beneficial knowledge and teaching experience. The data also revealed a number of matters that needed to be addressed to ensure consistent quality, for example, better techniques of feedback to student teachers and reconciling multiple demands upon both teachers and student teachers and providing exemplary models in the base schools.

## Developing a Theory

From the emerging information about the school-based part of teaching a teacher education program described in this paper, and what is known about other attempts, it is now possible to identify several factors that might be included in a theory of this school based component. The theory might be called the theory of effective school-based delivery in teacher education. The effectiveness factors we have identified are:

1. The university teaching staff need to believe in the merit of the program.
2. The university teaching staff and tutor teachers need directed assistance in adapting their teaching to alternative strategies.
3. The available technology needs to be within the capabilities of teaching staff and student teachers.
4. Substitute means of communication between university teachers and student teachers and also between the student teachers are required to compensate for reduced face-to-face communication.
5. Student teachers require access to whatever technology is used and the skills to use it.
6. Student teachers' success in school-based coursework will depend on their capacity to become independent learners who are able to reflect and negotiate.
7. Effective elementary school placements require effective supervision, feedback and advice.
8. Multiple demands upon student teachers need to be rationalised to ensure adequate time is given to university coursework.
9. All parties need to clearly understand their roles in the school-based work.

As a starting point the above factors provide not only the chance to theorise about what might be an effective program, but a blueprint for policy development. For example, the second factor was developed from a feasibility study of international multi-media delivery systems. It was found that problems arose when tutor teachers were inadequately prepared. Being aware of this, steps were taken to provide funds and time for staff to develop course materials and computer usage skills. In 2000 we will be in a position to review the quality of teaching of the first cohort of graduates. The school-based part of their teacher education is sure to be a key element in the level of effectiveness in the graduates' teaching.

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# USING THE WEB TO ENHANCE FIELD EXPERIENCES FOR PRESERVICE TEACHERS

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**Abstract:** This paper describes an ongoing project at Fairleigh Dickinson University in which preservice graduate students are required to take a web-enhanced Field Experience course. In Spring 1999, an initial pilot was conducted and pre- and post-assessment data were collected. Results show that all students found this course to be very beneficial and that there was increased proficiency in computer use, especially for those who were the most inexperienced. This type of course increases interactivity among field experience students and facilitates communication and involvement for all involved.

## Introduction

Field experiences are one of the most important factors that promote professional development in preservice teachers. Research confirms that placement of preservice teachers into classroom environments facilitates reflective professional behavior whereby interns are more inclined to carefully think about and improve their own teaching (Boyd, Boll, Brawner, & Villaume 1998; Metcalf & Kahlich 1998). Field experiences allow preservice teachers to participate in and experience as learners a wide variety of instructional approaches, styles, and techniques (Metcalf & Kahlich 1998), while also helping them to develop a coherent philosophy of learning and to connect their philosophy to classroom practice (Boyd et al. 1998). However, there are several attributes of Field experiences that are problematic. First, there is no consistent way to ensure that each intern will be placed in an exemplary classroom setting that is modeling the practices and methods that the university is promoting within its curriculum. Invariably, a few students are placed into classrooms which function as negative models—examples of what not to do in a classroom. Second, when interns are placed in a classroom, they are usually isolated from any type of continuous communication with the university instructor and other interns. This often leads to a feeling of abandonment, isolation, and, perhaps most serious, a period of missed opportunities to teach and reinforce important concepts about the classroom whether they be positive or negative aspects of teaching and learning. Third, because interns are in different classrooms, there is no common experiential base for them to develop into a community of learners sharing and developing a common core of beliefs.

These early experiences in a preservice teacher's education influence their beliefs about what it takes to be an effective teacher and how students learn best. The experiences that each intern is exposed to during this stage of professional development will greatly impact how he or she eventually teaches in the classroom (Laffey & Musser 1998). The research in the field of instructional technology suggests that one reason our schools are lagging so far behind in the use of instructional technology in the classroom is that teachers, themselves, were never taught using instructional technology, do not know how to use it, and are afraid of it. In addition, today's colleges of education do not adequately prepare teachers to use technology in their teaching (OTA 1995). Research further suggests that technology plays a significant role in changing the climate, culture and process of learning within the classroom, helping teachers shift from a lecture-oriented classroom to a project-oriented one where students collaborate in a more constructivist approach to learning (Cohen 1997; Becker & Ravitz 1999). This shift in instructional methodology supports what current learning theorists claim is the most advantageous way for students to learn, and, in fact, supports what educational reformers have been trying to accomplish for years without the use of technology. In essence, this means that teacher educators must start requiring the use of technology by their students as part of teacher certification requirements, and professors must model effective use of the technology within the instructional process. Many preservice teachers view computing as stressful and take a conservative view toward using technology in teaching, namely that they view technology as a potential interference in the teacher-student relationship and they do not perceive the relevance of using technology in the classroom (Laffey & Musser 1998). It is therefore essential that preservice teachers have positive experiences that model effective and comfortable use of technology within their own classes so that these experiences will positively influence their belief systems and encourage them to use technology as a future teacher.

This paper describes an ongoing project at Fairleigh Dickinson University in which preservice graduate students enrolled in the Master of Arts in Teaching (MAT) program are required to take a web-enhanced Field Experience II course that incorporates the use of technology as part of course requirements. This course is the second field experience required for New Jersey State Teaching Certification and the students must spend at least 30 hours in a classroom-- participating, teaching model lessons, and observing curricular trends that are being implemented. Traditionally, field students met with an instructor three times during the semester, but for the most part they were very much on their own. They went to their respective field placements and had little contact with other students, teachers or with the professor, resulting in a feeling of isolation that oftentimes pervades the teaching profession. This project was designed to develop a virtual community of learners who would share experiences, thoughts, issues and concerns with each other and with their professor on a continual basis. The course was also designed to help preservice teachers increase their proficiency in technology and influence their attitudes and belief systems about technology by requiring them to use technology as part of course requirements.

### **The Web-Enhanced Course**

This instructor was initially given a summer grant from Fairleigh Dickinson University (FDU) to develop the web component of the course, Field Experience II. During the summer, the instructor learned Web Course in a Box (WCB), the authoring package that FDU uses to develop web-based courses. WCB provides an easy and comfortable environment for instructors to develop an effective and dynamic online environment. Each student requires a user name and password to enter this site, ensuring security and privacy, a very important feature for any distance course. Much of the development time was spent searching for links for student research and developing lesson plans that the students could access.

Part of course requirements for Field Experience II are that students must choose five curriculum trends to observe in the classroom out of 10 different trends listed in the syllabus. These include: Balanced Reading Approach, NCTM standards, moral and ethical teaching, higher level thinking skills/critical thinking, cooperative learning, reading and writing across the curriculum, multicultural education, constructivist classroom, integrating technology into the curriculum, authentic/alternative assessment, learning styles/Multiple Intelligences, and hands-on science. The students must then write a paper describing what the research states about each trend and compare what the research says to how each trend is being implemented in the classroom. To facilitate access to research and to introduce students to the unlimited potential of the web as a research tool, the course provides students with links to ten different sites which allows students to read research articles right on the web about each trend. This is supposed to supplement any other research the student has access to. Care was taken that each link to a curriculum trend was a scholarly article describing an overview of the research, and that the link was not just a description of a school using the trend or a "promotional" site proclaiming or disclaiming its merits.

In addition, two lesson plans were developed for the students. In Field Experience II each student is required to present a lesson to a university supervisor, the first time an intern is formally observed and evaluated. Many of the students are nervous about this and do not feel confident of their lesson planning skills. One lesson was developed on how to develop a lesson plan and provided models of different types of lessons in reading, math and science. Another lesson was developed on promoting literacy in the classroom. Both lessons were easily accessible and could be printed out or downloaded.

A Discussion Forum was developed for the students. This was designed to be a "threaded discussion", one in which students could leave messages and respond to other messages, and everyone in the class could follow along. For example, one area for discussion was "Issues in the Classroom" in which students could respond to any pertinent issue that arose while they were doing their field experience. One student responded that she was not happy with her teacher; her teacher was constantly yelling at the students and embarrassed a student in front of the whole class by yelling at her because she did not bring her homework to school. Other preservice teachers and the instructor immediately responded by confirming that this was not appropriate classroom management and offering advice as to how this could have been handled in a different way. All messages were left on the web for others to read and a continuing thread of responses and follow-ups developed throughout the semester. It became an exciting vehicle to establish an open line of communication with the students and to provide immediate feedback on varying issues of concern. Another area that was developed for online discussion was "Online Issues" which helped students who

were having difficulty accessing the web or sending e-mails. Again, it provided feedback and support for students who were having technical difficulty. Another area that was developed was "Being Observed and Evaluated Teaching a Lesson" which became a very active area as each intern was observed. Being formally evaluated was a stressful part of the course and this provided preservice teachers with continuing support and advice.

