In recent years corporations and educational institutions have begun to look at video teleconferencing (videoconferencing or VTEL) as a means to provide training and offer educational programs. Our investigation focused upon preservice teachers’ use of videoconferencing as a tool for sharing ideas and experiences. Our students, located at two very different geographical sites, were all graduate students in teacher education programs in mathematics and science at a large southeastern US university. One site is located in a rural setting, the other in a large urban area. The students communicated using synchronous two-way audio and video.

Reaching the educational value of videoconferencing

Videoconferencing was studied by Schiller and Mitchell (1993), who considered it effective when student and teacher sessions involved a high level of interaction, as if everyone were in the same room. According to Miller, McKenna and Ramsey (1993), advantages of videoconferencing included being able to increase course enrolment as well as reducing faculty
and student travel requirements. Freeman (1998) studied how this technology is used with large classes and multiple campuses. He found up-front costs were substantial, but cost-effectiveness could be achieved over time if many courses were involved, especially in cases of large classes and multi-campus locations. Miller et al. concluded that distance learning has developed primarily for its economic rather than educational benefits. We found that, in addition, VTEL may promote collaboration and exchange of ideas between students at different sites.

Willis (1992), Bates (1991) and Rowntree (1990) each point out a prominent disadvantage of using VTEL: specialized equipment and technical assistance is required. Further, because commercial television tends to condition viewers to passivity, special instructional design considerations and systematic planning are necessary to maintain student interaction. On the other hand, Pirkl (1990) found VTEL technology has potential to contribute to programs that are struggling to adjust curricula to meet the personal needs of each student.

A collaborative action research project

The collaborative action research method has emerged in education in recent years for the purpose of understanding and improving teacher thinking (Pate, 1997; Elliott, 1990; Noffke & Zeichner, 1987; Carr & Kemmis, 1983). We were interested in how combining collaborative techniques and VTEL technology could influence the preparation of pre-service science teachers. When we refer to action research, we are referring to a subset of action research called collaborative action research, and even more specifically, to a subset of collaborative action research, collaborative group action research. In our study, we made use of collaborative group action research to answer our question concerning the effectiveness of VTEL as a distance learning tool in pre-service teacher education.

As illustrated in Figure 1, action research is rooted in the work of Kurt Lewin (1947), often cited as the "founder" of this form of research. Action research combines interventive actions and group research. Lewin's research in "group dynamics" was a cylindrical process involving a recursive, nonlinear pattern of planning, acting, observing, and reflecting on
changes in social situations observed by a facilitator. We are using Lewin's definition of action research as the basis of our definition of collaborative group action research.

Action research has and will continue to be used to look at roles and processes that initiate changes not only in education, but in industry, community development, and the military (Noffke, 1995). In this process, two or more researchers work together,

ACTION RESEARCH

COLLABORATIVE ACTION RESEARCH

COLLABORATIVE GROUP ACTION RESEARCH

Figure 1. Relationship of collaborative group action research to collaborative action research and action research

meeting regularly to reflect, plan, and conduct the study, actively exchanging ideas and expertise and continually interacting as they act to improve their practice. Our own collaboration involved a group of pre-service teachers and university educators. We engaged in a process of collaborative group action research that involved a particular sequence of
research strategies and theoretical perspectives (Saurino, 1998; Saurino & Saurino, 1996). The beneficiaries of the process are the students, yet the teachers and university researcher also benefit, as everyone learns from the process.

The various types of collaborative action research have some common characteristics. Collaborative action research is generally qualitative in nature, aimed at developing new insights into schooling, education, teaching, learning, and/or finding new approaches to solving educational problems. The desire is for a deeper, richer understanding of the topic, and thus this type of research also involves reflection, which provides a means for understanding what was experienced in the research process and the implications of the findings. The study continues by repeating the process again, with either a new question or a refinement of a previous question, based on what was learned. Therefore, collaborative action research can be an ongoing, recursive sequence.

