Bringing Diversity into the Teacher Education Classroom: Video Conferencing as a Tool for Distant Field Experiences

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

JoAnn Phillion
Purdue University
Beering Hall of Liberal Arts and Education
100 N. University St.
West Lafayette, IN 47907-2098
phillion@purdue.edu

Abstract: Field experiences are a key means to prepare future teachers for the diversity and complexity of today's classrooms, but not all colleges of education have ready access to diverse school settings. In a 3-year initiative, part of a PT3 implementation project, Internet-based video conferencing technology was used to support pre-service teachers' observations of and interactions with diverse K-12 classrooms at a distance. Using this technology, future teachers are able to learn about and come to better understand diverse classroom settings unavailable to them locally. Using both quantitative and qualitative methodologies, this initiative was evaluated. Results showed that pre-service teachers' knowledge of diversity and the use of technology grew as a result of this experience. Pros and cons of this approach were identified, and a number of lessons were learned. This approach has the potential to augment traditional field experiences in important ways.

Introduction

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, and technology has the potential to be of significant benefit.

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, for example, with diverse student populations. Distance education technologies offer capabilities that can be used to provide a form of these critically important 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 and technology integration.

Using video conferencing technologies, prospective teachers can observe and interact with K-12 students and teachers from a distance. The concept of using live video for classroom observations is not new. Abel (1960) reported on the use of closed circuit television for observation of classrooms in teacher education

programs, 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 by observational practice using microwave-based video connections to public school classrooms (Hoy & Merkley, 1989). While successful, these older video technologies were expensive as well as difficult to set up and maintain. Today's Internet-based video conferencing technologies offer a much more flexible and cost-effective option for observation of and interaction with school-aged learners at school sites that are remote from the university campus. Good quality group-to-group or individual-to-individual video conferencing can be accomplished over the Internet, and any two sites with reasonably fast Internet connections can engage in this type of video conferencing.

Recent literature on applications of video conferencing in education has focused on applications such as virtual field trips (LeBlanc, 2002; Pachnowski, 2002) and supervision of practicum students at a distance (Pemberton, Tyler-Wood, Pérez Cereijo, Rademacher, & Mortensen, 2001). While a few authors have reported on the use of video conferencing as a tool for remote field experiences (Edens, 2001; Howland & Wedman, 2003; O'Connor, 2003, Phillion, Johnson, & Lehman, 2003-04), this application of the technology has been relatively little explored. This paper reports on a 3-year implementation project, part of P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, which has investigated the use of video conferencing as a tool for enhancing teacher education by providing opportunities for pre-service teachers and classes to link with K-12 students, teachers, and classrooms in diverse settings.

Background

Purdue's P3T3 project is part of the U. S. Department of Education's Preparing Tomorrow's Teachers to use Technology initiative, a nationwide effort designed to ensure that future teachers are adequately prepared to use technology for teaching and learning. Purdue's project is a collaboration involving several partners. The School of Education, which plays the primary but not exclusive role in teacher preparation on the campus, is the lead organization. At Purdue, the Schools of Science and Liberal Arts, which provide coursework for teacher education students across disciplines and provide the specific programs for secondary teacher education majors in science and liberal arts disciplines, are partners. The campus-wide Information Technology at Purdue (ITaP) group is also a local partner and assisted with faculty development efforts. Both Apple and Intel are for-profit corporate partners that have provided both equipment and training support. Partners from the non-profit sector include: the North Central Regional Technology in Education Consortium (NCRTEC), the Center for Interactive Learning and Collaboration (CILC), and the Indiana Department of Education. Finally, four Indiana school districts are partners: School City of East Chicago, Crawfordsville Community Schools, Lafayette School Corporation, and Lawrence Township Schools of Indianapolis. These school districts offer geographic, ethnic, and socio-economic diversity. The distant field experiences described in this paper took place in partnership with these districts.

The overall goals of Purdue's 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 implementation of technology experiences in teacher preparation courses, (b) development of an electronic portfolio system for all pre-service teachers, and (c) the creation of rich and diverse field experiences enabled and enhanced through the use of technology. This paper focuses on the latter, although faculty development and technology integration in a teacher preparation course was also involved.

