Virtual Field Experiences: Helping Pre-Service Teachers Learn about Diverse Classrooms through Video Conferencing Connections with K-12 Classrooms

James D. Lehman and Jennifer Richardson
Purdue University
Beering Hall of Liberal Arts and Education
100 N. University St.
West Lafayette, IN 47907-2098
Email: lehman@purdue.edu and jennrich@purdue.edu

Abstract: Field placements for future teachers must address issues such as diversity and technology use. Video conferencing technologies can help pre-service teachers to observe and interact with K-12 classrooms at a distance. New IP-based video conferencing systems provide good quality video and audio over the Internet at low cost. Pilot projects as part of a PT3 implementation project have developed models for linking pre-service teachers with K-12 teachers/students for virtual field experiences. Advantages of this approach include: developing pre-service teachers' observational skills, experiencing diversity, and providing opportunities for learning to use this technology. Limitations include school Internet firewalls, classroom audio and sometimes video problems, and lack of in-person contact. The technology offers promise for certain kinds of field experiences. Evaluations suggest that students have favorable opinions of it, and learn about both technology and student diversity.

Introduction

Teacher preparation programs are faced with a variety of challenges. Over the past two decades, a number of national reports have emphasized the need to improve teacher preparation (Carnegie Forum, 1986; Holmes Group, 1986; Moursand & Bielfeldt, 1999; National Commission on Teaching and America's Future, 1996). Today, teacher preparation programs must prepare future teachers to meet national and state standards with regard to both content and pedagogy in an era when there is increased emphasis on performance. Teacher preparation programs must also help pre-service teachers learn to use technology and develop their understanding of diversity and multiculturalism (NCATE, 2001). Meeting these challenges may require new approaches.

Field experiences have been identified as a key means to better prepare teachers for the diversity and complexity of today's classrooms (Goodlad, 1990). While field experiences are generally recognized as critically important, many colleges of education, particularly those in rural areas, have difficulty placing students in field settings that provide for needed experiences with, for example, diverse student populations and technology. Distance education technologies offer capabilities that can be used to provide needed experiences for pre-service teachers when appropriate field sites are not in close proximity. Purdue University has initiated an innovative project in the use of technology-enabled field experiences, part of a Preparing Tomorrow's Teachers to use Technology (PT3) implementation grant, to address key components of its teacher preparation program including understanding of classrooms and diversity, technology integration, and development of appropriate instruction for K-12 learners.

Using video conferencing technologies, future teachers can observe and interact with K-12 classrooms from afar. This concept is not new; closed circuit television was used for observation of classrooms in teacher education programs as far back as the 1960s (e.g., Abel, 1960), and, in the 1980s, Iowa State University's Teachers on Television program showed that the observation skills of pre-service elementary teachers could be improved through training using microwave-based video connections to public school classrooms (Hoy & Merkley, 1989). However, these technologies were expensive and difficult to set up and maintain. Today's video conferencing technologies offer a flexible and cost-effective option for observation of and interaction with school-aged learners at remote school sites. Particularly promising are IP-based video conferencing technologies that support good quality group-to-group or individual-to-individual video conferencing over the Internet. This paper reports on a project, part of P3T3: Purdue Program for Preparing Tomorrow's Teachers to

use Technology, which is exploring the use of video conferencing distance education technologies for enhancing teacher education by providing opportunities for pre-service teachers and classes to link with K-12 students, teachers, and classrooms.

Project Background

After several years of reform planning by its faculty and administration, the School of Education at Purdue University recently completed implementation of totally restructured elementary and secondary teacher education programs. The new programs, which were launched with students entering teacher preparation programs in the fall of 1999 and completed in the spring of 2001, feature a cohesive set of courses arrayed in a series of blocks and practical experiences that are anchored by four strands – technology, portfolio assessment, diversity, and field experience.

In Purdue's new teacher preparation programs, the technology strand is anchored by a required educational technology course and then integrated throughout the programs. An electronic portfolio system allows teacher candidates to document professional growth and skills while also addressing the technology strand. The diversity strand is supported by appropriate course work and by exposing pre-service teachers to various forms of diversity (e.g., socioeconomic, rural/urban, religious, cultural, special needs/gifted populations) during field experiences. The field experiences strand is supported by a Theory Into Practice (TIP) component that accompanies each block of courses in the new program.