**Our Cycle of Collaborative Group Action Research**

The research group in our study consisted of two cohorts of pre-service middle and high school science and math teachers, and several university collaborators. Three videoteleconferencing sessions were scheduled throughout a recent semester. We aimed at establishing an informal environment where questions could be asked and answered, problems discussed, and common ground created. The group setting also provided an opportunity for new ideas to emerge, as well as strategies, and techniques for initiating actions, solving problems, and ultimately answering the research question.

The research process completed by our study involved a number of phases, including a planning phase for future cycles. The recursive collaborative group action research cycle is illustrated in Figure 2. After the first cycle, research questions could be modified or replaced, based on what had been learned. Our Planning Phase (in Figure 2) began with initial meetings of the pre-service teachers and the university researchers early in the semester. The students had volunteered to participate in the study but were not well versed in the process of conducting this type of research.
The general plan of creating a research question, actions and interactions, collecting data, and reflecting was discussed and a basic time frame for the cycle of research was established. The students had a variety of questions and concerns that were expressed and discussed.

During the project, meetings were audio-taped and field notes created from observations. By the end of the planning phase the research question had been determined, which was: *How can videoconferencing (VTEL) enrich the preparation of graduate pre-service science teachers?*

The students participated in the VTEL sessions as part of their course-work. Students at the main campus, in the rural locale, represented more traditional graduate students. They engaged in their planned major with little real work experience within their field of study. The extended campus, located in a large metropolitan area, consisted mainly of students in the process of mid-career changes. These students had held previous positions in corporate organizations, the military, or government, and had extensive work experience. Students at both campuses had been selected to go through their programs as a cohort.

The intention of the university faculty was to use the distance learning technology to enrich each student’s internship year experience. We wanted to provide each student with opportunities to engage with colleagues in discussions about educational issues and topics of mutual interest. Each campus was equipped with the appropriate technology, including
television monitors, cameras, microphones, and control panels to establish videoconferencing connections with the two sites. The technology included general open microphones and special push-to-talk microphones, which also directed and zoomed the camera to a close-up of the speaker. The combination of microphones allowed for general and individual interaction throughout the sessions.

The next phase (Baseline Data Collection in Figure 2) would normally be a collection of data that answered the question, “What is the current situation in reference to our research question?” However, since we were beginning a new project there was little data to collect. The situation was that we had never tried the form of distance learning interactions we were attempting, nor could we find any other research on the specific topic. Our baseline data summarized that we intended to try a series of VTEL sessions with varying themes to see how the technology might be utilized in pre-service teacher education.

The next phases (Actions/Interactions, Reflection and Adjustment of Interactions in Figure 2) began with our first VTEL session in September. University faculty participated in all sessions, that followed a format of sharing experiences using a theme question. This approach was a novel experience for all participants, as the first observations reflected (the “Rural” group was the main campus; the “Urban” group was the mid-career cohort from the metropolitan area:

**Field Notes Summary-Session 1 (September, 1998):** The discussion appeared awkward initially, as (the Rural students) looked at the National Science Education standards, and (the Urban students) looked at the (Virginia) Standards of Learning (curriculum framework, “SOLs”). Since the (the Urban) students had already been in the local schools’ classrooms, the initial discussion was dominated by topics such as: how to develop complementary science/math lessons; comfort level of SOLs with teachers, and making course work relevant. (The Rural) students made reference to the abundance of technology in (the Urban area) and the conversation shifted to comparisons between rural (area) and (the Urban area).

There was a strong interest in the diversity of cultural experiences within the educational system in (the Urban area). However, this interest was articulated and
expressed by students located in the urban environment. Students from the rural environment were more apprehensive about working with students from diverse backgrounds. This may be because they were younger students who by and large had not experienced careers. (Students in the urban program were second career people with varied career experiences such as military, government, etc.) Nevertheless, participants interpreted this initial session as an opportunity for cultural exchange. The introductory session allowed the students to acquaint and familiarize themselves with this form of technology.

