Assessing the Use of Video Conferencing for Linking Teacher Preparation Programs with K-12 Schools

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Abstract: Teacher preparation programs face many challenges including preparing future teachers to work in diverse classrooms and to effectively use technology. Video conferencing technology offers a means for teacher preparation programs to broaden opportunities for future teachers to obtain desired knowledge and skills through linkages with K-12 schools at a distance from campus. Projects at Purdue University have explored the potential of linking teacher education classes/candidates with K-12 teachers/students via video conferencing. Data collected from participating university and school faculty as well as from participating pre-service teachers suggest this approach has certain benefits but also limitations. Project results suggest that this approach may be a useful way to augment traditional field experiences in teacher preparation programs.

Introduction

University teacher preparation programs face many challenges today. Over the past two decades, a number of national reports have emphasized the need to improve teacher preparation (Carnegie Forum, 1986; Holmes Group, 1986; Levine, 2006; 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 a time of increased emphasis on performance and accountability. Colleges of education must also help pre-service teachers learn to effectively use technology (ISTE, 2002) and develop their understanding of diversity and multiculturalism (NCATE, 2001). Meeting these various standards and requirements is difficult in the best of circumstances, and it may require college of education to find new approaches to prepare prospective teachers for the classrooms of today and tomorrow.

Field experiences are 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 and rated as the most valuable aspect of preparation by prospective teachers, the amount of field experience in teacher preparation programs is often limited (Levine, 2006). Further, 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. New technologies, such as Internet-based video conferencing, offer capabilities that might be employed to provide needed experiences for pre-service teachers when appropriate field sites are not in close proximity.

To explore this potential, Purdue University initiated an innovative project in the use of technology-enabled field experiences as part of a Preparing Tomorrow's Teachers to use Technology (PT3) implementation grant (Lehman, 2003; Lehman, Richardson, Malewski, & Phillion, 2005). This project was designed to address key components of Purdue's teacher preparation program, including understanding of classrooms and diversity as well as appropriate technology integration, through video conferencing connections with K-12 schools at a distance.

Video conferencing technologies allow teacher educators and future teachers to connect in real time with distant K-12 classrooms to observe and interact with students and teachers. This can provide opportunities for future teachers to work with schools and student populations that might otherwise be unavailable for traditional field experiences. Further, the process of using this cutting-edge technology simultaneously provides a model of technology integration for pre-service teachers. In Purdue's project, different models or ways of using the technology for remote observations and virtual field experiences were explored, including short-term connections focused primarily on pre-service teacher observations of classrooms, longer-term connections in which pre-service teachers actively worked with school children, and distant supervision of student teachers by teacher education faculty members. The objective of this study was to assess participants' perceptions of the benefits and limitations of this use of video conferencing as a tool for linking the university with K-12 school sites at a distance. Participating pre-service teachers were surveyed, and participating faculty members and classroom teachers from various pilot projects were interviewed. The data, both quantitative and qualitative, were analyzed to identify perceived benefits and limitations of this approach.

Background Literature

The concept of using live video to allow pre-service teachers to observe K-12 classrooms has been around for a number of years. Closed circuit television was used for observation of classrooms in teacher education programs as far back as 1960 (c.f. Abel, 1960). In the 1980s, Iowa State University's Teachers on Television program showed that the observation skills of pre-service elementary teachers could be improved through practice that involved viewing live microwave-based video broadcasts from public school classrooms (Hoy & Merkley, 1989). While providing proof of concept, early applications of closed circuit and microwave video for observations of K-12 classrooms were expensive, difficult to set up and maintain, and typically provided only one-way video from the K-12 classroom into the university classroom.

Today's video conferencing technologies are a much more flexible, capable, and cost-effective option for observation of and interaction with school-aged learners at remote school sites. Modestly priced equipment for video conferencing over the Internet, so-called IP-based video conferencing, is now available. Using this equipment, a two-way audio and video connection can be established between any two sites, such as university classroom and a K-12 classroom or other instructional space, equipped with a local area network and relatively high speed Internet connection. Thus, video conferencing today has great potential for helping universities and schools to make real-time connections.