The P3T3 project is helping to support implementation of the new programs with initiatives that address all four of the strands. The overall goals of the P3T3 project are to (1) prepare pre-service teachers to demonstrate fundamental technology competencies, using technology as a tool for teaching/learning, personal productivity, communication, and reflection on their teaching, and (2) prepare teacher education faculty to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves. The project is meeting its goals via three complementary components: (a) faculty development and integration of technology in teacher preparation courses, (b) development of a electronic portfolio system to support production of portfolios by all pre-service teachers, and (c) creation of rich and diverse field experiences enabled by the use of technology. This paper focuses on the latter, specifically the use of distance education technologies to create virtual field experiences for prospective teachers.

Virtual Field Experiences

For colleges of education in rural locations, like Purdue, it can be difficult to place students in field settings that provide for needed experiences such as interaction with diverse student populations. As one way to address this problem, Purdue's P3T3 initiative is making use of two-way video conferencing to link pre-service teachers in college classes with K-12 students and classrooms at distant locations. Purdue's P3T3 project has developed partnerships with several schools in diverse areas of Indiana. Two-way video technologies, particularly those based on Internet-based video conferencing, are being used to link with our partner school sites. These experiences provide our pre-service teachers with opportunities to observe classrooms under the supervision of a faculty member, interact with students and teachers in diverse school settings at a distance from the Purdue campus, practice developing instructional materials for school-aged learners, and develop their ability to use video conferencing, a cutting-edge technology that is becoming more common in K-12 schools. This pilot initiative was designed to explore various models for enhancing teacher preparation through these linkages between the university and participating K-12 schools.

At the outset of the project, we intended to use an intrastate fiber optic video network called Vision Athena (http://www.visionathena.org), managed by the Center for Interactive Learning and Collaboration, a partner in the P3T3 project. While we have used that network on a limited basis, IP-based video conferencing equipment from Polycom (http://www.polycom.com) emerged during the project as a superior solution for our needs. This technology supports good quality video and audio over the Internet, is relatively affordable, and is very flexible because a standard H.323 connection can be established between any two locations with access to a reasonably fast (128 Kbps or better) Internet connection. These advantages have led us to focus most of our project efforts on this new technology.

We currently use two types of Polycom video conferencing equipment. Room-to-room video conferencing is supported by Viewstation SP (point-to-point) or FX (multipoint) units. These compact units have an integrated camera with panning and zooming capability that can be attached to any available video monitor and plugged into an Ethernet jack for Internet connectivity. Educational prices start at about $2,500 for the Viewstation SP. For person-to-person or small group to small group connectivity, we use the Polycom ViaVideo computer-based desktop video conferencing unit, which operates in conjunction with a Windows PC. While the ViaVideo camera is of lesser quality and lacks the panning and zooming capability of the larger Viewstation units, the inexpensive (about $400) ViaVideo unit adds the exciting capability for application sharing during video conferencing. Two pilot projects involving these IP-based video conferencing technologies are described in this paper.

Pilot 1: Class to Class Video Conferencing Interactions

In the first block of the teacher preparation programs at Purdue University, teacher candidates take two classes: Exploring Teaching as a Career and Multiculturalism in Education. The classes are designed to provide a foundation for future education courses by helping the pre-service teachers to begin to understand the nature of teaching and schooling in a diverse world. The two courses share a theory into practice (TIP) component, an early field experience, in which students typically travel to nearby schools to observe classrooms for a couple of hours each week. The goal of this initial TIP experience is to help students become familiar with the work of teachers, observe teaching, reflect on student diversity and its expression in the school setting, and begin to interact with learners.

Because Purdue not located near a major urban center, opportunities for pre-service teachers to encounter diversity during field experiences are limited. In addition, pre-service teachers often feel there is little need to understand diverse populations of students because they expect to teach in predominantly white and rural areas after graduation (Yao, 1999). However, the demographics of much of Indiana, like other locales in the United States, are rapidly changing and diversifying (Glazer, 1997). To help our teacher candidates experience the ethnic, linguistic, and socio-economic diversity they need to be prepared for the future, we launched this pilot project to use video conferencing technology to reach out to diverse classrooms in other parts of the state.