Two types of video conferencing have been used to support our efforts to create diverse field experiences for students using technology. Some of our partner K-12 schools are linked to an intrastate fiber optic video network called Vision Athena (http://www.visionathena.org), which is managed by the Center for Interactive Learning and Collaboration, a partner in the P3T3 project. While Purdue University does not have a direct connection to the Vision Athena network, we can connect with schools on the network through a video bridge, and we have used this connection to link with some of our partner schools. The other technology we have used extensively is IP-based video conferencing equipment from Polycom (http://www.polycom.com),

which supports good quality video and audio over the Internet. Because this equipment connects via the Internet, it is capable of going into any classroom with a fast Internet connection; special video conferencing facilities are not needed.

Polycom makes room-to-room as well as computer-based desktop video conferencing units. Viewstation SP or Viewstation FX units are used for room-to-room conferencing; a unit with a video monitor connected to the Internet is needed at each site. The Viewstation SP connects two sites at data rates up to 768 Kbps (with rates of 256 to 384 Kbps typical for our connections) with the capability for remote control of the camera including panning and zooming to focus in on selected learners or classroom activities. The Polycom Viewstation FX is a high-end room-to-room unit that has a built-in a Multiple Control Unit (MCU), a device that bridges together multiple inputs so that up to four sites can participate in a video conference. Computer-based desktop video conferencing is done with Polycom's ViaVideo, which offers video and audio of good quality at connection speeds of up to 384 Kbps. ViaVideo, which works in conjunction with a Windows-based PC, supports file sharing, whiteboard, chat, and file transfer along with video conferencing. While the ViaVideo camera cannot pan and zoom, the software that comes with the unit is capable of controlling a Viewstation remotely. Equipment costs run about $400 for ViaVideo units, $2500 for Viewstation SP units, and about $7500 for Viewstation FX units. While these expenses are not trivial, they are much less than the video conferencing costs of just a decade ago, and the costs must be weighed against the savings in travel time and expense that can be realized from the use of video conferencing.

Several models of interaction between college teacher education classrooms and K-12 classrooms have been explored. A number of faculty members in the School of Education have used video conferencing to provide relatively short-term experiences (usually one to three video interactions) for their classes of prospective teachers. For example, one faculty member in Consumer and Family Science Education had her class spend a class period observing a pre-school, housed in a high school in an urban center in the state, to learn more about its operation. A faculty member in Agriculture Education had his teacher education students spend a class period making structured observations of a high school classroom to learn about teaching techniques and classroom management. A faculty member in Educational Technology, with the assistance of an advanced graduate student, developed several projects with partner elementary schools to provide a genuine context for his university students to develop instructional materials. The university students developed web-based instructional materials for the elementary students and then used a series of video conferencing sessions to teach the lessons and involve the elementary students (O'Connor, 2003; Phillion, Johnson, & Lehman, 2003-04).

The longest running pilot project involving the use of video conferencing to connect pre-service teachers with diverse K-12 settings has now spanned three and a half years. In this pilot project, which is the focus of this paper, an introductory teacher education class at the university has linked with an elementary school classroom in a diverse, urban region of the state. This project has involved a more sustained use of the video conferencing spanning nearly an entire semester. A video program describing this pilot project was produced by WHRO-TV and Soundprint Media for the *PT3 Now!* video series and can be viewed online at: http://www.pt3now.org/207.php.

The pilot project described here was implemented in order to link learning about technology with learning about diversity and multiculturalism. While pre-service teachers often feel there is no need to understand diverse populations of students because they plan to teach in predominantly white and rural areas after graduation (Yeo, 1999), demographics of schools are changing throughout the country. Prospective teachers must be exposed to the diverse classrooms they are likely to encounter in the future. In this project, pre-service teachers enrolled in the first course in Purdue's teacher education program link with the teacher and students in a grade two or three bilingual class in a diverse inner city school in East Chicago, one of the lowest socio-economic and most culturally diverse districts in the state of Indiana.

Once per week throughout most the semester, the teacher education class connects with the elementary classroom for 1-2 hours. Initially, the pre-service teachers use the video conferencing to focus on classroom observations under the guidance of the instructor. This activity helps the pre-service teachers, who are just beginning their teacher education programs, to gain a perspective on classrooms from a different vantage point.

Because the instructor observes alongside the students, there are opportunities for rich discussions that emerge out of the shared observational context. As the semester progresses, sessions become increasingly interactive. Eventually, the future teachers actually conduct lessons for the elementary students, designed to supplement the elementary teacher's curriculum, via the video conferencing. Thus, the prospective teachers get the experience of working with diverse students using a cutting-edge technology that promises to be more widespread by the time they become practicing teacher in their own classrooms.