Recent literature concerning applications of video conferencing in education, particularly involving the linking of universities and K–12 schools, is limited. Uses of video conferencing that have been reported include virtual field trips, remote observation of teaching practicum students, teacher professional development, and what might be termed virtual field experiences for prospective teachers.

Virtual field trips involve the use of video conferencing for short-term experiences where K–12 or college students connect to a distant site to learn more about the site or engage in a planned activity (LeBlanc, 2002; Pachnowski, 2002). In Indiana, for example, K–12 schools that are part of an in-state video network are able to connect to informal education service providers such as the Indianapolis Zoo and the Indianapolis Children's Museum through two-way video conferencing to learn about exhibits and interact with educational personnel. Such uses of video conferencing allow students to experience resources at remote locations without having to travel to the locations.

Some universities have experimented with the use of video conferencing as a tool for supervising practicum students at a distance (Pemberton, Tyler-Wood, Pérez Cereijo, Rademacher, & Mortensen, 2001; Sharpe, Hu, Crawford, Gopinathan, Moo, & Wong, 2000) and for conducting teacher professional development (McDevitt, 1996; Welch & Sheridan, 2000). Although it was not initially an objective of our project at Purdue, several faculty members experimented with the use of video conferencing for observing practicum students, i.e. student teachers, at a distance. Initial pilot projects led to an internal grant from the university that funded the acquisition of additional equipment to support faculty members wishing to use the technology for remote supervision and other connections to schools.

Video conferencing can also support a form of virtual field experience in which preservice teachers can not only observe classrooms but, thanks to the two-way audio and video, also interact with students and teachers at the school site. For example, McDevitt (1996) described the use of two-way video conferencing to allow pre-service teachers to observe professional development school sites and interact with teachers about the observed lessons. This approach gave pre-service teachers the opportunity to observe expert teachers in action and talk with them about their teaching, and it also aroused the pre-service teachers' interest in using the technology themselves. Edens (2001) discussed the advantages and limitations of using videoconferencing to link a university teacher education class to first-grade and fifth-grade classrooms for, among other things, question and answer exchanges between the pre-service teachers and the elementary students. Howland and Wedman (2003) discussed the use of videoconferencing as a way to help pre-service teachers experience various forms of diversity, including cross-cultural learning through video conferencing connections with overseas schools. Most of the initial efforts in our project explored similar uses of video conferencing technology to provide opportunities for teacher education candidates to observe and interact with K-12 students and teachers in partner school districts that included diverse, urban schools unlike those near to the campus (Lehman, Richardson, Malewski, & Phillion, 2005; O'Connor, 2003; Phillion, Johnson, & Lehman, 2003-04).

Description of the Project

This project was one part of a Preparing Tomorrow's Teachers to use Technology (PT3) implementation grant conducted from 2000 to 2004. The overarching goals of Purdue's PT3 grant were 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 addressed its goals via several complementary components including the creation of technology-enabled field experiences through video conferencing linkages with partner K-12 schools.

For colleges of education in rural locations, like Purdue, it can be difficult to place students in field settings that provide important experiences such as interaction with diverse student populations. As one way to address this problem, the PT3 project made use of two-way video conferencing to link pre-service teachers and teacher education classes with K-12 students and teachers at distant school locations that included urban centers with diverse student populations. This pilot initiative was designed to explore models for enhancing teacher preparation through these linkages between the university and participating K-12 schools.

Two types of video conferencing were used to enable diverse field experiences for students using technology. At the outset of the project, we planned to use an intrastate fiber optic video network called Vision Athena, managed by the Center for Interactive Learning and Collaboration (<u>http://www.cilc.org</u>), a partner in our project. While we used that network on a limited basis to link to some of our partner schools, IP-based video conferencing equipment from Polycom (<u>http://www.polycom.com</u>) emerged during the early stages of the project as a better way to meet most of 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 Internet video conferencing connection can be established between any two locations with access to a reasonably fast (128 Kbps or better) connection. IP-based video conferencing does not require special distance education rooms or video studios; connections can be established from classroom to classroom.