WCB is structured so that there are many links that are available to the students when they enter the course homepage. Students can view the syllabus that was put online, as well as any course requirements. Announcements such as paper requirements and student expectations for participating in the Discussion Forum are listed. A Schedule of class meetings and when assignments are due is also posted online. A very helpful link that WCB provides is a list of all students and their e-mail addresses. Any participant can then e-mail the whole class with one click of a mouse, or he/she can e-mail an individual student or the instructor. This facilitates online communication with the whole class and helps build a community of learners. One requirement was that each student must e-mail the instructor and other students a minimum number of times. WCB also provides students with a help page, which provides documentation for using WCB. There is also an easy tool for students to develop their own webpages.

### **Results of the Pilot**

In Spring 1999, an initial pilot was conducted in one section of the web-enhanced Field Experience II course. The first meeting of the 10 students was in a computer lab that had internet access. Each student was given a password and username at this session to ensure that each student could access the site without any problems. Each student's e-mail address was also entered and if a student did not have an e-mail account, he/she immediately signed up for a university account at this time. This first session involved covering all the different components of the course. The inexperienced users were given special attention and shown how to navigate the web. Each student was asked to enter a message into the threaded discussion forum so that they understood how to do this. The course requirements and syllabus was also discussed and arrangements were set up to meet two more times.

These next two meetings were not in a computer lab but were designed to discuss issues related to classroom curriculum trends. During these two sessions, problems and issues related to using the technology were brought up. If any student had a problem using the computer or accessing the website, he/she either e-mailed the instructor, or set up an individual appointment to meet with her.

During the pilot of this course pre- and post-assessment data were collected on the group of 10 students taking the course. Data was collected on students' proficiency in working with computers and their ability to use the web. At post-assessment time, data was gathered on how useful they found various aspects of the course and how often they used its various components. Table 1 (Tab.1) displays the results of differences between pre-assessment results and post-assessment results on selected items. Results are shown in percentage points which are based upon 9 students' responses (one student did not fill out a post-test). The ratings are based on 5 being the highest level of proficiency or use and 1 being the lowest. For example, on question number 1, at pre-assessment time, 44% of the students felt that they had a very high level of proficiency in operating a multimedia computer. At post-assessment time, 66% felt that they had a very high level of proficiency in operating a computer.

	Pre					Post				
Question:	5	4	3	2	1	5	4	3	2	1
1. I can operate a multimedia computer.	44	14	11			66	33			
2. I use the internet to access information.	55	33		11		88	11			
3. I use email to contact others.	66	11		11	11	88	11			
4. I use search engines to find information.	55	11		11	22	66	11		11	11
5. My overall proficiency in computers is:	11	44	33	11		66	33			
Aspects of the course I found most useful:										
a. Links to sites for research						22	44	22		
b. Threaded discussion						33	44		11	
c. e-mail to students						11	44	22		
d. e-mail to instructor						33	44		11	
e. Lesson plans						22	55			
f. Announcement/schedule						55	22	11		
Aspects of the course I used the most:										
a. Links to sites for research						66	22			
b. Threaded discussion						22	44	11		11
c. e-mail to students						11	11	55		11
d. e-mail to instructor						11	22	33		22
e. Lesson plans							33	44	11	
f. Announcement/schedule						22	55			11

Table 1: Responses to Selected Items at Pre- and Post-Assessment in Percent

In looking at Questions 1-5 (Tab. 1), most students improved at post-assessment time in their ability to operate a multimedia computer, to access information using the internet, e-mailing others, and in their overall proficiency to use computers. Proficiency in e-mailing and accessing information using the internet increased the most. Interestingly, the above data shows that students did not really improve in how to use search engines; this is because the research links were provided and students were never directly taught how to conduct searches. Perhaps this needs to be covered in the future and should be included as part of course requirements.

In looking at the items that students rated on usefulness and frequency of use, students found the links to research sites, the threaded discussion, e-mail to students, e-mail to the instructor, and the lesson plans to be somewhat useful, while 55% found the announcement/schedule to be very helpful. They used the links to research sites the most (66% responded that they used it a lot), while the e-mailing was not used as much as anticipated. Few students said they e-mailed the instructor frequently. Another surprise was that the students found the announcements/schedule component of the course as valuable and used it quite a bit. To the instructor, this was one aspect that was not seen as a significant part of the course, but as a nice "add-on." Perhaps this means that students need to be encouraged to use e-mail more frequently as a means of communication between students and the instructor.

Students' written comments at post-test time reflect a very positive reaction to the course. What is interesting is that the inexperienced students seemed to find the course the most beneficial. One student who rated her overall proficiency in using the computer as 3 and never knew how to e-mail or use the internet to access information before the course began wrote: "As a result of taking this web course, I learned many new things regarding computers. I learned how to use the internet and find websites, how to e-mail and correspond with others. I am very happy that I now know how to do these things so that I can integrate them into my teaching. Ultimately, this class assisted me in becoming "computer literate." I am no longer confused when using the computer..." Another student wrote, "I really enjoyed my Field Experience II. This course did not compare to any other because of its web access. This is a vital tool both in education and in our personal lives." All the students wrote positive statements of this sort and echoed the student who wrote: "The benefit of using technology in Field II was that I felt more involved in the class since I could go to the webpage and discuss things and look for things on the page."

## Discussion

Using the web to enhance Field Experience II for our preservice teachers has been very beneficial. The pilot of the course has shown that students react very positively to the use of the internet in their educational process. Using the web in this way has benefited the students and the program in many ways. First, it has helped to expand the amount of interactivity required of the students while they are participating in a field placement. By interacting online, a community of learners develops into a support system and students learn how to share important concepts, issues and concerns among each other. Second, a web-enhanced course has helped to shape students' belief systems about what effective instruction can be all about. They are not being taught about technology, but they are using it as a viable tool that is a part of course requirements. Hopefully, they are learning that technology can be used as an integral part of the classroom. Third, it encourages communication among all participants. What this pilot revealed is that some students are reluctant to use e-mail and discussion groups and need to be constantly encouraged and reminded to reach out to other students and to the instructor. Others, use e-mail frequently and effectively, asking for feedback and seeking comments and assurance. Perhaps having students paired together for the semester as e-mail partners would help. Third, this type of course has helped the students become more computer proficient. By using technology within a field placement course instead of learning about it in a computer course, students are forced to improve their skills. The inexperienced and unconfident students benefit a great deal from this experience. Lastly, Both instructor and students seem to enjoy the new challenges and potential this type of course offers to the educational community.

Researchers are now focusing on the benefits of using technology in teacher training. In addition to being incorporated into traditional theory and pedagogy classes, technology can enhance field placements as a powerful means of communication. It allows students to reach across traditional boundaries to communicate freely with other classmates, with their professor, and with teachers. Technology not only becomes a means to model effective instructional strategies, but becomes an integral tool that binds the class together. A new sense of community develops whereby students who do not ordinarily talk to one another in class, find common interests in an on-line community. Inadvertently, literacy skills, communication skills, and computer skills increase as this tool is used. Incorporating technology into field placement classes is a powerful tool for promoting communication and higher level thinking skills in future teachers.

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# Pre-service Music Teacher Attitudes Toward Web-Enhanced Learning in a Methods Class

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**Abstract:** This case study involved subjects (N=12) in a college music education methods class who utilized various web-based tools and resources to complete assignments and carry out other course related matters. Subjects were given a questionnaire at the final class meeting to explore their attitudes toward the web tools and resources used in the class. Overall responses toward the technologies utilized were positive. Subjects with home Internet access (who could therefore access course materials from home) did not indicate that the time they were required to use the computer for the class was excessive, while subjects who couldn't access the Internet from home tended to be of the opinion that too much computer time was necessary ( $p \leq .05$ ). Furthermore, the more Internet experience a subject reported, the less likely they were to state that online learning was impersonal ( $p \leq .05$ ).

## Introduction

School reform is a topic currently receiving a great deal of attention by both those in educational circles and the general populous. The nature of this reform is being fiercely debated, but many people believe technology needs to play a prominent role in any changes that are made (U.S. Department of Education, 1997). In particular, the Internet is being touted as a viable means of delivering instruction (Pierian Spring, 1997). Higher education institutions are expending resources to move courses online, with some projecting that over 800 college degree programs would be Internet accessible by 1998 (Schlumpf, 1998). Commercially, vendors are moving to fill needs in this area by marketing an increasing array of products to expedite online instruction (Gray, 1998).

Studies examining online learning at the collegiate level have begun to be conducted (Roberti and Davis, 1998; Charp, 1998; Deal, 1998; Kubala, 1998). At present, the primary research emphasis has been focused on aspects of distance learning; courses offered in their entirety over the Internet. Interestingly, the same electronic tools being used in these distance learning courses are also beginning to be utilized by instructors of courses taught in more traditional ways. In fact, some researchers indicate a mixture of web-based and traditional types of instruction may be advantageous in some respects (Friedlander & Kerns, 1998). However, the most successful means of utilizing these new technologies has not been thoroughly investigated. One important area to consider with any new teaching-learning paradigm is student attitudes toward the new model.

## Purpose of the Study

The purpose of this study was to determine pre-service music teacher attitudes toward web-enhanced learning in a methods class.