In pilot project 1, beginning pre-service teachers enrolled in a section of the first block's TIP experienced diverse classrooms for their field experiences through the use of video conferencing and the Internet. Over five semesters, Professor JoAnn Phillion and her students linked with a teacher and students in an elementary school in a diverse inner city school in East Chicago using Polycom Viewstation equipment. The two sites connected once a week throughout the semester for between one and two hours. During that time pre-service teachers observed the classroom, interacted with the children and teacher, and prepared a variety of enrichment activities, in consultation with Professor Phillion and the classroom teacher, which they taught using the interactive capabilities of the technology.

At the beginning of each semester, the pre-service teachers first became acquainted with the technology. They learned how to connect to a remote site and operate the camera control for both at the Purdue site and the distant school site. They practiced using the equipment locally, and they developed mechanisms to facilitate communication. Prior to beginning the actual video conferencing field experiences, the university class visited the participating school. The pre-service teachers spent a day touring the school; meeting staff, teachers, and students; and interacting with the students in the class involved in the project. This visit allowed the pre-service teachers to gain first-hand knowledge of the school and the students, which we believe helped somewhat to overcome the impersonal nature of video conferencing communication.

After the site visit, the virtual field experiences began and continued weekly through the remainder of the semester. Initially, pre-service teachers spent time observing the classroom and getting oriented to classroom activities. During one semester, the first session was spent on introductions. Students in the 3rd grade class and pre-service teachers brought in baby pictures and made riddles about "Who am I?" Some riddles were done in English and some in Spanish for the bilingual classroom.

A typical interactive session began with the classroom teacher teaching a lesson. Pre-service teachers then took turns, individually or in small groups, teaching enrichment or reinforcement mini-lessons to the students. Over the life of this pilot project, pre-service teachers have taught lessons on fractions, read stories and asked follow up questions, researched information about Benjamin Franklin and presented it to students in the form of a skit, and communicated with the students in both English and Spanish. One session was devoted

to the World Trade Center disaster; Purdue pre-service teachers and the 3rd grade students wrote memoirs about where they were on 9/11 as part of a process writing activity. The teacher provided links on her website that the pre-service teachers used to see how to discuss sensitive topics with young students.

In the most recent semester, Purdue students connected to a 2nd grade class in which the teacher was preparing to visit Japan. The Purdue students worked with the teacher and the faculty member to develop curricular units about Japan, which the teacher organized into topic areas including: geography, school life, food, daily activities, wildlife, and the arts. Purdue pre-service teachers worked in groups of three to prepare lessons on these topics. Each group located resources for their lesson on the Internet and/or in the library, and two Purdue graduate students from Japan assisted the undergraduate students in preparing Japanese writing for the children to learn as well as sharing expertise and Japanese artifacts. Several lesson activities were conducted including developing a class book on Japan and preparing sushi. The lessons were among the most successful to date, and the teacher asked for the Purdue students' Powerpoint presentations to use in the future.

Throughout pilot project 1, the pre-service teachers quickly adjusted to the video conferencing. They began to see the technology as a tool that could be used for teaching and their own and others' learning, personal productivity, and communication. Significantly, one benefit seems to be the development of pre-service teachers' classroom observation skills. These beginning teacher education majors come into the course as unskilled observers, but through the guidance of a faculty member who observes alongside them via the video conferencing, they become better observers themselves. In addition, the shared observational experience leads to opportunities for richer class discussions. Further, the pre-service teachers' understanding of diversity issues appears to have grown as a result of the project.

When surveyed about the technology-enabled field experience at the end of 2002, the pre-service teachers generally were positive. See Table 1. They tended to be comfortable with the technology, found it easy to use, and felt that they learned how to use it. Most agreed that it was a valuable addition to the class and increased their comfort both with technology use and with teaching diverse learners. On open-ended items, they reported that they saw advantages in the ability to connect to a diverse classroom site and learn about technology and distance education. Limitations included the lack of person-to-person interactions and technical issues such as connectivity difficulties, audio and video problems, and the time delay in verbal exchanges caused by the distance.

Table 1. Pre-service teachers' responses to video conferencing survey items.