We used two main types of Polycom video conferencing equipment. Room-to-room video conferencing was supported by equipment such as the Viewstation SP (point-to-point) or Viewstation FX (multipoint) unit. (Today, Polycom's VSX series provides this capability.) These units have an integrated camera with panning and zooming capability that can be controlled remotely. One 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 a point-to-point unit capable of handling a classroom; two units are needed, one on each end of the connection. For person-to-person or small-group-to-small-group connectivity, we used the Polycom ViaVideo computer-based desktop video conferencing unit connected to a Windows PC. (Today's model is the Polycom PVX.) While the smaller desktop video camera is of lesser quality and lacks the panning and zooming capability of the larger Viewstation units, this inexpensive (about \$400) unit provides basic person-to-person connectivity while adding the ability to share computer applications during video conferencing. For basic observations by one or two individuals, a desktop unit can be used

on one end of the connection linking to a room-based unit on the other end. While the costs of these video conferencing units are not trivial, they are substantially less than video conferencing costs of just a decade or so 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.

With the assistance of PT3 project staff, faculty members interested in using the equipment to connect with schools made contacts with teachers in the partner schools. Tentative plans for some sort of video connection were made between the faculty member and the participating K-12 teacher in consultation with the PT3 project staff, school officials, and technical support staff. The project provided equipment to support the activity to the remote school site. Technical support staff in Purdue's College of Education then worked with the technical support staff in the school to set up, test, and maintain the video linkage between the university and the school. The chief obstacle in establishing the connection was creating the necessary point of entry through the school's Internet firewall, which otherwise would block the use of the equipment. This typically required some reconfiguration of the school's firewall to allow the Polycom equipment to function properly.

Several ways of using the video conferencing connections to link teacher education candidates and faculty with K-12 classrooms were explored in our project. Although there were a number of variations, three main types of interactions emerged: (1) short-term class activities, typically involving only one or two video connections, that focused mainly on having pre-service teachers observe a classroom in action and perhaps interact with the teacher about the lesson; (2) longer-term class activities, with regular video connections stretching over a period of weeks, in which pre-service teachers had the opportunity to interact with and actually teach lessons to the students in the remote classroom; and (3) remote observations of student teachers in the classroom by university faculty members.

In one example of a short-term class experience, a faculty member in consumer and family science education had her class of pre-service teachers 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. The pre-service teachers were able to observe the center and interact with the teacher about its operation. In another short-term experience, a faculty member in mathematics education had her mathematics education college students spend two class periods observing mathematics problem-solving activities in an elementary school classroom. Using the ability to control the camera in the classroom, the college students were able to zoom in on selected groups of elementary students to observe how they interacted with one another during the problem-solving activities.

The longest running pilot project involved multiple interactions between a class of pre-service teachers at the university and a diverse elementary school classroom in an inner city community in northern Indiana. Guided by the faculty member in charge of the course, a class section of pre-service teachers in their first teacher education course connected to the elementary classroom once per week for about one to two hours throughout most of a semester. This activity took the place of a traditional early field experience in which the pre-service teachers would have been assigned to various classrooms for two hours of observations per week. In the video conferencing experience, the pre-service teachers initially observed the classroom remotely but gradually expanded their efforts to eventually teach lessons to the K-12 students at a distance to complement the teacher's curriculum.

This project was described in a video program produced for WHRO-TV by Soundprint Media for the *Teaching Now!* video series (available online at <u>http://teachingnow.org/watchTV.php?id=30</u>). This interaction between one or two sections of the teacher education course and the elementary school was repeated over the course of several semesters.

Remote observation of practicum students, i.e. student teachers, was added in the final year of the project. Faculty members in both science education and consumer and family sciences education experimented with remote observation of student teachers as a substitute for some but not all of the normal in-person observations. The video conferencing allowed the faculty supervisors to unobtrusively observe student teachers in the classroom without having to travel to the school site.

