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ABSTRACT

This study explored video technology as a tool to overcome problems of distance, cost, and shortage of presenters hindering the professional development of rural science teachers. A qualitative design was used to collect data on how 4 teachers responded to 10 videotaped vignettes of science instruction. The 4-minute vignettes showed urban teachers engaging students in hands-on activities to discover scientific principles. Three of the responding teachers were in their second year of teaching and the fourth had taught for 8 years. The teachers provided responses to the vignettes in interviews, videotaped data, and journals, and during classroom observations. Data were transcribed into protocols and categorized according to prevalent themes. The data were verified using juxtapositioning, recurring data, and triangulation. Although three of the four teachers were initially skeptical of vignettes that did not match their classroom environment, they seemed to construct their own meaning of the vignettes as they reflected upon their classroom practices. The findings suggest that vignettes could be valuable tools for professional development, particularly with the support of an external person or other staff members. Present and future possibilities are outlined for the use of vignettes in distance education for teachers. (Contains 24 references.) (KS)

PROFESSIONAL DEVELOPMENT OF SCIENCE TEACHING via DISTANCE TECHNOLOGY

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Abstract

Providing professional development opportunities to teachers in remote schools is a challenge. There are few people offering professional development opportunities and remote schools suffer when in competition with their urban counterparts. Even if experienced personnel were available, the cost of getting teachers to a central site or the presenter to remote schools is more costly than most school divisions can afford. This study explored video technology as a tool to overcome problems of distance, cost and shortage of presenters involved in the professional development of science teachers.

Central to understanding how video technology may be used to overcome professional development problems is describing how teachers respond to video technology. Specifically, how they respond after viewing videotaped vignettes of science instruction. The vignettes used in this study demonstrated how teachers engage students in manipulating materials to discover scientific principles. The definition of a vignette in this discussion is a pictorial representation such as a brief scene in a movie. A qualitative design was used to collect data on how four teachers responded to ten vignettes.

The data collected suggested that after viewing vignettes teachers examined problems with their own classroom practices. If teachers frame problems and attempt to solve problems with their classroom practices then vignettes sent or transmitted to remote schools can be used as a tool to provide professional development opportunities. Professional development opportunities using vignettes could be offered at times convenient to the school, include the principal and school staff, be offered without closing the school and offer a long range plan.

This paper will demonstrate that professional development of teachers using video technology is feasible. By using video technology some of the problems encountered in rural and remote schools in keeping their staffs informed of educational innovations may be solved. Prior to establishing a framework the terms used will be defined.

Professional development is defined as having two parts: learning what it means to be an education professional, and developing professional expertise. To be an educational professional implies that teachers have specific knowledge that is applied in a classroom situation. Shulman (1987) suggests that teachers have specific knowledge related to curriculum, students, how students work and learn, classroom strategies, educational goals and how to apply this knowledge to teach discreet subject matter. Schon (1983, 1987) suggests that this professional knowledge is developed when professionals, in this case teachers, reflect upon their activities.

According to Driver and Erickson (1983), Erickson (1987), Mackinnon and Erickson (1988), and Smith (1993) teacher reflection is necessary for teachers to change what they are doing in the classroom. This change requires them to frame problems and solve these problems using their professional knowledge within a classroom situation. The reason for this notion is that teaching requires knowledge of content, pedagogy and context. Central to this notion is that teachers frame problems with their practices and after reflection, may solve these problems and increase their

repertoire of educational practices. The study suggests that videotaped vignettes may assist teachers in reflecting upon their classroom practices.

The study used vignettes of classroom practices to promote reflection among teachers viewing the vignettes. A vignette is defined as a pictorial representation such as a brief scene in a movie. The vignettes demonstrated experienced teachers implementing hands-on science in classrooms. The study examined the responses of other teachers in similar grades after viewing these vignettes.

Rural Profssional Development

Normally when professional development sessions are conducted, groups of teachers meet to view demonstrations or discuss educational problems with their colleagues. Teachers in remote or rural communities are not afforded the same professional deelopment opportunities as their urban counterparts. Cost of travel and lack of speakers limit rural professional development opportunities. The study suggests that videotaped vignettes may be used to offer professional development sessions at a time convenient to the rural school and when the professional development presenter is at a distance from the teachers receiving the professional development opportunity. This model is similar to distance education. According to Holmberg (1979) distance education occurs when information is exchanged between instructor and "learner" who are separated by distance.