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## Methodology

### Subjects

Subjects were music education majors (N=12) at a major Midwestern university who were enrolled in a music education methods class. Included in the population were six males and six females. The mean age of the subjects was 21.7 years. Four were juniors and eight were seniors

### The Measurement Instruments

The questionnaires were designed by the researcher on the basis of a review of literature and the researcher's previous experience in using web-based technologies with students. Questionnaire #1 solicited dichotomous responses, responses selected from Likert-type scales, and free responses to determine the background of the subjects and their previous Internet and online learning experience. Questionnaire #2 examined subjects' attitudes toward learning via the web-based tools and resources that they utilized in the course. From a Likert-type scale, subject's selected their degree of agreement (1 = strongly disagree to 5 = strongly agree) with each statement given.

### Procedure

The class met daily for 65 minutes in a traditional setting during a five-week summer term. In addition to this, many class assignments and activities took place online using web-based tools and resources. On the first day of the course, following discussion of the syllabus and the completion of Questionnaire #1, the class moved to the School of Music computer lab where students received a hands-on orientation to the course web site and the web-tools to be used in the class. Over the course of the class, subjects were required to regularly use a World Wide Web browser to access a variety of web-based resources. Through these resources they were able to check the course syllabus, complete reading assignments, take quizzes, participate in class discussions via newsgroups, check their grade in an online grade book, do research, explore course-related web sites, and communicate via email. All of the web-based tools/resources could be accessed from anywhere the student had a connection to the Internet. At the final class meeting, the subjects were administered Questionnaire #2.

## Results

During the first class, subjects completed Questionnaire #1 to determine their background and previous experience with web-based learning. The most frequently used computing resource for completing school assignments listed by the subjects was the computer lab located in the School of Music (n=12), followed by other university computer labs (n=9), and personally owned computers (n=8). Six subjects said they were able to connect to the Internet from home. Responding on a Likert-type scale that ranged from 1 (very inexperienced) to 4 (very experienced), subjects indicated they were moderately experienced Internet users (M=2.6) prior to this class. The comfort level of the subjects upon beginning this course when using email, the World Wide Web, and newsgroups was also examined through their responses on a Likert-type scale ranging from 1 (uncomfortable) to 4 (very comfortable). Subjects were quite comfortable using email (M=3.7) and the World Wide Web (M=3.6), but indicated less comfort in using newsgroups (M=1.9). Subjects indicated their use of Internet/web-based tools and resources in previous courses was limited.

At the final class meeting, Questionnaire #2 was administered. Subjects responded on a Likert-type scale which ranged from 1 (strongly disagree) to 5 (strongly agree) to 14 statements related to their attitudes toward the web-based tools and activities used in the class. Descriptive statistics were calculated for the subjects' responses to each of the items on this questionnaire (see Table 1). By inspecting the mean, median, mode, and standard deviation of the responses to each questionnaire item, the items were categorized as (1) statements the subjects agreed with, (2) statements on which the subjects were neutral,

Statement	Mean	Median	Mode	S.D.
The Internet contains valuable resources for music education.	4.7	5	5	0.49
I like being able to access course materials at a time that suits my own schedule and preferences.	4.2	5	5	1.27
I feel more comfortable communicating with my instructor via email than face-to-face.	2.7	3	3	0.78
I feel more comfortable participating in class discussions online via newsgroups than in traditional classroom situations.	2.4	2	2	1.00
Participating in newsgroups as part of class instruction allows me to learn from my classmates.	3.8	4	4	0.94
I like being able to check my current grade online at any time I desire.	4.5	5	5	0.67
I have a greater opportunity to participate and contribute to online discussions than in traditional classroom discussions.	2.8	3	multiple	1.36
Online instruction is impersonal.	3.6	4	4	1.16
I receive better feedback on my class performance through online assignments than through traditional assignments.	3	3	3	1.13
Having course materials and assignments online requires me to spend too much time using the computer.	3.1	3	3	1.44
Using web-based technologies helped me to better understand the content of this course.	3.7	4	4	1.23
I would like to take more courses that use web-based technologies as part of the instructional process.	3.6	4	5	1.44
The online quizzes helped motivate me to complete reading assignments on time.	3.4	4	4	0.97
I would like to take a course that was conducted completely over the Internet.	2.3	2	multiple	1.29

1 = Strongly Disagree  
 2 = Disagree  
 3 = Neutral  
 4 = Agree  
 5 = Strongly Agree

**Table 1: Student Attitudes Toward Using Web-Based Technologies**

and (3) statements the subjects disagreed with. While only the means are listed in the following narrative, the median, mode, and standard deviation were also considered in placing each item in a category.

The subjects had moderate to strong agreement with the following items: "The Internet contains valuable resources for music education" (M=4.7), "I like being able to access course materials at a time that suits my own schedule and preferences" (M=4.2), "Participating in newsgroups as part of class instruction allows me to learn from my classmates" (M=3.8), "I like being able to check my current grade online at any time I desire" (M=4.5), "Online instruction is impersonal" (M=3.6), "Using web-based technologies helped me to better understand the content of this course" (M=3.7), "I would like to take more courses that use web-based technologies as part of the instructional process" (M=3.6), and "The online quizzes helped motivate me to complete reading assignments on time" (M=3.4). Statements which the subjects were neutral toward included: "I feel more comfortable communicating with my instructor via email than face-to-face" (M=2.7), "I have a greater opportunity to participate and contribute to online discussions than in traditional classroom discussions" (M=2.8), "I receive better feedback on my class performance through online assignments than through traditional assignments" (M=3), and "Having course materials and assignments online requires me to spend too much time using the computer" (M=3.1). Subjects tended to disagree with "I feel more comfortable participating in class discussions online via newsgroups than in traditional classroom situations" (M=2.4), and "I would like to take a course that was conducted

To determine if there were any differences in the dependent variables (data from Questionnaire #2) by gender, a *Wald-Wolfowitz runs* test was calculated using the *Statistica Mac* computer program. No significant differences by gender were found. A second *Wald-Wolfowitz runs* test was calculated to see if there were any differences in the dependent variables according to whether or not subjects had access to the Internet via their home computer. One dependent variable, "Having course materials and assignments online requires me to spend too much time using the computer" was significant in this analysis. Subjects (M=3.83) who did not have Internet access from their own personal computer indicated greater agreement with this statement ( $p \leq .05$ ) than subjects (M=2.33) who could access course materials from their own personal computer.

A *Spearman Rank Order Correlation* was calculated between the subjects' self-ratings of experience in using the Internet and each of the dependent variables. Significant relationships were found between Internet experience and two of the 14 variables. A significant ( $p \leq .05$ ) positive correlation ( $R = .60$ ) was determined to exist between amount of experience and "I like being able to check my current grade online at any time I desire." The greater a subject's experience level in using the Internet, the more they agreed that they liked being able to check their grade online. A significant ( $p \leq .05$ ) negative correlation ( $R = -.58$ ) was found between amount of experience and "Online instruction is impersonal." Here, the less their experience in using the Internet, the more subjects' agreed that online instruction is impersonal.

## Discussion

The subjects in this study were positive toward many aspects of the web-based tools and resources used during the course. They strongly agreed that the Internet contained valuable resources for music education. They liked the asynchronous aspects of online learning, valuing being able to access course materials at times that fit their own lifestyle and personal schedule. The asynchronous features of an online education may be a tremendous advantage for students who might be juggling several classes, a job, family, etc. The subjects tended to believe that some of the tools they used in the course helped them to learn more effectively. They cited improved understanding of the course content, that they learned from their classmates via the newsgroups, and that they completed the reading assignments when assigned so that they could take the online quizzes. The actual impact of these items on achievement is an area that deserves further inquiry.

In general, subjects were neutral toward the amount of time they were required to use the computer to complete assignments for this class. However, when this question was viewed from the standpoint of whether or not a student had home Internet access (and hence access to course materials, assignments, etc.), a different perspective was obtained. Subjects who did not have home access indicated significantly ( $p \leq .05$ ) greater agreement with the statement "Having course materials and assignments online requires me to spend too much time using the computer" than did subjects who had home access.

For subjects without home access the convenience and asynchronicity of learning online was at least partially sublimated since they had to arrange their schedules to go to a computer lab, at a time when it was open, to complete class assignments. A person's attitude toward online learning may be effected by how easy it is for them to actually connect to the online environment.

Subjects were also neutral regarding their preference for communicating with their instructor via email or face-to-face. It may be that some aspects of online learning are related to a person's personality type or learning style. In this instance, there may be certain students who would prefer one type of communication, others another type. The population as a whole is neutral on the issue, but a certain type of person might feel much more comfortable in one situation or the other. The relationship of learning styles and personality types to aspects of online learning is an area that needs further research.

It appears that the subjects in this study preferred some aspects of the conventional classroom over the online learning environment. Numerous subjects perceived online instruction as being impersonal. However, it is interesting that there was a significant ( $p \leq .05$ ) negative correlation ( $R = -.58$ ) between this questionnaire item and the amount of Internet experience a subject had. The less Internet experience, the more a subject felt online learning was impersonal. As with any new environment one encounters, persons who have not spent a great deal of time using the Internet may not feel comfortable in this unique atmosphere. This lack of comfort may lead to feelings that the environment is impersonal. It may be that as a person gains experience in the cyber-environment, they begin to learn that it is not necessarily more impersonal than a regular classroom, it is just different with unique alternatives for interaction.