Each of these pilot uses of video conferencing offered potential benefits, but also had drawbacks. The intent of this study was to examine participants' perceptions of the benefits and limitations of these uses of video conferencing for observations and virtual field experiences. Data from pre-service teachers, university faculty members, and classroom teachers were analyzed to identify perceived benefits and limitations of this approach.

Methods and Data Sources

Two primary sources of data were utilized in this study. First, pre-service teachers who participated in the long-term video conferencing experience, in which an introductory teacher education class connected to an elementary classroom once per week throughout most of a semester, were surveyed following their experiences. These surveys were administered to two separate groups of pre-service teacher participants (n=21 each) in each of two semesters of the project during an academic year. Surveys consisted of Likert-like and open-ended items designed to elicit candidates' perceptions of the video conferencing field experiences. Surveys were administered online, and were completed by students after they had participated in multiple video conferencing experiences with participating K-12 students and teachers. Data were compiled, including mean responses to Likert-like items and common responses to open-ended items.

Second, to gather more in-depth qualitative data, interviews were conducted near the end of the project with seven faculty members and five classroom teachers who participated in the video conferencing experiences and analyzed using a qualitative-interpretative research paradigm. Semi-structured interviews were employed to gather information about the nature of the video conferencing activities and participants' perceptions of them. Interviews were transcribed and constant comparative analysis (Strauss & Corbin, 1990) was employed to identify common themes related to benefits and limitations of the video conferencing experiences.

Results

Table 1

Pre-service Teachers

Pre-service teachers' responses to the Likert-type survey items about the video conferencing experiences are summarized in Table 1. These data suggest that the pre-service teachers who participated in this experience had relatively positive responses to it; mean responses clustered near a response of "agree." The pre-service teachers tended to agree that they were comfortable with the technology, found it easy to use, learned how to use it as a result of the experiences, 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. Although there were some minor differences, the pattern of responses across the two different groups was similar.

Summary of Pre-Service Teachers' Responses to Likert-type Survey Items Likert-type Survey Item Group 1 Group 2 Mean Mean (n=21) (n=21) By the end of the class, I felt comfortable with video conferencing 3.90 3.71 equipment that we used. The video conferencing in this class was easy to use. 4.00 4.00 I learned how to use video conferencing in education from this class. 3.95 3.67 I believe that the use of video conferencing was a valuable addition 3.95 3.33 to this class. Because of the experience in this class, I feel more comfortable in 3.90 3.62 my ability to use technology for teaching and learning. 3.90 Because of the experience in this class, I feel more comfortable in 4.14 my ability to understand and teach diverse learners.

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

The pre-service teachers' comments in response to open-ended survey items provided further insight into their perceptions of the experience. One of the key advantages cited by the pre-service teachers was the ability to observe a classroom at a distance. One pre-service teacher noted, "We got to watch the students more in their element (because they couldn't see us, so they did not act as different)." Another commented, "I think it was nice to be able to watch the students without being right in the classroom. We were able to see them at the end with them practically forgetting we were there." Another pre-service teacher liked the approach because, "We did not have to all be placed in different schools, and we did not have to leave campus on a weekly basis to go to a local school. We got a chance to see a classroom without actually being there."

A second advantage cited by the pre-service teachers was learning to use the technology itself. One pre-service teacher reported, "I have learned how to use video conferencing to some degree." Another wrote, "I think that I am comfortable with using technology in the classroom." Another future teacher summed up the advantage nicely by saying, "Not only did we get to observe a classroom but we also got to learn how to use new

technology to do this. I think it was very good to learn this because it most likely will be beneficial for us in the future."

A third advantage cited by the pre-service teachers related to their exposure to diversity. As one pre-service teacher reported, "I think the diversity of the class that we taught was the biggest advantage." Another pointed to, "The opportunity to get to experience a multicultural diverse classroom was a unique experience that fit nicely with our block one coursework. It was interesting to view how different their world is compared to the world in which we grew up in." A third commented that it was an advantage, "Being able to see a very diverse classroom and how that is handled by an experienced teacher."