Distance Education using Video Technology

Videotaped vignettes and educational messages have been used to transmit educational ideas for the past 30 years. Piper and Butts (1969) found teachers preferred videotaped information to live television when receiving inservice training. One important factor in this research was the control a teacher had over the technology. Video technology could be viewed in the teacher's environment at a time convenient to the teacher. Television transmissions had to be watched at the time of transmission. However, these transmissions can now be videotaped and watched at a later time. Neufeld and Birch (1985) compared data collected from participants receiving instruction via televised presentations compared to participants attending class. They found that the participants preferred televised information as the presentation incorporated more visual aids and they paid more attention to the televised message than to a presenter. Eli-Meligi (1985) in Eygpt found that when teachers received information via video technology they incorporated some of the information into their classrooms.

Method

Minnis (1985) stated that distance education lacks grounded research and suggests that qualitative methodology would substantiate distance education as an area of research. One reason that qualitative research is lacking in distance education is the difficulty of finding participants who would provide responses to research questions while in a rural setting. This research took one school year in which the researcher travelled to two remote

sites monthly.

Four teachers volunteered for the research. Three of the teachers were in their second year of teaching and the fourth had taught for eight years. These four teachers from two semi isolated schools provided responses during interviews, videotaped data, journals and classroom observations. The data were transcribed into protocols and then categorized according to prevalent themes. Once the data had been categorized it was verified using juxtapositioning, reoccuring data, and triangulation, shared data among teachers. The draft report was then presented to the participants for member checking.

Participants Responses to Videotaped Vignettes

The participants viewed a videotaped vignette of a class doing hands-on science. The ten vignettes each four minutes long were of urban teachers demonstrating hands-on activities in their classrooms. Three of the four rural participants were skeptical of the vignettes. They stated the vignettes were staged, unrealistic and edited. At first it seemed that the teachers were going to reject the vignettes as being idealistic. Instead they compared their classrooms to the vignettes and framed problems with their own science classes. Following is how the four teachers, Kathy, Kent, Susan and Velma responded to the vignettes.

Kathy

Kathy viewed the vignettes and made inferences about teacher practices.

> Kathy: If this is not staged and she [vignettes teacher] can do that [teach that way] and those kids are listening

to her, she has obviously planned a lot and the students know what they are supposed to do.

Kathy, who at first thought the vignettes had been staged, later assumed that she watched a realistic classroom situation. She then linked good classroom management to planning and setting class expectations. Kathy then applied this information to a problem she had in teaching hands-on science. Central to this problem was that she did not teach science in groups. The reason she did not group her students is that she had problems using groups and wondered how you would teach science that way. The vignette had prompted Kathy to examine the way she taught science.

> Kathy: I don't see how you can go into a science lesson and say "Okay, we are going to do this" and whatever happens, happens. Because you may get a number of things happening that may not lead to the correct scientific answer.

To ensure her students were getting the correct scientific answer Kathy used notes from a science book to teach science. However, she was not totally convinced that this is the way she would like to teach science. She stated that the way to teach science was to have the students solve problems in a group situation. When Kathy's class was videotaped she had grouped her students and had them compare a hard boiled egg to a cell. Although this could not be considered a scientific problem she had restructured her class and the way she taught science. In the following excerpt Kathy links the change in her teaching practices to the videotaped vignettes.

> ...seeing that it [students working in groups on the vignettes] can work...that's when I decided to do it [group her students]...and I thought that I liked the way

> the room on that film [vignettes] looked with the different groups working and I decided to give it a try.

It seems that viewing the vignettes prompted Kathy to reconsider the way she structured her classroom and taught science.

Kent

Kent was more skeptical and analytical of the vignettes than Kathy. Perhaps the reason for his attitude toward the vignettes is Kent had a degree in science. He was also considered the "science person" in the school and other teachers approached him for assistance. His critical attitude is stated in an excerpt from his first interview.

> Some of them [activities] are not viable for a single teacher in a class to do. One activity has students testing the pollution caused by car exhaust. My concern is kids inhaling exhaust...and having only four student involved. Where is the rest of the class.