While previous researchers (Kubala, 1998; Kelly & Leckbee, 1998) have found that some students are more comfortable engaging in online discussions than they are in classroom based discussions, the subjects in this study did not indicate they felt this way. This may be another area where learning style or personality type has a relationship to a person's attitudes. It is also interesting to note that the subjects were not anxious to take a course that was conducted entirely over the Internet. It may be that the combination of traditional and web-based instruction works very well, and most people prefer online learning as a supplement to instruction held in a traditional classroom setting.

### Summary/Conclusions

While the design of this study does not allow for broad generalization of the findings, the results do suggest areas for further investigation that may lead to a more comprehensive understanding of learning via web-based technologies. In general, web tools seem to be received positively by students. Their asynchronous nature is one characteristic that seems to be particularly appealing. The degree of Internet accessibility may impact how receptive students are to the use of these tools. In addition, the unique characteristics of an individual's personality type or learning style may have some relationship to their preferences for learning online. This should receive further study. As the body of research in this area grows, trends may begin to appear which will enable instructors to use web-based technologies in the best possible manner. In any case, the education of pre-service teachers need no longer be limited to specific locations or times of day. The emerging online paradigm is an additional tool for teacher educators to utilize to prepare future teachers for the challenges they will face in school classrooms.

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# What is Happening in the Virtual Classroom?

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**Abstract:** This paper discusses the dramatic differences of students' constructive sociocultural interaction between online courses and traditional face-to-face courses. The author of this paper taught a course called *Educational Foundations* several times in a traditional face-to-face situation as well as several times online. The course is the first course in the teaching credential program and covers primarily different educational philosophies. The instructor used the same books, the same assignments, the same lectures, the same visuals, etc. This paper compares the synchronous face-to-face discussions in the traditional classroom to the asynchronous communication in the virtual classroom.

## Introduction

The integration of technology for educational purposes provides teacher education institutions with powerful tools not only for the delivery of courses to geographically distant students but also for enhancing classroom learning. Online education should not be understood as the downloading of information followed by the passive and solitary activity of staring at a computer screen. Instead, online education advances the pedagogical principles of constructive learning through providing opportunities for constructive sociocultural interaction: Bazillion and Brown (1998) described these opportunities in greater detail: (a) students actively construct knowledge by exploring web sites, experimenting with search engines or new ways of seeking information, manipulating things, and engaging in discussion; (b) students explore other learning styles and find out what works best for their cognitive abilities; (c) students work not only with the teacher but also among themselves which leads to additional learning; (d) students improve their critical thinking skills by examining ideas found on the World Wide Web and using the entire class time for critical analysis of a topic rather than information delivery; (e) students gain better understanding of a topic by searching for more web sites and exploring different perspectives of a subject; and (f) students learn how to learn. This paper looks in particular at the opportunities of constructive socio-cultural interaction.

## The Background

The author of this paper teaches a course called *Educational Foundations* for the Department of Teacher Education at National University in California. National University offers graduate courses in an intense one-month format. The student population consists of working adults. Most of the students are currently teaching on an emergency permit in California's public schools. The emphasis in the course *Educational Foundations* is on diverse goals and philosophies of education. The author of this paper had taught this particular course several times in the traditional face-to-face situation before she developed and taught the course in the virtual environment. For accreditation purposes, the course content, the reading requirements, the assignments, the visuals, etc. were kept the same. The excerpts below are taken from a lesson on various educational goals. The instructor presented students with the following five goals of education:

1. To develop students' ability to think clearly, to use intellectual reasoning, to solve problems, and to make rational decisions.

2. To nurture the individual child's unique potential, to allow full development of his/her creativity and sensitivity, and to encourage personal integrity, love of learning, and self-fulfillment.
3. To diagnose the learner's needs and abilities, to design instructional strategies which develop skills and competencies, and to produce trained people who are able to function efficiently in our ever changing complex technological society.
4. To transmit to young people the basic knowledge, skills, traditions, academic concepts, and values necessary to interpret, participate in, and further the heritage and traditions of our country.
5. To create a future world condition of peace, harmony, equality, and love; and to foster a new society with humans who can live together in balance with their environment and with each other.

The excerpts below present the initial discussions after introducing the five goals of education. The author of this paper chose these particular excerpts because they are representative of most conversations throughout the courses.

### **The Virtual Classroom**

The most dramatic differences between online courses and traditional courses is how students participate in discussion with their professors and peers if there is no face-to-face meeting. Online communication tools develop and improve almost daily; for example, text-based environments are evolving into graphical and even multimedia environments. In the present day, the most common tool that is used for online collaboration is asynchronous communication.

In April 1999, 20 students had enrolled in the online course. The five different goals of education were presented on the course web-page. The following will show an excerpt from the asynchronous discussion in the online classroom.

Assignment posted by Instructor: "I would like you to think about the goals of education. Try to rank the above mentioned five goals in the order of importance to you."

Posting 1; Student A responds to the instructor's initial posting: "All of these are so important that it's hard to rank them! What about teaching a child self-worth?"

Posting 2; Student B responds to posting 1: "I agree, I think our job as educators is to raise a community of well rounded, good people. I want to teach my kids good moral lessons! If I can be a good role model to the kids I teach and they learn from this I have done more than simply teach them book work."

Posting 3; Student C responds to posting 1: "This is where Character Education comes into play. Everyday, we as teachers can be examples by being Responsible, Respectful, Caring, Fair, Being a Good Citizen, and Portraying Trustworthiness. These traits are so important and children need role models they can emulate these from."

Posting 4; Student A responds to posting 3: "Don't forget ... we may be the best role models some of these kids have!"

[Posting 5 through 12 started a new discussion about a different goal of education.]

Posting 13: Instructor responds to posting 3: "What is a good citizen? Different people have very different ideas about what a good citizen should do. Your culture defines your idea of a good citizen. Whose definition of a 'good citizen' should we strive for?"

Posting 14: Student C responds to posting 13: "Yes, different cultures may interpret citizenship differently, but I believe it all goes back to the Golden Rule. Do you like to be treated with kindness? Most people do. Wouldn't it be great if everyone lived by the Golden Rule? The crime rates would plummet."

Posting 15; Student D responds to posting 13: "Is this assuming that the entire world would play by our rules somewhat ethnocentric?"

Posting 15; Student E responds to posting 14: "The Golden Rule to me is to be kind to all people and respectful to others and elders."

[Posting 16 through 25 started a new discussion about a different goal of education.]

Posting 26; Student F responds to posting 1: "Just wanted to share this with you all. I found it in 'Better Teaching: Tips & Techniques to Improve Student Learning'. It is published by the Teacher Institute. Values are the principles and ideas that people believe strongly in and that guide their behaviors. They deal with moral, political and social preferences-honesty, justice and equal opportunity. And they provide rational procedures to follow-like tolerance, reasoned argument and respect for critical inquiry. All values - or the lack thereof - affect what children do in and out of the classroom. The more clearly students understand the basic core values that exist in your classroom, the more orderly and civil your classroom will be. To help students better understand values, read them the values the defined a 'Good American' in 1926: 1. Control themselves. 2. Train to gain and keep good health. 3. Are kind. 4. Play fair. 5. Are self-reliant. 6. Do their duty. 7. Are reliable. 8. Are true. Do the right thing in the right way. 10. Work in friendly cooperation with fellow workers. 11. Are loyal. Ask students if these values are at work in their classroom and their lives today? Have them give examples. What do they think is missing? Should anything be changed?"

Posting 27; Student G responds to posting 26: "Thanks for the tips."

### **The Traditional Classroom**

In July 1999, 19 students had enrolled in the traditional, face-to-face, on-campus course. The instructor had distributed a handout with the five goals of education two days earlier but handed out additional copies for the students who forgot to bring them to class. The conversation went as follows:

Instructor: "Your homework was to read over the five goals of education and to rank them in the order of importance to you. Which goals did you choose as the most important?"

Student A: "I picked goal 1. I think it is very very true."

Student B: "I picked goal 1 too because it is a life-skill; necessary for everything."

Student C: "I think everybody should have the ability to think."

Instructor: "But why? You have to explain why you think a certain goal of education is important. Otherwise you could also say it is important for children to be able to jump on one leg around the block."

Student D: "I did not pick goal 1 as the most important because you do not need it to be functional in society; you do not need it to go down to McDonald."

Student E: "I think morals are more important."

Student F: "I picked goal 1. It is more important to make rational decisions rather than emotional decisions. Students need to be able to analyze a problem and make a favorable decision."

Student G: "I chose goal 2. I chose that because I believe that students are away from home so many hours of the day that they need support; I mean nurturing, not necessarily mothering. I believe that children have come to school to learn and actually, that is our job. I say that because when we run into a child that is having problems learning we have to backtrack and do different things to reach that child. I believe all children are different. Yes, we can point them into groups, so many of this type and so many of that. They come with different strengths and weaknesses, different concerns and I think we need to be aware of that. For example, yesterday one of the kids came to school crying and when I sent the child to the principal, she was upset; the principal said that I have to nurture the child even though the child was crying about something completely different."

Instructor interrupted G who was in the process of telling more stories from her day at school: "Thank you G. So it is most important for you to nurture the child. Let's hear what other students think."