The limitations cited by the pre-service teachers fell into two basic areas, technical problems/limitations of the equipment and not being present in the classroom. One preservice teacher commented, "Sometimes the connection could not be completed and when it was at times it was blurry and slow." Another noted, "There were definitely disadvantages to this too. We could never fully interact with the students because you couldn't see them, hear them." A third remarked, "At times the technology didn't work and was a distraction to the students." The issue of the lack of personal presence was noted by a Purdue student who wrote, "I felt that it was a disadvantage that we were not in the classroom in person." Another put the issue succinctly saying, "There was not a personal relationship built up between us and the students because there were TVs between us."

University Faculty

Through our interviews with university faculty members who participated in these video conferencing linkages with the schools, we explored their perceptions of benefits and limitations as well. Several themes emerged from the analysis of these interviews, and many of these themes mirrored the perceptions of the teacher education students.

One of the themes that emerged from the faculty interviews as an advantage of this approach was the ability for students to see a classroom and an experienced teacher in action. Professor Keith (a pseudonym), who had her English education students observe a high school classroom, saw an advantage for her students by

Allowing them to see that real world connection... Seeing an experienced teacher actually doing some of the things that we were talking about in class as being good things to do, I think lends those strategies the credibility that sometimes, if were talking about something in class and didn't see that actually in the high school class, that they might not certainly believe that it was a good thing to do.

Professor Bates, who had her mathematics education students observe elementary school students doing problem solving, commented that it is

very very hard, almost impossible, to find elementary school classes that teach mathematics as the national curriculum reform would like... So it's a chance for them to see a real teacher and believe it could happen and then see how he/she conducted the class. Very important, they don't have many models that they have a chance to see what this might look like... And this is an excellent example actually too, not just of a classroom like that, but someone who is really really good at teaching. That, I think, was a big benefit. Professor Jones, who integrated observations into her beginning teacher education course, commented on the insights the experience provided for her about her teacher education students and their observational skills, saying

Through sitting in one room with these students and all observing the same teacher teach, and debriefing and having discussions around that, I realized that they didn't see the same things at all that I see. Because as an experienced teacher you learn to view, for example, student-teacher interaction in a different way than someone who's seeing it from a student perspective.

Like the pre-service teachers, the faculty members also saw benefits in exposing the university students to the relatively new technology of video conferencing. Professor McDonald, who required his students in a beginning teacher education course to observe a middle school classroom, identified learning about technology as one of his goals, saying, "I wanted to get my students to experience the technology, and get them to think critically about how they would use it in their programs as a teacher." This exposure to technology benefited not just the students but some of the faculty members themselves. Professor Jones, who also used the video conferencing in a beginning teacher education course, commented,

I'm not into technology. I don't use much technology. So one of the objectives was to bring myself a little more into the world of technology. It's also part of the mandate for [the course] that students will be exposed to exemplary uses of technology, and that students will see or model use of technology, and that they'll learn about technology that they could use with their students. So that's one of the reasons I wanted to do it.

Use of the equipment itself afforded certain advantages. Professor Grant used the technology to observe student teachers at a distance. She commented

It's really kind of neat, because you could adjust the camera to scan the whole room, actually zoom right in to what the high school students were preparing. Very different in the sense that I could zoom in, see what's going on, and not be distracting to them. Whereas if I was there in person, I would've had to get up and walk away from where I was sitting, to see what they are doing.

She also commented on her own use of the technology, noting

The equipment was really much easier to use, that's a part of my skepticism because I was not familiar with it. But you know, really a low level of background, I had a low level of background, and it didn't matter. I was able to learn what I needed very easily.

Professor Hawkins also used the technology for remote student teacher supervision. He reported

I feel the most beneficial was the ability to make extra visits without driving over there, and I think to observe in another way was beneficial. I also liked the fact that I could, you know, I would dial in before school started, we could talk, or if the kids were there for special, I could talk to the teacher.