Survey item	SA	A	U	D	SD
By the end of the class, I felt comfortable with the video conferencing equipment that we used.	4	11	6	0	0
The video conferencing in this class was easy to use.	4	13	4	0	0
I learned how to use video conferencing in education from this class.	4	15	0	1	1
I believe that the use of video conferencing was a valuable addition to this class.	7	9	3	1	1
Because of the experience in this class, I feel more comfortable in my ability to use technology for teaching and learning.	6	11	1	2	1
Because of the experience in this class, I feel more comfortable in my ability to understand and teach diverse learners.	8	8	2	1	2

Note: SA = strongly agree, A = agree, U = undecided, D = disagree, SD = strongly disagree

Pilot 2: Small Group Instruction via Personal Video Conferencing

Pilot project 2 was developed as a part of a course on the production of instructional materials open to both undergraduate and graduate students. Professor Tristan Johnson launched this pilot project in cooperation with the P3T3 project to provide his university students with a genuine context and audience for the design, development, and implementation of instructional materials. In this pilot project, teams of university students created instructional materials, both web-based and for video conferencing delivery, for a K-12 audience. Three different experiences were implemented during three consecutive semesters.

In the first semester of this pilot project, a small group of university students created a web-based virtual field trip for 2nd grade students at a partner school who were planning to visit a children's museum in the state. The virtual field trip was designed to prepare the students for the museum visit by having them obtain information online, assimilate the information, and communicate their understanding to peers, university students, and teachers. Video conferencing was employed for both planning and implementation of a lesson built around the virtual field trip. The university instructor, team of student developers, and teacher twice used video conferencing to collaboratively plan the virtual field trip and associated instructional activities. Then, video conferencing was employed by the university students to observe as the teacher implemented initial instructional activities with the 2nd graders in the classroom. As a culminating activity, the team of university students led the final classroom activity at a distance using video conferencing. The activities spanned about ten weeks of class time, although only two hour-long video conferencing sessions were involved in the implementation phase.

The next semester, university students engaged in small group to small group interaction with a group of 5th grade students. During this semester, the team of university students developed a stock market investment project using themes outlined by the cooperating teacher. Four lessons were created, one web-based and three using video conferencing. A key strategy implemented during this second iteration of pilot project 2 was the use of application sharing during video conferencing with Polycom ViaVideo units connected to Windows PCs. This capability allowed the university students to share an application (Microsoft Excel) with the K-12 students so that they could co-construct a spreadsheet as part of the lesson.

The third semester of this pilot project continued the use of application sharing as one part of a comprehensive lesson developed for an urban 5th grade class at a partner elementary school in the Indianapolis area. This time, the team of university students directed by an advanced graduate student developed a lesson built around a popular engineering contest founded at the university called the Rube Goldberg Machine Contest. Rube Goldberg was cartoonist who drew cartoons of absurdly complex machines that took many complicated steps to perform a simple task. In the early 1980s, students at Purdue University began a contest that paid homage to the cartoonist by requiring teams of engineering students to construct elaborate machines that required many steps to perform a simple task such as sharpening a pencil or screwing in a light bulb.

The university team developed a website to provide background information for the 5th graders about Rube Goldberg, metric measurement, and simple machine concepts. Video conferencing sessions were used to introduce students to the lesson concepts building toward the culminating activity of the lesson, a Rube Goldberg machine building contest for the 5th graders. Application sharing with the ViaVideo unist was used during one of the video conferencing sessions to help students understand simple machine concepts. During the lesson's final session, teams of 5th grade students, who had constructed their own Rube Goldberg machines demonstrated them in front of the video conferencing unit to the university students who served as the judges at a distance. Thus, the university students were able to gain experience in the creation of authentic instruction from planning to design to development to implementation and finally evaluation. At the same time, the 5th grade students benefited from an engaging lesson that involved important mathematics and science concepts and interactions with a genuine audience of college students.

The university students generally felt that the remote field experience was instructionally valuable, showed a real-life application, increased their technology confidence, better prepared them for teaching in the future, and engendered a desire to continue using technology for teaching. Challenges included the difficulties of jointly planning an instructional unit with a cooperating teacher at a distance, the constraints of a semester schedule, and students' lack of comfort with the ambiguity of the design process. There were occasional technical problems, and the ViaVideo units, which were designed for person-to-person video conferencing, were difficult to use with small groups. However, the overall experience was judged a success.

Strengths and Limitations of the Technology

When working with any new medium of communication, there are inevitable difficulties and a period of acclimatization. The first step in each of these pilot projects was simply to get the technology working between the university and remote site. For IP-based video conferencing, a significant initial barrier is Internet firewalls. Most schools are protected by an Internet firewall which must be configured to allow selected outside connections. When trying to set up video access, we ran into difficulties. These problems were resolved, but not without a fair amount of time and the help of several technicians. Once established, the IP-based connections worked fairly well most of the time.