Obviously, Kent would not use this activity in his class or would alter it considerably. What this relates is that one must endeavour to demonstrate realistic class situations on vignettes if teachers are going to use them to reflect upon their practices. Since Kent had an extensive background in science education, he had seen many of the activities. However, viewing the vignettes benefitted him as he realized different ways of distributing materials to his groups.

> Kent: I got some ideas [from the vignettes] on how to do activities. I noticed how she [vignettes teacher] had the materials set out. I changed some of the things she did such as putting the items into little cups instead of having them on a sheet of paper.
>
> I still wonder what the teacher used her anecdotal comments for. The teacher was writing things down, and

I never knew what she was writing down.

Murray: How would you resolve this question about anecdotal reporting?

Kent: I'm just wondering if the people we should be talking to is our staff. You get a conference together after [viewing the vignettes] and ask other people in the school. Maybe somebody has the solution to that [problem] already in their mind and you could share answers.

The vignettes raised questions about anecdotal reporting for Kent. When asked how these questions could be answered Kent provides further insight into how could promote staff collegiality. Often the presenter of professional development opportunities may not know the context of teacher problems. Here Kent has suggested he talk to other staff members. In doing so, he has moved his professional development from an individual experience to a staff professional development opportunity. Here Kent suggests that not all the answers have to be explicit in the vignettes. Answers to problems framed after viewing the vignettes may be solved at the staff level, within the school context.

Susan

Susan enjoyed the vignettes and made observations which led to her framing a problem with her own practices of teaching science.

Susan: The main thing that I kept thinking about was the teacher was only working with four kids. The second teacher worked with several groups and this was a little bit more realistic to me. The kids were very organized and either they [students] had done it [hands-on science] throughout the year or they have been doing hands-on science since grade one.

Susan: I like listening to the questions the teachers asked - good questions. I liked the way they [teachers] got the groups [students] together and compiled the information and came up with the conclusions for

experiments. I like that idea.

Murray: What did you notice about the questions teachers asked on the videotaped presentation?

Susan: Well, they [teachers] were not asking yes/no questions. They asked questions where the kids had to think about the answers, talk about what they would do, make them think and build upon what they already knew.

Murray: Did you observe anything on the videotape that you could transfer to your classroom?

Susan: I don't think there was anything I could transfer to my classroom. If anything that could be [transferred] it would probably look different in my class as I deal with things differently than the teachers on the videotape. If they had my class, they wouldn't be reacting the way they did on the tape.

Susan gained insight into her teaching practices even though she realized she was watching "unrealistic" situations. It is significant that Susan uses these unrealistic vignette situations to gain insight into her own teaching practices. It seems that the vignettes gave Susan a frame of reference to judge her teaching practices.

Secondly, she noticed the way the teacher in the vignettes asked questions. The questions according to Susan challenge students to think about what they are doing and the answers to open ended teacher questions. To make this observation and to state that they are not yes/no questions suggests that Susan may have reflected upon her questioning practices.

Thirdly, Susan suggests that what is in the vignettes may not be directly tranferrable to her classroom. She suggested that the teachers in the vignettes would also respond differently if they were teaching in her classroom. This insightful observation

suggests that each teacher must personalize their meaning of the vignettes and that they are useful to teachers seeking solutions to teaching problems. These solutions to teaching problems though would have to be adapted depending on the teacher and the classroom situation. After viewing the vignettes and attempting changes in her classroom Susan had the following comment.

Susan: ...I've had to think a lot more about what is happening in my room.

It is clear that the vignettes prompted Susan to assess and attempt to change some of her classroom practices.

Velma

Velma had been teaching for eight years and she viewed the vignettes critically and then framed a problem with her practices.

Murray: If you were a co operating teacher with teachers on the videotape, what would you say to them regarding their teaching?

Velma: I think I would really commend them on their prepararion before the lesson because obviously they [teachers in the vignettes] were well prepared on their questioning of individuals ...I thought she did a good job of questioning. She used good questions to check up on the learning [of the students].

Murray: What do you mean by good questions?

Velma: The questions are good because there is not as much room for errors and the students have a wide variety of responses and feel free to answer them [questions] based on their observations...I think you have to have good questioning techniques in order to have good hands-on science.

Following her ideas about questioning practices, Velma frames a problem.