Exposure to diversity was another important theme identified by several of the faculty members. Professor Evans used video conferencing in the context of a teacher education class on multiculturalism in education. He remarked, "Purdue students do not

have much exposure to the types of diversity that I value. That will be race, class, gender types of differences. I found it beneficial they connected with students, to have some exposures to those issues." He went on to observe

They began to see how the reading, the theoretical stuff they are doing in multicultural education, applies to school. They see a curriculum of a teacher working in a multicultural, multilingual school and multilingual classroom. They can actually see the things they read about laid out in the teacher's classroom.

Professor Jones, whose beginning teacher education course shared a field experience with the multiculturalism course, found that connecting to a classroom in an urban, diverse school gave her teacher education students some much-needed perspective on the students in such schools. She explained

The opportunity to have my students interact with children different than children they had grown up with was something that I decided would be very valuable for them. The opportunity to work with teachers who are committed to working with these kids. These teachers are absolutely awesome teachers who work with all sorts of children (ESL, bilingual, low S.E.S.), and they treat them like they're not deficient. My students think they come from single parent or poor families, whatever, and are going to have these deficits. And actually they think that this would impede their learning. They start to observe a classroom like that, and teach these students over the Internet, and start to realize that these children are not deficient; they're bright. One of my students said to me, "I don't know how am I going to be able to teach kids like this; they're just so smart."

The faculty members also saw benefits of the project for other participants. Professor Grant found the teachers she worked with to be open to this new approach, saying "All three teachers were very willing to try something new, even though they had not done this type of videoconferencing. They were all aware and knew it was out there." Professor Jones saw benefits for the teacher she worked with, noting, "There are benefits for the teachers too. [The teacher I worked with] is using this for National Board Certification, she won a Crystal Apple Award here, she won best teacher... I'm not saying it's just this that just did that, but it's part of a recognition that she's a really great teacher who's trying things." Professor Jones also felt that the school children benefited from their interaction with Purdue students. She explained,

I think it's good for the kids... They don't have maybe anyone in their family who has gone to college or even talked about college. And suddenly they're talking to college kids on a weekly basis, and they say things like "What do you guys eat?" My students will say "We eat pizza and hamburgers." "Oh, you can eat pizza and hamburgers at college?"... I don't know what they think a university is, but it's somewhat demystified. Maybe I'm Pollyannish, but I think that all those connections count. I remember one student saying that no one in her family had gone to college, and one day she came on a field trip to Purdue, and then that changed her whole life. She realized that university wasn't what she thought. I'm hoping that some of those kids can think that maybe I can go to college too. And they just love, they call them, their Purdue friends, buddies. They love just being connected to university students.

Although the faculty members saw a number of clear benefits of the video conferencing linkages, they also recognized problems and limitations. The technology, while generally working fairly well, did have problems. Professor Keith noted, "The control of the camera was a little awkward." She also observed, "I think [the pre-service teachers] found the quality of the video interaction a little bit more bothersome than what I did. I don't think they were sure of what the real purpose of it was to be honest." Professor Hawkins commented on the poor connection to one site, saying, "It was disappointing at the elementary because, in many instances, the teacher had to unplug their email. There is only one plug, so they had to unplug their computer, plug in the Polycom. It was slow, and it wasn't a good picture. Sometimes, you couldn't tell who was the teacher, who was student teacher." Professor Jones said, "I thought the technology would be better than what it was. There were quite a few problems." She continued, "The imperfection of the technology, and the fact that they're not in a real classroom is a problem. You're looking at the kids in the Internet, on a TV screen. That is not the same as being right there where you can see every nuance of their facial expression."

Nearly all of the faculty members cited logistical problems and the work involved in conducting virtual sessions as a limitation. Professor Keith observed, "It was really hard to schedule because of time." Professor McDonald echoed this concern, saying, "Schedules create a big barrier." Professor Grant said,

I think another surprising aspect to me is that it does take a lot of coordination, a lot practices, a lot layers when I started creating it, all those pieces facilitating success. There really is team effort. I'm not sure that surprised me, but it certainly, it really like does take several people working together to make this happen.