### **Comparison between Online and Face-to-Face Communication**

Today we are concerned if and how meaningful interaction between a teacher and students as well as among students can take place online. Fundamental to every computer mediated communication system is the concept of utilizing technology to simulate the human communication process. The above excerpts show that the students in the online course embark more on a conversation with each other than in the traditional classroom where students only respond to the instructor's questions but not to each others' comments. Furthermore, there were a total of 48 postings from 17 different students (7 postings from the instructor) whereas in the traditional classroom only 8 students participated in the discussion.

The students in the virtual classroom engaged in a discussion by supporting their postings. One student (see posting 26) even provided materials for further discussion which was appreciated by the classmates. In the traditional classroom, however, most students made a brief statement without any explanation of their thoughts. As student G showed, students in the traditional classroom tend to stray into issues that do not directly relate to the topic.

## Conclusion

In the traditional classroom, some students process the presented information immediately and respond with interesting and valuable comments; other students might have interesting comments but not right away; and some students talk all the time without having anything to say. Asynchronous conversation allows every single student to participate in the class discussion without being forced to an immediate response, without being interrupted by another student, or being cut off by the sound of the school bell. Students have time to think before responding to their class members' opinions and they do not have to wait for the next class to express their views, yet they can participate in the communication when they are in "top form" rather than during a preset class hour that follows a long day of work or a long night at the campus party. Since the discussions are text-based, students can easily save entire conversations and access them at a later time.

But as appealing as asynchronous communication might sound, potential problems need to be known in order to counteract them before they turn into real problems, such as students getting off the topic or insulting their classmates. Thus, the rules for asynchronous communication need to be clear to all participants, just like rules in the traditional classroom need to be clear to the students. Most importantly, the communication needs to be very organized and structured in an effort to keep the conversations related to the topic. Nevertheless, the lack of body language and/or gestures can easily lead to misinterpretations of typed messages. Attempts to express body language, mood, gestures by using so-called emoticons have doubtful success.

In conclusion, the initial experiences with online teaching and learning show that the virtual classroom can be a means of advancing the pedagogical principles of constructive sociocultural interaction.

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## Online Communication Modes – What's the difference?

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**Abstract.** Distance education is expanding the higher education classroom, sending it outside the walls of the universities, and even into students' homes. Online communication may be the key to providing interactive opportunities in these classes to foster the formation of learning communities. The challenge, then, is to develop activities that will promote learning while fostering the social interaction that is so much a part of traditional classrooms. Are certain communications modes more appropriate for certain delivery methods (classroom, online, video)? Is there ever a time when off-task behavior would be appropriate? These are issues facing the instructors who are preparing the teachers of today and tomorrow.

The university experience has changed dramatically since most of us attended our alma maters. Halpern (1994) describes "the 'old' style of classrooms where students sit quietly, passively receiving the words of wisdom being professed by the lone instructor standing in front of the class" (p. 11). This traditional view is what many of us remember as the norm. She goes on to present "a vision of a not-so-distant future in which the lone lecturing professor is accompanied by a host of educational technologies, global information, images, and sound that require active student participation in their own learning" (p. 190). This future has now arrived, and higher education is taking on a new look, as these new technologies have expanded the classroom concept, and distance education via interactive video or the Internet is enabling people to 'attend' classes in remote learning centers or even in their homes.

Central to the learning experience is communication. Today, with the advent and popularity of the Internet, online communication is expanding rapidly. E-mail has become as common, if not more so, than phone calls and letters, at home, school, and work. Conferencing systems utilizing both synchronous and asynchronous communication are proliferating, especially for work and school environments.

Although the type and direction may vary, communication is a necessity in the transmission and acquisition of knowledge. In Halpern's 'old' style of classrooms, it was primarily a one-way activity, as the instructor lectured to the students. However, communication in educational environments has expanded to include a variety of different types of interactions, methods, and technologies. Anderson and Garrison (1998) describe six distinct interactions, and some technologies that are used to support them. These interactions include learner-teacher, learner-learner, teacher-teacher, learner-content, and content-content. Anderson and Garrison conclude,

Higher education is being transformed by new developments and applications of learning technologies both on and off campus. We believe that the use of interaction between and among learners, teachers, and

content promises to increase opportunities for, and experience of, deep and meaningful learning. (p. 110).

A question arises, then, as to which communication modes are appropriate in which settings and for what purposes – and how does this relate to teacher education?

### **Teacher Education**

Teacher education has been changing. With the advent of new technologies for instructional delivery, university courses are now offered in a variety of formats. However, despite the format, these are still university classes and as such have certain characteristics—and one of these is the need for communication. Although communication is a key element in all classes, the amount, type, and goals of the specific communication activities differ within the various course delivery methods.

Basic questions that might be asked about these activities within each delivery method include the following: How do students and instructors communicate as they strive to address course objectives and assignments, and about what are they communicating—specifically, how much of this communication consists of on-task behavior, and how much is off-task? In traditional face-to-face classes, communication will be both oral and written, and the physical presence of the instructor may promote on-task communications in both modes. However, in online classes, which by definition lack this face-to-face component, the instructor and students must rely on the written word, and these communications will include both on-task and off-task behaviors.

### **Communication Modes**

A variety of communication modes, both synchronous (real-time) and asynchronous (time independent) are currently being used in educational settings. They include, among others, e-mail, mailing lists (sometimes referred to as listserv, which is the name of a popular program for this purpose), and computer conferencing through either postings (asynchronously) or chat (synchronous). Each has its specific characteristics that may influence when and where it might be used as an effective medium for learning. So which of these communications technologies should be used in which classes and for what purposes?

### **E-mail**

The most well-known and often used of these is electronic mail. E-mail may be sent one-to-one or one-to many. An instructor may contact individual students, or send out assignments or other information to groups of students. Students may write back to the instructor, or may communicate with fellow classmates to work on assignments or for more social purposes. Gackenbach (1998) describes some characteristics and advantages of e-mail::

The major appeal of e-mail is its asynchronicity and rapid transmission across great distances, making it an effective substitute for both FtF meetings and more traditional "snail Mail." E-mail participants do not need to be near each other to communicate: Messages can be left anytime, sent from any location. Moreover, messages are received almost instantaneously, yet they can be read at the convenience of the receiver. The *different time—different place* aspect of e-mail combined with rapid transmission overcomes scheduling problems, particularly when the members of teams work in different locations, schedules, or time zones.... (p. 202-203)

Additional advantages of e-mail include its ease of use, and the fact that it sometimes seems as if everyone has an e-mail address. These issues could also be part of a problem. Sproull and Kiesler (1991) discuss how

two characteristics of computer-based communication – plain text and perceived ephemerality of messages – make it relatively easy for a person to forget or ignore his or her audience and how reduced social awareness leads to messages characterized by ignoring social boundaries, self-revelation, and blunt remarks. (p. 39)

### **Mailing Lists (Listserv)**

Closely related to e-mail, mailing lists provide an easy way to send a message from one to many. Ideally suited for online classes, mailing lists provide a forum through which the instructor can reach all students quickly and efficiently. Of course, students must have e-mail accounts and must check their accounts on a regular basis for this to be an effective mode of communication in online (and other) classes.

Although it is possible through the use of address books to set up lists of people to be reached by e-mail, some advantages of mailing lists will be missing. One of these is ease of use – Mail can be sent to one address, and from there, it will be distributed to everyone who subscribes to that list. These lists can be configured so that a reply will go to everyone on the list, or so that the reply will go only to the original sender. This *configurability* provides instructors with flexibility—the option to customize the list for maximum benefit for the class. (A variety of other custom options are also available.) Of even greater significance is the fact that all communications sent out on the list may be archived and retrieved at a later date. Retrieving these messages may provide instructors with information that will assist them in future course preparation, or in assessment of the current class. Students may also be able, if the instructor so configures the list, to search the archives and to retrieve prior messages

### **Computer Conferencing**

Computer conferencing may actually include either one or two modes of communication. The first is posting, an asynchronous activity where messages are placed in

a conference and remain there to be viewed by participants in a time-independent manner. This can provide a focused way to carry on a discussion in which all students are able to share their thoughts, and may return to read these whenever they wish. This time-independent, place-independent characteristic of makes posting ideal for use with online classes, as well as to enhance classroom-based classes.

The second is chat, a synchronous activity where participants engage in real-time discussions by typing responses that are immediately viewable by the other persons involved in that chat. This information will be available only to the chat participants, and only during that chat session. Some chat programs allow the retrieval of chat logs, which may of great benefit to instructors who wish to review what was said and by whom. This facilitates instructors assigning students to have focused chat sessions with each other, where the instructor is not present but can review the discussion later. This may help make the students more independent, and may also encourage them to stay on-task if they know that their discussions will be read by the instructor.

The specific method (asynchronous or synchronous) of computer conferencing to be used should be determined based on the instructor, the students, and the specific objectives of the activity and the class. Students who are slow typists, have slow modems, or language problems may find chat difficult, but may excel with postings where they are able to take their time to think, compose, and type. Mason and Kay (1990) describe advantages of computer conferencing:

Computer conferencing vastly increases the opportunities for turns at expressing one's ideas and for receiving more feedback on them from a wider variety of people, and in a format that is easily retrievable (unlike audio conferencing). ... Thus, by enhancing the potential for interactivity, CMC allows students to personalize and control their learning activities and environment far more easily than with traditional methods. (p.19)

Palloff and Pratt (1999) suggest that in asynchronous mode, "postings can occur at the convenience of the participants, allowing them time to read, process, and respond" (p.48), whereas in synchronous mode, chat "rarely allows for productive discussion or participation and frequently disintegrates into simple one-line contributions of minimal depth" (p.47). They go on to mention that to be successful, synchronous (chat) groups should be small, while asynchronous (postings) groups can be larger.