At the beginning of the semester, the pre-service teachers first become acquainted with the technology. They learn to connect to the remote site, operate the remote controls for the cameras both at the Purdue site and the school site, and develop mechanisms to facilitate communication. The pre-service teachers practice with the equipment by splitting into two groups and video conferencing between two local classrooms. A checklist of procedures helps the pre-service teachers learn how to connect to the school site. Prior to beginning the actual video conferencing field experiences, the university class makes a site visit to the participating school. During this trip, the pre-service teachers spend the day touring the school; meeting staff, teachers and students; and interacting with the elementary students involved in the project. This visit allows the pre-service teachers to gain first-hand knowledge of the school and the students, which we believe helps to overcome some of the impersonal nature of remote connection.

Following the site visit, the virtual field experiences begin and continue weekly through the remainder of the semester. Initially, pre-service teachers spend time observing the classroom and getting oriented to classroom activities. During one semester, the first session was spent on introductions. Students in the elementary class and pre-service teachers brought in baby pictures and made riddles about "Who am I?" Pre-service teachers prepared Powerpoint presentations of their riddles to share. Some riddles were done in English and some in Spanish for the bilingual classroom.

A typical interactive session begins with the classroom teacher teaching a lesson. Pre-service teachers then take turns, individually or in small groups, directly teaching mini-lessons to the students. These activities reinforce what the teacher is teaching in the class or enrich the curriculum. Over the life of this pilot project, pre-service teachers have had the opportunity to engage in a variety of activities, including teaching lessons on equal and unequal fractions using everyday objects, colorful graphs, and diagrams and charts; reading stories and providing follow up questions; researching information about Benjamin Franklin and presenting it to students in the form of a skit; and, discussing the 9/11 World Trade Center disaster.

In the recent semester, the cooperating elementary teacher was preparing to teach in Japan and decided to use Japan as a year-long theme. Purdue pre-service teachers were invited to participate by preparing activities related to Japan. The students, Purdue pre-service teachers, and the classroom teacher brainstormed questions about Japan. The teacher then organized these questions into topic areas including: geography, school life, food, daily activities, wildlife and art/drama/literature. Purdue pre-service teachers then worked in groups of three to prepare lessons about these topics. For example, the school life group wrote a book. The food group did a lesson on preparing sushi via the video conferencing, while the teacher did a similar activity in her class. Thus, a variety of supplemental lessons were created, enriching the teacher's curriculum while giving the pre-service teachers a chance to learn about and work with diverse elementary students. The Japan project took place over the entire semester and was deemed by the teacher, who had done videoconferencing several times, and the faculty member who had also done it several times, to be the most successful format for interaction of any that was used throughout this pilot project.

Methodology

In order to understand the learning of the pre-service teachers about diversity issues and the use of technology, both qualitative and quantitative methodologies were employed. Quantitative data were collected by means of short online surveys completed by the pre-service teachers in the pilot study class. Data for this paper were drawn from the fall 2002 surveys, which were administered three times: prior to the beginning of the distant field experience, during the experience, and again at the end of the semester. The online surveys contained both Likert-type and open-ended questions that probed pre-service teachers' attitudes toward the

technology and class experience.

Qualitative data were drawn from the open-ended responses to survey items and from pre-service teachers' journals. The contents of the journals were analyzed for themes related to diversity and technology use. Student journals and questionnaires were reviewed by the instructor (the second author of the paper) and by the P3T3 project coordinator (the lead author of the paper). Outcomes related to diversity and technology are discussed below. In addition to these sources of information, regular observations were made of the video conferencing sessions, and these observations contributed to the overall assessment of the impact of the project.

Results

Although the pre-service teachers tended not to be particularly familiar with video conferencing at the outset of the class, we found that they quickly adjusted to it. See Table 1. By the end of the class, mean responses to the Likert-type items all clustered around a response of "agree." Pre-service teachers tended to agree that they were comfortable with the technology, found it easy to use, learned how to use it from the class, and found it to be of value to the class. They also tended to agree that the experience made them more comfortable in their ability to use technology for teaching and learning and in their ability to understand and work with diverse learners. One pre-service teacher commented, "I've learned that technology can do a lot of good things in education." Our observations of the K-12 class suggested that the K-12 students also became comfortable with the technology fairly quickly. Students quickly got over the novelty of being on camera, and, with prompting from the teacher, they learned to raise their hands, speak up, and otherwise follow protocols that facilitated communication with their distant "Purdue friends."