Professor Jones commented, "I think it is too labor intensive to do this kind of project. It takes a huge amount of time." All agreed that technology support was crucial for success. Professor Grant said, "The key factor... is good technical support." Professor McDonald stated, "If I hadn't had the technical support, I would have been discouraged from doing it. The technical support are really people who deserve the congratulations for a job well done. It wouldn't have happened without them."

Despite the limitations, the overall sense among most of the faculty participants was fairly positive. Professor Keith said, "I really don't think there was anything bad about it. It was just I needed to work more in terms of my curriculum... If I would have to do it again I'd like to more fully integrate it into my course plan." Professor Evans commented, "The response overall is supportive. They really like the experience of connecting with [the school site]." Professor Jones captured these mixed sentiments, noting

At the end [the pre-service teachers] would be fairly happy with what they've accomplished and what they've done, but they also indicate some regret around not having been in a regular classroom... So it's a continuum of responses from "I don't like this technology thing, I wish I'd been in a real classroom" to "This was fantastic, I'd like to try this in my class" and kind of anything between the two depending on the students. Overall, it had to be positive enough for me to continue doing this.

K-12 Teachers

A sample of the participating K-12 teachers was also interviewed about the benefits and limitations of the video conferencing approach. As a group, they had less to say than the pre-service teachers and university faculty members. However, their comments echo many of the themes reported previously.

The teachers were generally positive about their experiences. One teacher remarked, "Me and the class all enjoyed it. Overall it was a very positive... The questioning and answering was good." Another teacher reported, "It was very positive experience. Had virtual tour. Did question and answer... It was fascinating process to use technology in that way. I think it's a positive experience for us all." She continued on to say, "First of all, I guess I was a little skeptical about how the technology would work. The technology worked more successfully than I thought. The college students were well-prepared and had questions. It worked better than I thought."

Several comments from the teachers supported the diversity theme mentioned by both the pre-service teachers and university faculty members. One of the teachers commented

I think it's a valuable tool for multicultural classes. Instead of just talking about it in class, they can go where these children live. Students should go to culturally diverse classes so that they can become more sympathetic and understanding of these children.

Another expressed similar feeling by saying

I teach in a culturally diverse school. By connecting to Purdue, the college students can see different things than they can in the schools of Lafayette area. We celebrate our diversity. We see it as our strength. It's an advantage to use media to see such diversity. College students can gain some insights of the diverse classroom.

The limitations cited by the teachers included the technical problems cited by other groups. One teacher commented, "Some technical glitches were a bit frustrating, but not much." Another noted that "When the screen was pixelating, or with the whole group setting, the attention did waver." A few of the teachers expressed initial discomfort at having their classrooms opened to observations. One of the teachers explained, "At first I was a bit nervous, because I didn't want to be judged. I've been teaching 20 years, and it feels a bit uncomfortable when suddenly many students are watching you." Finally, for some of the teachers, there was little benefit for participating in the experience. One teacher said, "I think it was beneficial for the Purdue students, but not really for us." Another echoed this comment, saying, "Happy to do it. But no particular advantages for my class to do that."

Conclusions and Implications

This study examined the benefits and limitations of the use of video conferencing as a tool for linking teacher educators and pre-service teachers with K-12 teachers and students at a distance. Different models for making connections between one university's teacher education program and participating K-12 schools were explored. Pre-service teachers, university faculty members, and participating K-12 teachers shared their perceptions of this

innovative project.

There was agreement across the groups of participants that this use of video conferencing offered certain benefits. Among the most compelling benefit was the ability to expose pre-service teachers to examples of classroom diversity that might otherwise be difficult or impossible for them to experience. University faculty, classroom teachers, and pre-service teachers themselves all agreed that the ability to observe and interact with diverse classrooms was a positive outcome of the project. For colleges of education located in rural areas, such as Purdue, video conferencing offers one means to allow pre-service teachers, who themselves are often from rural and homogenous communities, to have experience with and so come to better understand the diversity that increasingly characterizes America's classrooms. This understanding is a first step toward learning how to teach in culturally responsive ways (Gay, 2000; Ladson-Billings, 2001).