Online courses may benefit greatly from the use of computer conferencing, in synchronous and/or asynchronous modes. This may contribute to the development of a sense of community within the class. In 1990, when computer conferencing was in its infancy, Linda Harasim (1990) suggested,

Most computer conferencing systems are based upon asynchronous (that is, not real-time) communication. ... Users can thus participate at a time and at a pace convenient to them and appropriate to the application. This attribute impacts group dynamics and the learning process. (46).

Today, this last statement may also apply to synchronous communications when they are managed appropriately for the specific group with which they are being used.

### **Online Learning Environments**

Hiltz (1994) suggests that “the most basic premise from which all online teaching should begin is that the goal is to build a learning community and to facilitate the exchange of ideas, information, and feelings among the members of the community” (p.101). Online communications may promote this sense of community in an online course, where members do not meet face to face. Harasim states that “computer conferencing is essentially a many-to-many communication tool that structures information exchange and group interactions” (p.43). For this to be an effective tool, though, it is important to remember Palloff and Pratt’s (1999) statement: “An important element of community, whether it is face to face or in the electronic realm, is the development of shared goals” (p.110). Care must be taken to develop assignments and activities that will promote this sense of shared goals.

With the various types of online communication, which will contribute to the fostering of Hiltz’s (1994) learning community? Which will provide our students, ranging from preservice teachers to the 20-year veterans who are returning to update their skills and knowledge, with experiences that will promote networking with other educators, as well as providing possibilities for continuing professional development online?

As mentioned above, online courses may utilize various modes of communication including, among others, private e-mail, class or discussion e-mail lists, conference or bulletin-board postings, and chat. The purpose, tone, and content of these vary, depending on the instructor, objectives, students, and communication mode. With the variety of modes available, instructors must choose which to use, either alone or in conjunction with others, when teaching online. Each has specific characteristics which may make it more appropriate for various types of course-related activities.

### **Task Orientation**

A major concern is whether the chosen communication mode(s) will provide students with the appropriate experiences to promote their learning in the discipline under study. Although discussing only one mode of communication, Hiltz (1994) might have been referring to communications activities in general when she said, “A necessary (but not sufficient) characteristic of a successful conference is that students are motivated to participate actively, to think about the material, and to respond to one another” (p. 36). These are the keys to successful learning communities—promoting active participation and interaction. As in the Palloff and Pratt (1999) quote above, engaging students in activities where they have shared goals is essential to developing community, and in an educational setting, these shared goals will revolve around the course curriculum and learning. A possible concern may be the content of the student communications. How many times have we seen class e-mail that has addressed the assigned topic superficially or not at all? How often do people use e-mail to exchange information about out-of-class activities and issues?

In class-related online communication, how much time is actually spent on-task? What is on-task behavior, and is off-task behavior ever appropriate?

These questions are being explored in a study of e-mail, chat, and conference postings of graduate students in a variety of online courses, some about the Internet, and some using the Internet merely as a vehicle (the classroom), as well as some classroom-based and interactive video classes.. Preliminary findings suggest that while there are some basic behaviors across the communication modes, there are differences in the appropriateness of task-oriented behavior based on the course delivery mode. For example, an analysis of communications from four online classes has revealed that e-mail messages have more off-task information, while conference postings stay totally on-task. This may be partly because e-mail has a short life, going to an individual or group of individuals, and then being trashed. Conference postings, on the other hand, are semi-permanent, and may be read throughout the course. Since each conference has a specific assigned topic, students are able to see what their classmates have posted, and realize that their postings may be read and compared with the others. Chat sessions appear to combine the two approaches—containing both on-task and off-task comments, as students use this arena to emulate face-to-face discussions, beginning with small-talk and proceeding to the topic at hand.

The appropriateness of on-task and off-task behavior may vary based on the type of delivery system that is being used. For example, in a face-to-face setting, where students and instructor see and talk to each other on a regular basis, online communication activities may be more focused, with fewer off-task comments. However, in an online class where online communication is the only method of interaction, students may engage in non-class comments and conversations as a substitute for the small-talk that takes place face-to-face .

### **Student Reflections**

In each of the online classes included in the research study mentioned above, students have submitted weekly reflections over their activities and related issues. These reveal that the various communications are effectively contributing to the over-all learning, and helping students gain perspectives from and respect for their classmates. In a rather extensive comment, a graduate student stated,

The chat makes it possible to share ideas and exchange information in a way that can be reviewed later by reading chat logs. This review can provide interesting information and feedback about a person's response and my responses to them. This interchange helps to mold or shape opinion and make me more open minded to other's opinions. I think knowing there is someone on the other end makes me more sensitive to "listen" and respond thoughtfully compared to reading a book or even responding to an email. Though a person will read the email, it is not the same as chatting, where you actually get to read a person's immediate response. I suppose there is some added human touch to chatting, with more emotional connection knowing they are actually reading what you are writing in real time.

Another student found that e-mail provided a viable alternative. She said,

I really feel that our group has been hindered a little by our inability to manage to chat. The storm the other night didn't help matters. But I have really come to value email as a good alternative to chatting. In some aspects, it has been better, in that it has allowed more time for thinking and reflecting as I compose the email. Whereas the chat demands immediate response. My favorite is the chat, mainly because of the bonding of the group together.

Yet another student indicated that her work group used a variety of communications as they were completing their project. She said, "My partner & I have accomplished quite a bit via e-mail and last week's chats, as well as via the telephone."

New procedures for chatting were inaugurated about three weeks into the semester. These required students to read the material and then post comments related to that reading in the conference before the scheduled chat session. Then, before the chat, they were to go back and read what their chatmates had posted. Writing about this procedure, one student said,

Chatting gives us time practicing the technology and exchanging ideas that help us develop a better understanding of the topics we cover. I think posting to the webboard before chatting is important. We can save time before the chat by knowing what has been said by each "chatter", and it requires that students make sure and cover the material before the chat instead of going in cold and trying to "wing it" through the chat.

Many students mentioned the benefits of this approach. In fact, I had some write me about specific people who had not been following the post-read-chat procedure, describing how this interfered with the group's discussion. These comments indicated that when students are involved in on-task discussions, they resent person's who are not prepared because those students interfere with the free exchange of ideas and information. One student sent the following:

The chat tonight which was supposed to be 3 ended up with 8. I really hate that some of my classmates just show up at chats instead of signing up with someone. I think it has happened to me every week. I get flustered because I re-read the postings of my fellow chatters right before the chat to refresh my memory. Also, we end up with too many chatters to be successful. :>(

The chat did go well, however. We broke into 2 groups. My group was communicating quite well and I learned some different view points on the change process.

After receiving this message, I sent out a reminder about the post-read-chat procedure, and the situation seemed to improve.

The postings and chat sessions fostered a sense of respect for the professionalism and knowledge of the students, as they learned that their classmates had various areas of expertise and interest.. A student reflected,

I enjoyed chatting with Jessica and Samantha... They are on the ball and are very intelligent about the chat topic! What a joy it is to be able to be a part of a chat group with them! I have really learned a lot from the topic chats this semester. I went into this class feeling like an outsider and everyone has been too kind and informative. The chats are really a highlight of my week. I also enjoy reading all of the postings to the board.

Another student reported,

The chat this evening was fun, as usual. I enjoyed talking with Rachel, especially. It was nice getting to know her. She will be sending you the chat synopsis. The different positions we hold and the varied levels of experience with technology make the chats interesting. There's almost always something to learn. We each had browsed something different within the TENET web site, which was our chosen topic of the evening. The chat made me want to investigate even more of the sites that I had "missed".

As the instructor, I always look forward to reading these weekly reflections, as I can share in the students' joys and triumphs, but also monitor and adjust as needed if there are difficulties. The key is to provide students with the opportunity to communicate with all class members (myself included) as they build and participate in our online community of learners, and as they develop professional networking skills and contacts so that they will feel part of the global world of educators.

### **Final Thoughts**

To maximize the teaching and learning environment, a class should evolve into a community of learners. For this to occur, there must be interaction not only between the instructor and students, but also between the students themselves. For this interaction to occur, communication is a necessity. Communications activities in online classes may include delivery of information, exchange of ideas, and submission of assignments—using one or more of the above (or other) communications modes. While many of these activities will be on-task, some will, appropriately, be off-task, for it is only through communication that a community of learners will be developed.