Likert-type Survey Item	Mean Prior to Video Conferencing	Mean During Video Conferencing	Mean After Video Conferencing
Familiar/comfortable with video conferencing	2.57	3.74	3.90
Video conferencing easy to use	3.57	3.68	4.00
Learning about video conferencing from class	4.33	4.05	3.95
Video conferencing of value to class	4.00	3.58	3.95
Able to use technology for teaching and learning	NA	3.74	3.90
Able to understand and teach diverse learners	NA	4.00	3.90

Note: means on scale of 5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree, 1 = strongly disagree

Table 1. Summary of Pre-Service Teachers' Responses to Survey Items (n=21)

The pre-service teachers began to see the technology as a tool that could be used for teaching and their own and others' learning, personal productivity, and communication. While these beginning teacher education majors came into the course as unskilled observers, through the guidance of a faculty member who observed alongside them via the video conferencing, they became better observers themselves. One pre-service teacher commented, "We got a chance to see a classroom without actually being there." The traditional model for early field experience, at least as implemented in this university course, involves sending all of the pre-service teachers into classrooms for one to two hours of observation per week. The pre-service teachers all visit different classrooms, and they come together the following week to discuss their observations. While certainly useful, this model lacks a shared context. Different pre-service teachers observe different classrooms and activities, and the instructor has no idea what most of them have seen. The shared observational nature of the distance field experience, on the other hand, led to opportunities for richer class discussions. Because the instructor and all of the pre-service teachers observed the same teacher, students, and classroom events, they were able to discuss their observations from a common ground.

Pre-service teachers' journals and questionnaires indicated that their understanding of diversity issues and how to teach "other people's children" (Delpit, 1995) also grew during the project. Diversity was in every interaction, although subtly, and in sometimes unexpected ways. Pre-service teachers initially thought the classroom teacher would teach differently because she had diverse students. Through interactions with the

teacher and students and in interviews with the teacher, they found that the teacher did not "water down the curriculum, had high expectations, taught in an integrated style, and built on the students' prior experiences." They also began to question their assumptions and beliefs about teaching and learning of diverse groups of students. This is an important aspect of preparing pre-service teachers to understand diverse populations (Gay, 2000; Ladson-Billings, 1994, 2001). One pre-service teacher commented, "I've learned not to be afraid of teaching students in the more run down communities and that they're not as scary as I had first imagined."

Although there were a number of indicators of success, there were also problems and issues. The technology, while generally working well, did have occasional problems. One pre-service teacher commented, "Technology is not perfect. We weren't able to connect one time and had trouble connecting another time. It can be hard to see…" A number of the pre-service teachers were also put off by the lack of face-to-face contact with the teacher and her students. One pre-service teacher commented, "I feel that we have not gotten an experience that we would have in the other class that actually went into the classrooms. I feel that we have been cheated…" However, a number of pre-services teachers shared the sentiment expressed by one who said, "At first I was opposed to the idea, but now I kind of like the experiences I had."

Discussion

When working with any new approach or medium of communication, there are inevitable difficulties. The first step in this pilot project was simply getting the technology working both at the university site and the school site. For IP-based video conferencing, a significant initial barrier is school Internet firewalls. Because of information security concerns, most schools are protected by an Internet firewall. While keeping people out of the internal network, a firewall can be configured to allow selected outside connections. When trying to set up this access, we ran into difficulties establishing the appropriate configuration. Purdue technical support staff had to work with the technical support staff in the school to "punch a hole" in the school's Internet firewall for the video conferencing. Once done, everything worked well until a network change caused a problem in mid-semester. This problem, too, was quickly corrected, but not before one planned class session was lost. Institutions contemplating this approach should allow for plenty of lead time to get the technology working, and one or more test sessions should be conducted prior to the first video conferencing session to make certain everything works.

Participants, both Purdue pre-service teachers and K-12 students, had to spend time getting acclimated to the system of communication. This process was not difficult, but it was critically important. The university students needed to practice using the system to help them get a feel for the communication abilities, and the K-12 teacher and students needed to develop procedures (e.g., raising hands, speaking loudly, addressing the camera) to facilitate routine communication. We found that it helped to develop conventions to facilitate communication, such as having name signs and using signals to denote when students at the remote site were supposed to do something. Setting basic communication conventions in advance helps the process go more smoothly.