The technology allowed for fluent interaction, yet there was a need for the groups to adapt to the flow from one campus to the other. As the conversation led to a verbalization of where students were with their respective programs, the following excerpt reflects the content and pacing of the initial interactions:

Researcher #1 (Rural campus): Our students do not go out into the field for another three weeks. We are set up a little differently. (He continues to discuss what his students are presently engaged in).

Researcher #2 (Urban campus): Our students have been working more with the (state standards) and they have been specifically looking at the local school environment. They will have some discussion questions for the group.

Researcher #1: I think the best thing to do is to let the students start talking, so I am going to be quiet.

One of the urban students began with a question having to do with how math and science were being integrated in the schools.

Student 1 (urban): One of the things we’ve discovered with just our first three days in the classroom is that all of our sponsored teachers have a wide variety of experience with the (state standards) and integrated curriculum in middle school and high school.

Student 2 (rural): I think some of us are kind of afraid to talk to you guys since we haven’t had a chance to actually go into the schools yet. I know I’m looking forward to meeting with some of the teachers and talking to them about real life and what really goes on in the classroom.
Student 3 (urban): (Describing his typical day in the classroom) it is difficult to get into a group environment (for integration) because of the old standard desks. There are no tables.

Researcher #1: I think this makes a very good point about the control of facilities. Many times you have to overcome barriers.

Student 3 (urban): It is interesting to see all the technology they have available to the students. (describes all equipment being utilized) It will be interesting to see what is up here and what they have in the more rural areas.

Several topics were discussed in the session and individuals were encouraged to ask questions of personal interest, such as in the following exchange:

Student 4 (rural): I know that I’m planning on putting this rural area to good use and implementing field study and outdoor research as much as I can. Have any of your advising teachers had any experience with that, and if so, do they think it works?

Student 5 (urban): I know in my high school they take field trips to natural parks and even to (x) Hospital to watch open heart surgery. They may not have some of the same opportunities you see in your area, but they are certainly exposed to things outside the classroom.

The next two sessions maintained similar formats with discussion questions covering a variety of topics. Some of the issues raised are included in the following excerpts:

Topic Question: Did you perceive any instances of teacher administrator preference or discrimination, for example by gender, ethnic origin, or social class?

Student 6 (urban): As far as I can tell in my classroom, the teacher calls on both genders equally and there does not appear to be any bias with perspective to any particular ethnic group.

Student 5 (urban): My cooperating teacher has made an effort to call on every student at least once and I’m trying to do this as well.

Student 7 (urban): I’m teaching high school biology. The balance of my classroom is largely Middle Eastern and Hispanic. I have seen no preference except for students who are more performance driven, which is the tendency when the classrooms are
large. The focus is on the people who always have their hands raised and always
turning their work in on time and listening attentively.

Researcher # 3 (Rural campus): Were there any signs of subtle discriminations, and I’ll
give you an example; pictures of famous mathematicians or scientists used in the
classroom being inclusive rather than exclusive?

There was concern regarding giving certain populations of students enough time to answer
questions, or to write assignments. The recognition of body language used as avoidance of
being called upon was also discussed briefly, before the following:

Student 8 (urban): When I first started, I would not call on kids unless they raised their
hand. Then I went to “back to school night” where parents expressed their concern
over their kids not being called on. They didn’t want their kids to be excluded, or to get
away with no participation. Some just needed a little push to get going.

Student 7: I was happily able to discover they have a flexible camera in my classroom
and I was able to get the microscope in focus with the cell I was looking at. Being able
to broadcast the microscope onto the screen in the classrooms helps the students
tremendously to stay involved.

Student 9 (rural): A teacher I know talks about giving each student a bag of M&Ms.
They pour them out on the table and sort them. They have tables and graphs to fill out.
They get to talk about their experience and everybody seems happy. Plus, they get to
eat the M&Ms (candies).

Student 5: Our class field trip collected various specimens in (a nearby state) from
several sites. We spent the next two weeks classifying them and then sometimes some
taxidermy when they died prematurely. We did all sorts of preservation and went
through a really healthy analysis of everything. The kids were amazingly involved.