These video conferencing linkages also provided pre-service teachers with examples of classroom practice that they might not otherwise get a chance to observe. The prospective teachers had the opportunity to observe expert teachers in action, and they had the opportunity to observe specific kinds of classrooms and classroom activities (e.g., diverse and multilingual classroom, reform-oriented mathematics problem-solving, in-school child care facility) that often are unavailable near the university. While recorded video of such settings might suffice in some circumstances, the live video connection offered interactivity and hence a dynamism that recorded video lacks. As Professor Jones commented in her interview, "Some people say 'Why not just tape the teacher and show it to everyone?". That's not it. Passively watching a tape is not the point. It's to be part of the experience.... Without that interactive element, it would be something I wouldn't have used at all."

Of course, this approach also helped the pre-service teachers, as well as the faculty and teachers, learn about and use a cutting-edge technology. Technology integration and use, after all, was the central focus of the PT3 initiative in which this project took place. Through the project, the pre-service teachers began to see the technology as a tool that could be used for teaching and their own and others' learning. As the cost of video conferencing equipment continues to decline, and as network capacity expands, it is likely that this technology will become much more widespread in schools in the future. Thus, by exposing prospective teachers to the technology today, we plant the seeds for what may be more and more effective use in the schools of the future.

Despite these benefits, there are clear limitations that must be weighed when considering any potential implementation of this approach. The technology itself, while pretty good, is far from perfect. All three groups of participants cited technical difficulties that ranged from a complete failure to connect on some occasions to pixelation (video breakup) and slowed transmission to the inability to clearly see and hear participants on the far end of the connection. These problems can limit, sometimes severely, the utility of video conferencing as a tool for real-time communication between universities and schools. However, as Professor Bates observed, "The equipment is awkward. The technology is awkward. But, it's going to get better." We can expect the technical problems to diminish as the technology itself matures.

Other limitations, however, are likely to continue to be issues. For the pre-service teachers, the video conferencing experiences lacked some of the authenticity of an actual field

experience. The physical distance also created some psychological distance, such that it was difficult for the university students to create relationships with the K-12 students. As the one pre-service teacher so aptly put it, "there were TVs between us."

For the university faculty members and school teachers, the time and effort involved in working out the logistics of making video conferencing connections was an issue. Schedules had to be aligned, class activities planned, and communication techniques practiced. This added a significant extra burden to their preparations, and this occurred despite the fact that during the project PT3 and IT staff members assisted in working out the logistics of the connections. Without this added support, it would be very difficult for faculty members and teachers to work out video conferencing connections on their own.

Finally, an important issue for the teachers and schools is the benefit of being involved in this sort of activity. Two of the teachers interviewed after the project felt that the project was worthwhile for the teacher education students but not particularly of value to themselves or their students. This may not have been true in every case. Professor Jones reported that she felt there were benefits both for the teacher and for the K-12 school children with whom her class worked. However, it probably is true that these experiences are of more benefit to the pre-service teachers than to the other participants. Therefore, universities must consider how best to craft such experiences so that mutual benefits accrue to the K-12 teachers and students.

This study suggests that technology-enabled field experiences may be a viable option for some types of student observations and for interactions between teacher education candidates and K-12 students and teachers. Video conferencing over the Internet is a new tool that expands the options available to teacher preparation programs to help future teachers develop their knowledge and skills. If the limitations of this approach are acknowledged and appropriate steps are taken to minimize the shortcomings, this approach may give teacher education program more flexibility in addressing the field experience needs of their pre-service teachers.

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 through video conferencing offer promise as a way to expand the options for linking pre-service teachers with K-12 teachers and students. While we do not advocate replacing traditional field experiences with virtual field experiences, these experiences do offer a way to augment the experiences of prospective teachers in university teacher preparation programs.

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