In this pilot project, 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. One pre-service teacher commented, "I feel that it was a good opportunity for us to receive a chance to see a school that is very diverse. We received an experience that others have not." Just learning to use the technology itself was a benefit for many of the pre-service teachers. One commented, "I have learned about the equipment used in such a process so I would feel comfortable participating in something like this in the future!" Using video conferencing in this manner is a convenient way to develop pre-service teachers' technical skills while achieving other objectives of the teacher education program.

The technology is good, but it has limitations. Sometimes we were unable to establish a connection due to technical problems of one kind or another. In addition, IP-based video conferencing connections are susceptible to problems as a result of limited bandwidth or network congestion. Sometimes the Internet-based video conferencing connection is "choppy." When Internet packets are "dropped" as a result of network traffic, this can result in the video freezing and the audio breaking up. Even when working perfectly, the picture on the

screen, while not bad, could be clearer. Effective observation often means noting facial expressions and body gestures not easily discerned by viewing a video monitor. Pre-service teachers reported that they had difficulty judging whether the K-12 students at a distance understood when a lesson was being presented. Audio was also problematic at times. While the teacher's voice comes through clearly most of the time, the children's voices are less clear. Furthermore, background room noise can create interference. While we have found that having the teacher work with the students to speak more loudly and clearly helps, audio quality is a problem that we have not fully resolved..

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 a loss at this mode of interaction. Clearly, this kind of distant or virtual field experience should not be viewed as a substitute for traditional field experiences in real classrooms. Pre-service teachers need real field experiences. However, by the end of the course, most found value in the distant field experience. One pre-service teacher captured this sentiment by commenting, "It was a really good experience. I was somewhat upset at the beginning that I wasn't going to be able to go to the classroom, but I feel I learned just as much, if not more, than I would if I had to be in a class."

Our pilot project suggests that technology-enabled field experiences provide a viable alternative for some types of student observations and for interactions with K-12 teachers and students. While certainly not a replacement for traditional field experiences, video conferencing over the Internet offers a promising new tool for teacher preparation programs. It provides an avenue for offering field experiences and for linking with diverse K-12 sites in a way that provides for flexibility and emphasizes integration of technology. It is one new tool for expanding the options for linking students in teacher preparation programs with K-12 teachers and students and for enhancing the preparation of future teacher both to use technology and to understand and be able to work with diverse students.

References

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

Delpit, L. (1995). *Other people's children: Cultural conflicts in the classroom.* New York: The New Press.

Edens, K. M. (2001). Bringing authentic K-12 classrooms and teachers to a university classroom through videoconferencing. Journal of Computing in Teacher Education, 17(3), 26-31.

Gay, G. (2000). *Culturally responsive teaching: Theory, research and practice*. New York: Teachers College Press.

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

Howland, J. & Wedman, J. (2003). Experiencing diversity: Learning through videoconference technology. *Proceedings of ED-MEDIA 2003 World Conference on Educational Multimedia, Hypermedia & Telecommunications(*1), 1562-1565.

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)

Ladson-Billings, G. (1994). *The dreamkeepers: Successful teachers of African American children*. San Francisco, CA: Jossey-Bass.

Ladson-Billings, G. (2001). *Crossing over to Canaan: The journey of new teachers in diverse classrooms*. San Francisco, CA: Jossey-Bass.

LeBlanc, P. (2002). What you see is what you get: Virtual field trips and pre-service teachers. *Proceedings of S*ociety for *Information Technology and Teacher Education International Conference 2002*(1), 1668-1669.

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

O'Connor, D. (2003). Application sharing in K-12 education: Teaching and learning with Rube Goldberg. *TechTrends*, *47*(5), 6-13.

Pachnowski, L. M. (2002). Virtual field trips through video conferencing. *Learning and Leading with Technology*, *29*(6), 10-13.

Pemberton, J., Tyler-Wood, T., Pérez Cereijo, M. V., Rademacher, J., & Mortensen, M. (2001). The use of two-way audio video at the University of North Texas as a tool for practicum supervision. *Proceedings of* S*ociety for Information Technology and Teacher Education International Conference 2001*(1), 2768-2770.

Phillion, J. Johnson, T., & Lehman, J. D. (2003-04). Using distance education technologies to enhance teacher education through linkages with K–12 schools. *Journal of Computing in Teacher Education*, *20*(2), 73-80.

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

Acknowledgement