Our final session included topics such as motivation of students, tracking, and professional
growth of the student teachers and culminated with a discussion of the benefits and difficulties
of the VTEL technology and format of our sessions. Highlights of the summary discussion
with some of the positive and negative aspects of the sessions follow:
Researcher # 1: Can we go on to some summary questions? What benefits have you received from the VTEL sessions?

Student 4 (rural): I found that it was helpful because I know there was a difference between that part of the country and this part of the country. I think it is important to realize the differences and similarities.

Student 8 (urban): I think the VTEL seminars amongst ourselves were extremely helpful because you realized you weren’t alone. It’s nice to know that you’re not the only one making mistakes - that it happens in this area and (the rural area) as well.

Student 2 (rural): Part of the battle is knowing what you are getting into. In this program I have been able to see education in a very urban environment. Discussing education and teaching in a rural environment has given me a bigger picture of the responsibility that we as educators have. I think that is going to be important whether we are in an urban or rural area. I think it has a big impact on how we view our classrooms and view our situations.

Researcher # 1: Let’s expand our discussion to negative aspects of VTEL.

Student 9 (rural): I find it hard. I don’t know where to look and where to talk. I think it’s kind of hard to actually do this. It’s much harder than if you guys were in the same room.

Researcher # 1: Has it gotten easier over the three sessions?

Student 9: We have been in three different rooms, but I guess it has gotten easier.

Student 7 (urban): The pace of the VTEL is annoying to me, and I think we would recognize more in common if we didn’t have a pause every time the camera is focusing ... I think you have to spend extra effort coordinating who is going to talk next ... which is more cumbersome.

Researcher # 1: Let’s do a little brainstorming about what we can do in the future given this technology ... what can we pursue in the future that would be of interest to you?

Student 1 (urban): Maybe have smaller groups where we can see everyone. It helps to be able to see everyone at once.
Student 3 (urban): I like it when we come up with a set of questions of interest to us. I feel better prepared to come in and discuss things. Maybe the first fifteen minutes more structured discussion, and the rest unstructured.

Student 2 (rural): I really like the idea of structure. If someone solicited particular answers or responses from us individually and prearranged for us to do three or four minute presentations, then allow for some complimentary ideas from our colleagues, that would better address any questions we all might have.

Researcher #2: I was going to say something very similar to that and I guess great minds run together. Maybe we can have mini-presentations with the concept of a panel discussion.

Participants in the VTEL sessions completed anonymous evaluations. Many noted positive and negative points about the technology. Many reacted negatively to the intrusive nature of the camera, like this rural student: “…the technology was somewhat distracting. I personally felt like I was watching a show - wondering where the camera would move next, etc.” That same student later wrote that, “The positives far outweigh the negatives … It was really good to hear some of the experiences of the (urban) students.” Another rural student wrote, “I was honestly interested in hearing about their experiences, especially how they are interacting with their advising instructors, and in discussing what really works and doesn’t in today’s schools.” And still another wrote, “The (urban) students had valuable tidbits to share with us. I am particularly interested in the block scheduling because I have no experience with it and know that it is the direction in which schools are now moving.”

Summary and Conclusions

Through video teleconferencing, students were able to reflect on their own field placements by comparing and contrasting their experiences with others working in different cultures and locations. Students expressed interest in the others’ program and in teaching experiences in cultures different from their own. Although rural students were exposed to less cultural diversity in their setting, they learned what to anticipate if they applied for jobs in completely different teaching environments. Students thought about their own teaching and
about issues such as educational standards by comparing how standards were being met in different schools. Overall, the teleconferencing facilitated sharing of different viewpoints and teaching strategies.

The research process was helpful in deciding what questions to ask and what topics to address. Student feedback was received in classes or through course list serv postings. This feedback was used to design the structure of subsequent teleconferences. Communication between the researchers from the two sites was enhanced by regular emails and phone conversations. This mutual support network is essential for planning and articulation of strategies to use the technology effectively.

References


Willis, B. (1992). Effective distance education. A primer for faculty and administrators (Monograph Series in Distance Education No. 2). Fairbanks, AK: University of Alaska Center for Cross-Cultural Studies.