Velma: Was she [the teacher in the vignettes] making it so all the groups were asking the same questions?...It is quite idealistic in a sense that you have three of four different groups of four or five students and I would be working with one group and there would

be no questions from them. The other groups would be saying, "Teacher, teacher excuse me". What do I do next if only one group was getting those questions?

Velma complimented the teachers in the vignettes on their questioning practices. The reason she liked the questions was these teachers asked questions which solicited a variety of answers from students. Velma seemed to want students to derive their own answers based on their own observations. She also advocated that students feel free to express their answers without fear of making errors.

Later in the interview Velma commented that good questioning practices are an important part of conducting hands-on science classes. It seems good questioning practices are important to her. From her observations of questioning practices Velma considered questions asked by students. Specifically she framed a problem around how to manage questions from different groups of students. She observed that students in the vignettes asked questions and she wondered how the vignette teacher managed questions from different groups of students. Having framed a problem Velma then recalled information provided by the vignettes that may assist her in solving her problem.

> Velma: Also another thing I noticed [on the videotape] within a group is that they [students] can have a discussion and you [teacher] can have these three children talking, giving their opinions...They [students] were used to doing things [science activities] very systematically.
>
> ...the teacher really had to prepare the students. Really sat down with them, explained to them what was expected in their groups, prepared them ahead of time so they understood completely what they were looking for.

After framing a problem with her practice Velma viewed the vignettes for clues that would assist her in solving her framed problem. She observed that the student groups discussed questions among themselves. Through these discussions some of their questions were answered and, therefore, they did not direct all their questions to the teacher. Since the students answered some of their own questions the teacher did not have to manage all the students' questions. She also observed that the students in the vignettes worked systematically at their activities. This observation prompted Velma to infer that the teacher must have prepared the groups of students to know what to look for and how they were to work systematically. Having made these inferences, Velma later conducted a similar science lesson in her classroom.

Summary of Findings

Even though teachers may be skeptical of vignettes that do not match their classroom environment they frame problems with their practice. Further, they may look for solutions to their problems as they watch vignettes. It seems that the teachers are constructing their own meanings of the vignettes and these meanings are generated as they reflect upon their classroom practices. The findings of this study concur with Kilbourn (1989) that vignettes of classroom activities promote reflection among experienced teachers. This reflection results in framing problems with practice as it is perceived from the teacher's view. As teachers attempt to solve their framed problems they grow professionally. Therefore, reflecting, framing problems and solving problems is

central to change. The data in the study indicates that the teachers followed this pattern and made some changes to their classroom practice.

This pattern of reflection to solve problems may need support either form an external person or other staff members. If it is a small school external support may be provided via telecommunications. One problem with external advice is that often the external person may not know the circumstances within the school. Therefore, the vignettes could be used as a tool for professional development by a staff where individual problems could be discussed by a school staff. These findings suggest that vignettes are valuable tools for professional development.

Present and Future Possibilities

Presently two-way television allows for the transmission of vignettes from several localities. Once vignettes are available staffs or groups of teachers could view and discuss them to facilitate change in their classrooms. The production and interaction about the vignettes could be facilitated through partnerships.

Partnerships between universities, teacher organizations and school divisions financed by business could provide long range plans to promote content and methodological changes within classrooms. This would require education to link partnerships already operating such as Ag in the Classroom. Information about solving classroom problems could be transmitted using the INTERNET system.

INTERNET is a telecommunications system already being employed by business and education to share information. Stone and Johnston (1994) report that in the near future video information could be sent over high speed telephone lines. This would make it possible to have two-way videotaped signals transmissions to rural communities. Although at this time this is not possible, INTERNET could be used to provide professional development or opportunities to teachers. Similarly teachers wishing to discuss problems with other teachers could post questions on the system. Once the question was posted teachers from around the country or internationally could respond to these questions. This system may encourage teachers who are not yet ready to discuss problems with close colleagues to enter into long distance relationships.

In conclusion a proposed plan to facilitate professional development may have the following steps.

1. Adopt a theory of learning which describes HOW teachers learn and subsequently change.
2. Identify expertise and provide funding for the production of vignettes as well as people interested in providing professional development opportunities.
3. Form partnerships consisting of schools, universities and businesses to deliver and evaluate workshops.
4. Develop materials for a variety of delivery modes such as INTERNET, video transmissions and workshops.

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