Participants had to spend time learning to use the technology to communicate. While not difficult, this form of communication is not natural and must be developed to create a successful experience. Both the university students and the K-12 teachers and students needed to practice using the system to develop a basic level of comfort and fluency with the technology to facilitate routine communication. Conventions to facilitate communication, such as having name signs and using signals to denote when students at the remote site were to do something, helped.

In both of these pilot projects, pre-service teachers learned to see technology as a tool that enabled them to communicate across distance, and with students they may have had little experience of in the past. Exposure to the classrooms in East Chicago and our other partner sites seemed to open the students' thinking to new possibilities. As a result, class discussions were rich and varied. In addition pre-service teachers learned to work together in groups and in partnership with a faculty member and classroom teacher. The main issue for the pre-service teachers was that they were not in a "real" classroom with "real" students. Some students, at least initially, felt at a loss. Structure seemed to be beneficial in helping the future teachers to benefit from the experience, but it is important to remain flexible and willing to adapt.

The technology is good, but students in both pilot projects noted limitations. Sometimes, technical problems or teacher absence caused the cancellation of a video conferencing session. In addition, IP-based video conferencing connections sometimes could become "choppy" as a result of limited bandwidth or network congestion. The video might freeze and/or the audio break up. Even when working perfectly, the picture on the screen, while not bad, might have been clearer. Effective observation often means noting subtle facial expressions and body gestures not easily discerned by viewing a video monitor. Pre-service teachers reported that had difficulty judging whether the K-12 students at a distance understood when a lesson was being presented. In the second pilot project, our use of ViaVideo units with small groups pushed the limit of what the small camera could convey. Audio is as important as or more important than the video. While the teacher's voice came through clearly most of the time, the children's voices were less clear. Furthermore, background room noise created interference. While we have found that having the teacher work with the students to speak more loudly and clearly helped, audio quality is generally a problem that we have not fully resolved.

Despite some challenges, when we consider all factors these virtual field experiences seem to be a worthwhile way to expose pre-service teachers to experiences they might not otherwise get. Our teacher education program has at its core emphases on early and continued field experiences, on developing technological skills, and on understanding diverse learners. Virtual field experiences seem to offer significant promise for expanding the options for linking students in teacher preparation programs with K-12 teachers and students. While we do not advocate replacing traditional field experiences with virtual field experiences, these experiences do seem to offer significant potential for augmenting the experiences of prospective teachers in preparation programs.

References

Abel, F. P. (1960). *Use of closed circuit television in teacher education: Relationship to achievement and subject matter understanding*. Minneapolis, MN: University of Minnesota. (ERIC Document Reproduction Service No. ED 020 473)

Carnegie Forum on Education and the Economy Task Force on Teaching as a Profession. (1986). *A nation prepared: Teacher for the 21ˢᵗ century. The report of the Task Force on Teaching as a Profession*. New

York: Carnegie Corporation.

Glazer, N. (1997). *We are all multiculturalists now.* Cambridge, MA: Harvard University Press.

Goodlad, J. I. (1990). *Teachers for our nation's schools*. San Francisco: Josey-Bass.

Holmes Group. (1986). *Tomorrow's teachers: A report of the Holmes Group*. East Lansing, MI: The Holmes Group.

Hoy, M. P. & Merkley, D. J. (1989). *Teachers on television: Observing teachers and students in diverse classroom settings through the technology of television*. Ames, IA: Iowa State University. (ERIC Document Reproduction Service No. ED 319 711)

Moursand, D. & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age?* Research study by the International Society for Technology in Education, commissioned by the Milken Exchange on Educational Technology. Milken Exchange on Educational Technology. Available online: http://www.mff.org/pubs/ME154.pdf

National Commission on Teaching and America's Future. (1996). *What matters most: Teaching for America's future*. New York: Author.

National Council for the Accreditation of Teacher Education. (2001). *Professional standards for the accreditation of schools, colleges, and departments of education*. Washington, DC: Author.

Yao, F. (1999). The barriers of diversity: Multicultural education and rural schools. *Multicultural Education, 7* (1), 1-7.

Acknowledgement