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# Connect-ME: Building and Sustaining A Local, On-Line Professional Learning Community for Elementary Mathematics Educators

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**Abstract:** This paper discusses a World Wide Web site (Connect-ME: <http://hydra.educ.queensu.ca/CM/>) that is being piloted for preservice and beginning elementary mathematics teachers. It describes the year-long development of the electronic learning community and its impact on beginning teachers' beliefs and practices. The paper will focus on (a) investigating the efficacy of locally-developed and locally-managed, distributed, distance-learning communities in sustaining significant change to beginning teachers' practice and (b) assessing the impact of emerging internet technologies on beginning teachers' commitment to the basic tenets of mathematics reform. We will report on a scaleable and economically viable model for creating and sustaining a community of teachers, on the factors which facilitated its inception and the tools and resources which have maintained and enriched it.

## Introduction

Research on mathematics teachers' efforts to modify instructional practices to meet current content recommendations, pedagogical principles and student achievement standards has grown over the last decade. Extensive scholarly study of teacher transformation underscores the importance of an empirical knowledge-base in implementing and maintaining curricular innovations and serves to clarify both the questions to be asked and the constructs that can be confidently employed. It has also firmly established the reliability and validity of specific analytic constructs (e.g., participation patterns as indicators of teacher learning). Still, gaps exist and critical questions remain: What social and organizational structures contribute to the professional growth of teachers? Can an electronic forum provide the context in which teachers begin to understand their practices, professional growth and development? What forms of support sustain changes to beliefs and practice? Clearly, only long-term and longitudinal research can answer these questions. We report on the early findings of a study designed to address these issues, seeking to yield both theoretical insight and practical application.

The framework for our study is rooted in a sociocultural view of learning, where teacher learning is conceptualized as a process of 'transformation of participation' in the activities of a community (Rogoff, 1994). We examine a group of beginning teachers who belong to a community in which they (a) exercise collective control over key decisions; (b) share a sense of purpose; and, (c) voluntarily elect to participate in and contribute to specific activities to sustain reform to their realigned mathematical disposition and beliefs, and instructional practices.

The work is shaped by three components: a comprehensive theory of internet-supported learning activities, specific theories of electronic communities and their development, and a commitment to linking theory and practice by providing bases for more scalable models of teacher professional development. The first of these comes from the work of many researchers including Shotsberger (1999) and Lieberman (1996); the second, from work in the first year of this project (Colgan, Higginson and Sinclair, 1999); and the last, from our ongoing work in changes to teacher beliefs and attitudes, and professional development and its relationship to pre-service education (Higginson and Colgan, 1999).

The objectives of the study are to: (a) investigate the efficacy of locally-developed and locally-managed internet communities in sustaining change to beginning teachers' beliefs and practice; (b) construct and test models of scalable collaborative electronic environments; (c) assess the impact of emerging internet tools on beginning teachers' commitment to the basic tenets of mathematics reform; and, (d) refine and test structures that are engendered by the learning community in response to their opportunity to learn about mathematics teaching and learning. The intent of the research is to provide a means to begin to integrate several disparate areas of the research literature.

We believe that our research will contribute to the advancement of knowledge by (a) modelling how on-line communities built on theoretical foundations can be constructed and managed; (b) providing detailed descriptions of developmental complexities; and (c) documenting the interdependence of professional learning and community with teacher practice and beliefs. We believe that the research has potential for considerable benefit in that it will clarify how a community-of-practice framework can be used analytically to examine teacher learning and evaluate the effectiveness of theory-based models which measure teacher learning by transformation from peripheral to full participation in a community. The study will investigate the design/developmental factors contributing to the effectiveness of internet technology as a vehicle for legitimate participation in a professional community-of-practice, extending a research initiative that has been ongoing for 18 months and will contribute to an overall research program focussing on professional development, and teachers and transitions in their knowledge, beliefs and pedagogy. Overall research goals remain the same, to model the active, continuous process of teacher reflection and instructional change and growth, to determine the nature of events and opportunities that can stimulate cognitive reorganization, and to design effective theory-based environments through which teachers can simultaneously be supported and challenged.

## Background

Based on feedback from the Elementary Curriculum courses offered as part of the Bachelor of Education program at Queen's University, it became apparent that there was a need for specific programs to assist mathematics-anxious students to develop the necessary confidence and positive mathematical disposition required to be teachers in contemporary classrooms. A survey of 137 teacher candidates revealed that despite the fact that these individuals were, arguably, among the most able members of their national peer group, there was widespread unease and dissatisfaction about their earlier encounters with mathematics. Early analysis of the data collected prior to the formal study suggested that they viewed mathematics from a purely utilitarian perspective. They were unanimous in stating that the changes to the elementary mathematics curriculum made them feel extremely inadequate and lacking in confidence with respect to content knowledge. This added stress, they reported, since they believed that mathematics is important because it opens doors to the future for students with respect to technology and employment. About 25% of the teacher candidates replied that their last official mathematics course was in the second year of secondary school, a total of six or seven years ago. At least three-quarters said that mathematics was not their favourite subject, and of this group, half reported that their school experiences in mathematics had been extremely negative.

Beginning in November 1998, a community of 60 of these elementary teacher candidates enrolled in a voluntary extended enrichment program called *The Joy of X* (See Figure 1). The program was predicated on two assumptions, namely, that: (i) rich, carefully-chosen, professional development experiences could strongly impact the mathematical knowledge and disposition of beginning teachers; and, (ii) by modelling 'reform' practices through narratives and resources from exemplary classroom scenarios, the pedagogic repertoires of beginning teachers could be significantly expanded. The participants attended a series of twelve participatory workshops, ranging in focus from origami to music. At the workshops, the teacher candidates worked collaboratively, posing problems, formulating conjectures, and discussing the validity of various solutions while being guided and scaffolded by mathematics enthusiasts who framed appropriate contexts, facilitated discussion of the important emergent mathematical ideas and steered them towards conceptual connections. The goal of the program was both to provide students with an opportunity to build a positive emotional relationship with mathematics and to help them to broaden their often very limited perception of the discipline. More than 80% of the participants agreed that the assumptions were good ones and that the series had accomplished its goals.

Now that they have graduated, the 60 beginning teachers represent a geographically widespread community. Some have assumed teaching positions in Boston, MA and London, England, others in Mexico and Columbia, one in Arctic Quebec, and many throughout southern Ontario. Through *The Joy of X* sessions the teacher candidates have become a community. They have expressed their commitment to strengthen and forge on-going bonds within an electronic community called, *Connect-ME*, which was developed in response to the preliminary data that they themselves provided.

We collected data from two sources. The first data set is from an extensive open-ended questionnaire completed by the community of 60 teachers described above. The second source is in-depth, hour-long focussed

interviews which were conducted with both groups of 6-7 ( $n = 4$ ) and with single participants ( $n = 8$ ). The responses indicated that although all the teachers were regular email users, their experience with the internet varied greatly. There was an approximate 50-50 split between regular/irregular internet users. They most often used the internet to find activities and lesson plans and reported being very disappointed in both the organization and quality of on-line materials. This phenomenon is substantiated by other research (Lieberman & McLaughlin, 1995). The teacher candidates ranked lesson plans and activities as their highest priority, followed closely by assessment resources, curriculum integration supports and on-line help opportunities.



Figure 1. *The Joy of X* was a 12-seminar series designed for elementary mathematics pre-service educators enrolled in the 1998/99 B.Ed program at Queen's University, Kingston, Canada. Beginning at the top left, and moving clockwise, we see the teacher candidates involved in origami, an investigation of Fibonacci numbers, origami-supported algebra and graph theory investigations.

In response to our participants' data, *Connect-ME* (<http://hydra.educ.queensu.ca/CM/>) was designed and constructed (See Figure 2). In order to address teachers' concerns about quality and applicability, each resource on *Connect-ME* was annotated, following the current practice at the most comprehensive and successful American-based on-line community for math educators, the 'Math Forum' at <http://forum.swarthmore.edu/>. The *Connect-ME* teachers articulated the need for discussion with experts, as well as peers, in areas such as curriculum changes, technology integration, curriculum integration, and special needs. Direct and immediate access to advice and assistance is ranked by teachers as the most helpful feature in becoming more effective (Merseth, 1992). We have thus decided to assign discussion leaders and moderators for each one of these areas, drawing on the expertise of both teachers and academics in Ontario, all of whom became part of the community through *The Joy of X* workshops. Finally, the teachers were most interested in sharing the lesson plans and activities that they themselves had created over the course of their pre-service year.

There are six areas within *Connect-ME*: (1) *Xcite* (links to exemplary resources on the internet, lesson plans created by *Connect-ME* teachers and print resources); (2) *Xchange* (forum for discussing mathematics education issues

with experts from Canadian schools and universities); (3) *XOS Line* (an archived help/advice line with a library of frequently asked questions); (4) *Xtra* (news, updates, information about professional development); (5) *Xplore* (a collection of open problems that *Connect-ME* teachers pose, post and work on); and, (6) *The Joy of X* (a collection of photographs, papers and rich resource materials).

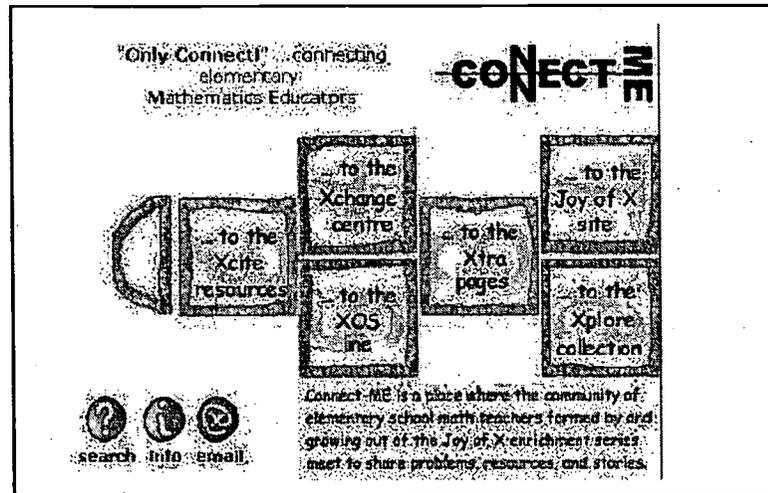


Figure 1. The *Connect-ME* website's opening screen. *Connect-ME* is an electronic professional development community designed for and by elementary Mathematics Educators from Queen's University.

## The Study

Our study has grown from *The Joy of X* sessions. Other studies have documented the isolation new teachers feel, (Lappan & Theule-Lubienski, 1994) and noted that "the hard work of moving pre-service teachers to reconsider their beliefs and expectations about mathematics teaching and learning can be undone in a flash by "a beginning job experience in a school whose culture promotes order in the classroom, teaching as telling and standardized test results as a measure of teacher success," (Lappan & Theule-Lubienski, p.251). In an attempt to reduce their feelings of isolation and sustain their practice, our pilot project is an attempt to learn how to develop a self-sustaining forum for collegiality, given the knowledge that time and long-term support are critical aspects of change (Lappan & Theule-Lubienski). We have taken major steps to ensure that the community already existed before the transition to cyberspace, and that there is a sense of ownership among the members, e.g., our community members have contributed not only to the design of the *Connect-ME* site but have also contributed to the content of curriculum resources.

Since August 1999, our beginning teachers have had access to Connect-ME. Preliminary data has been collected by tracking and analyzing the transcripts of participants' on-line histories. In addition to documenting the number of log-ins, the context and content of the teachers' on-line histories have been analyzed (i) to determine the extent to which the use of this tool promotes mathematics education growth and inquiry; and (ii) to articulate some possible interventions that would help to achieve this result. Our field notes continue to be summarized on a grid with categories for: software interactions, exploratory behaviour, pedagogical development, computer comfort and confidence, teacher-teacher interactions, teacher-expert interactions, student learning outcomes and affective outcomes. The grid and coding system will be adapted and/or expanded as data is acquired in order to ensure that objective attention is given to as many aspects of the phenomenon as possible. These data will be supplemented by journals, responses to questionnaires and participation in both informal and formal interviews. Simple quantitative analysis will be done to determine total lines of text generated by each participant, amount of participation, total sums of questions, statements, as well as number of directed responses sent and received. In addition, patterns of participation will be mapped/graphed and correlated to the contexts of interactions.

Since its launch, we have 'seeded' the *Connect-ME* site and made explicit efforts to maintain the sense of community among our members. We wanted to engage our teachers in professional activities that are not frequent in their daily lives in order to provide learning opportunities that have the potential to enhance their sense of self as teachers and as vital, contributing members of a professional community. We wanted our teachers have access to learning opportunities as well as opportunities to discuss their own teaching successes and challenges with their peers so that they would acknowledge that they face the same issues and they were often addressing them in similar ways. We wanted to remove

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the isolation they experience within their own classroom walls. We have attempted to address these issues by sending out individual weekly e-mail updates to all of our *Connect-ME* members. At the time of the launch, we had approximately 60 members. By the end of the third month, our official member list had decreased to 38, primarily because University sponsored e-mail accounts expired after convocation and some teachers had not made alternate arrangements. Our weekly updates include professional development information (e.g., N.C.T.M. packages for first-year teachers) and opportunities (e.g., Faculty of Education conferences, like *Y2X: Coming Home to Mathematics*) as well as information about new additions to the website (e.g., on-line articles, new problems). Between August and November, we have added 21 sets of resources to *Xtra* including resources on writing in mathematics, parents as learning partners, portfolio assessment documentation, lesson plans, and a discussion of the nature of open problems. We sponsored a one-day conference, *Y2X: Coming Home to Mathematics* that featured leading mathematics educators as workshop leaders, and we made the presenters' workshop notes available through the website.

### Preliminary Findings

Since the launch of *Connect-ME* in late August, 1999 there has been an average of 90 hits per week. Electronic tracking shows that we had more *XOS* questions between August and September and during October and early November. This is presumably attributable to the long-range planning and preparation that occurs before the school year formally begins. We have had 24 messages telling us:

- **how they like the site** ("I also wanted to let you know how great the website and chat rooms are. I have not really had a chance to join in on anything, but from my browsing it looks great. It is nice to know that there is support network out there of familiar people who are both experienced and new to this. Thank you to all of you for the work you have put into it.");
- **how they found us again** ("I was talking to Sam (she's teaching kindergarten in Boston) and she told me about the math emails that you have been sending out. Apparently they are very helpful. I am in need of all the resources I can get my hands on to make math more exciting for my grade 2's");
- **about personal updates** ("I wonder if you have been receiving many desperate appeals as the school year approaches. I am scrambling to put together an extremely diverse and adaptable program for my new teaching position. Yes! I got a job. I got the perfect job for me teaching in a psychiatric crisis facility for kids. They range in age from eight to sixteen less a day. Their abilities are even more diverse. As you can imagine, the task of putting together a meaningful program for a group of ten kids who are all working at different levels, with different experiences and different emotional needs is quite a challenge. What makes it more difficult is the fact that it is a locked facility and the children are only there for a maximum of thirty days by law. What!?! Yes, it is unlike anything one would normally think when it comes to teaching and almost impossible to plan for as I will arrive on the first day and have no idea what the current group of kids are able to do (there is no documentation on their levels or experience). What's more, it is a secure facility which means most manipulatives are not allowed due to security concerns (all items must be accounted for and anything even remotely dangerous is not allowed). This limits me tremendously. I have been going through my material from Queens, my placements and my own repertoire and am still feeling a bit short. I thought perhaps you might have suggestions for resources or any other ideas. If not, I understand it is a challenging scenario to work with. Anyway, any suggestions would be appreciated and I hope you have had a terrific summer. Take care. Thanks again.")

Additionally, there have been 5 contributions to the *Xchange* and requests for specific information on topics ranging from parental education, Family Math and related outreach programs to the implementation of portfolio assessment in the elementary mathematics classroom.

The visits to *Connect-ME* indicate that our members access the *Xcite* page most frequently, followed by the *Xchange* centre, the *Xtra* page, and the *Joy of X* pages in that order. It appears that *Xtra* is taking over *Xchange* as a place for us to communicate with them. With respect to resources, our teachers are using the links to assessment, lesson plans, and manipulatives, in that order. While participants are using mostly the *Xcite* resources component, many are going to the *Xchange*, presumably to see what others have written. The lessons plans they contributed themselves have been popular as well. About 1/4 of *Connect-ME* visitors are going to the *Xos* line with almost all of those reading the archives.

Despite our seeding and explicit outreach efforts, traffic at *Connect-ME* has been low. In response, we have hosted 2 on-line discussions. Through *Xlive* we are hoping to get a more lively interaction. Six participants participated in the first live interaction and nine in second. In our second conference, we also had 'featured guest experts' and brought together three leading mathematics educators from across the province.

There are very few 'outside' hits except a limited number of search engine matches and two visits from a Japanese site. We believe that this is a clear indicator that it is in fact our community members who are using the site.

## Next Steps

Mid-way through Year 1 (January 2000), an on-line questionnaire will be distributed to all *Connect-ME* participants and an on-line discussion will be seeded that will focus on the challenges to teachers' attempts to implement the reform curriculum. The topics of the questionnaire will include: patterns of daily instruction, the challenges to teachers' knowledge, and the link between what happened in *The Joy of X* and the expectations of the larger teaching community. The on-line discussion will be modelled after the *Mathematics Case Methods Project* (Barnett, 1999) and participants will be asked to provide a narrative in which they describe an instructional sequence in which they were surprised or perplexed by students' responses or by the results of an assessment task. A facilitator will moderate an on-line forum in which participants will be invited to generate questions and issues raised by the various cases. The on-line archives will be analyzed on a grid for changes in beliefs about how mathematics should be taught as well as teachers' understanding of the transformations to their mathematical content knowledge and disposition. Again a software package such as NU-dist or Atlas.ti will be employed to assist in the thematic and inductive analysis of the extensive qualitative data.

On site focussed interviews with a subset of participants will be conducted at the end of the Year 1 (spring 2000) in order to determine the teachers knowledge, beliefs and practice, as well as to establish what the participants' professional development needs and preferences are (and whether or not they changed and were continuously met), what they needed to learn (and have gained knowledge about), and how the on-line community affected instructional practice and professional beliefs. Participants will be asked to self-assess the degree to which they were able to sustain their reconceptualized understanding of mathematics and its teaching and the degree to which *Connect-ME* influenced their practice.

The data from the on-line questionnaires, forum and focussed interviews will be aggregated to create a first set of levels that we will call our 'markers of change' and will include aspects of teacher beliefs, knowledge and practice.

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