

**Investigating the Use of Video in
Online Professional Development**

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Introduction

This is a final report and executive summary for a class on Distributed Learning at the University of Michigan (Education 718). In the class, we played the role of consultants for Professor Rod Williams and were charged with the task of designing an online professional development system that would support in-service teachers. The promise of online professional development makes it the next logical choice for exploration in teacher training. Virtual classrooms and learning environments are appealing because they extend the learning community of the classroom into large virtual spaces where learners work together in groups to acquire knowledge (Maeroff, 2003). Other advantages of online professional development versus traditional face-to-face professional development are that online systems have the potential to reach more teachers, can be integrated throughout the school year, and have stable operating costs after the initial investment of creating the system (Fishman, Edelson, & Konstantopoulos, 2005).

Early in the design process we decided to center the professional development on using video within the context of Japanese-style lesson study. Indeed, we believe that the widespread availability of video over the Internet as well as the lowered cost of video equipment will make it an invaluable part of the professional development experience. Unfortunately, much of the video found on the Internet consists of teachers talking about a lesson or teaching a specific curriculum. We began to wonder whether teachers could actually relate to these situations. From our exploration of the literature and other resources we made two hypotheses that we wanted to test with our study: (1) teachers who observe video of their own teaching benefit more than teachers who observe generic video of other teachers and (2) this observation of video will be enhanced if it centers around a “community of practice” where teachers have the chance to discuss, share, and critique their teaching with their peers.

We originally envisioned testing our hypotheses by building an online professional development system that would allow a small cohort (3-4) of teachers to videotape and upload samples of their teaching to an online website. We would then ask these teachers to review the videos. They would then discuss them in a virtual space (either a phone call or over an online system such as voice-over-IP). Such a system broadens the scope of traditional face-to-face professional development as it could potentially connect teachers from all over the country. This would be particularly useful for teachers who do not have access to peers that teach their curriculum, such as those who teach in isolated rural school districts or who are the sole instructors of a subject area in their schools.

Unfortunately, the ending of the 2005 school year created logistical problems for this study because teachers were busy with end-of-the-year activities. Instead, we decided to design a new study that borrowed from a previous study on communities of practice using lesson study built around a high school economics lesson (Lonn, 2004). Extending this study was helpful in many ways; the most helpful being that extensive classroom video had already been collected. Additionally, the teachers in this study had all taught the same curriculum on the California energy crisis. This would allow for the professional development to center around a discussion of each teacher’s approach to this lesson.

Three of the teachers in this previous study (Sarah, Kathy, and Bill) agreed to participate in our new study. We decided to select video of each teacher introducing the lesson because we believe this is a very important aspect of teaching. We felt that this would provide an enlightening discussion because although the contents of the lesson were the same, (introducing the unit, asking the question, “What would life be like without electricity?”, and introducing the students to the facts surrounding Enron) each teacher implemented the lesson differently. To further simplify the process, we edited and uploaded the video to the website ourselves instead of asking the teachers to do this. To help scaffold the teachers’ viewing of the videos, we posted questions on the website that we wanted the teachers to focus on while they were watching. Finally, we elected a simple four-way conference call with all of the teachers where we served as moderators.

The key questions that we wanted to answer in this study are:

- (1) Do teachers benefit from watching video of their teaching and then discussing this video with their peers?
- (2) What models can we draw on in creating an online professional development system?
- (3) What are the technical challenges of creating such a system?
- (4) What difficulties would teachers have in using such a system? How can we add scaffolding to the system to overcome these difficulties?

In the remainder of this paper we review some of the literature that justifies our design decisions, describe our study, discuss our findings and recommendations for an actual implementation of the online professional development system, and posit avenues for future research.

The Argument for Video in Teacher Education

Traditional teacher education programs generally work by grounding teachers in theory and then developing that theory through instruction and observations of expert teachers at work. (Beck, King, & Marshall, 2002). However, these programs are usually better at providing teachers with content knowledge and procedures than enhancing their decision-making abilities (Schrader et al., 2003). It is mostly observation of real classrooms that improves teachers’ decision-making abilities. Furthermore, cases help teachers to bridge the gap between theory and practice (Beck, King, & Marshall, 2002). Research has shown that teachers appreciate this case-based approach to learning and that they find that it helps to convey important paradigms and teaching principles that are not obtained in a traditional classroom-based curriculum (Copeland & Decker, 1996; Beck, King, & Marshall, 2002; Schrader et al., 2003).

Unfortunately, traditional teacher training offers only a modicum of exposure to this rich experience. Mostly this can be attributed to the paucity of resources often available to student teachers. There are only so many schools and classrooms that a pre-service teacher has convenient access to. This is not to say that there hasn’t been an effort to enhance the traditional curriculum to allow for more case study, including classroom lectures given by expert teachers, textbook and case-study readings, and simulations presenting imagined conditions (Schrader et al., 2003). These simulations, however, can

often times feel canned and usually present an idealized view of the teacher-student relationship. Real classroom observations of actual teacher and student behaviors still remain the best way of presenting a case-based teacher training curriculum.

We believe that the use of video-based case study may be the answer to ameliorating this hole in teacher education. In the past, the cost of producing and storing video has obviated its widespread use in education. However, the cost of both are decreasing at a rapid rate that now makes video a plausible solution. Even less-endowed universities are now using streaming video technology to enhance the classroom experience for students by archiving lectures (Flower, 2003).

Studies consistently show that student teachers benefit from courses that include video technology. These benefits range from outperforming control groups in posttest elicited written responses to teaching examples (Beck, King, & Marshall, 2002), outperforming control groups on a posttest of teaching mastery (Kpanja, 2001), and higher student satisfaction as measured by a post-class survey (Schrader et al., 2003).

In classes where pre-service teachers had access to video, the students were observed to spend large amounts of time analyzing examples of not only their expert teacher-mentors but also video of their own teaching. In particular, this self-analysis allowed them to clearly see weaknesses and areas of improvement in their own practice of teaching.

Video has an added advantage of being able to capture classroom events that a novice teacher would not notice. Expert teachers will likely notice more and different things in a busy classroom than a novice (Goldman et al., 1999). For example, novice teachers are usually concerned more about their teaching and controlling the classroom. Hence, they sometimes ignore the classroom atmosphere and rarely try to probe their students for understanding. Expert teachers, however, can survey a classroom and notice when the students understand the material or are generally confused; they can then change their lesson on the fly to accommodate these observations. Teaching is indeed an acquired skill and it often takes 10 years to become an expert in this practice (Ericsson & Lehmann, 1996).

Video may be able to help novice teachers become experts more quickly by allowing them to relive and analyze their teaching. Rand Spiro (Spiro, Jacobsen, & Coulson, 1991) suggests that becoming very familiar with a variety of video teaching examples can help student teachers learn the intricacies of their craft more quickly. They see more situations than possible in normal student teaching. By reviewing clips multiple times they can also notice events they missed the first time.

Methods

While some teachers may have the luxury of time at school for professional development activities, it seems more likely that participants would need to view the video clips at home. This means that some teachers will use a modem and phone line to browse the Internet while others will have access to a high-speed connection. We tested both streaming video (where the video file is hosted on a server and is played in real-time over the Internet to the user's computer) and different forms of downloadable video files (where the user downloads the entire video file) to see what settings would work best for

each type of access. We found that streaming did not produce adequate results at dialup speeds.

In the end, we produced two downloadable versions of each video clip. One was heavily compressed and had a smaller frame size for dialup users. The other file was larger and had better quality for users with a cable modem or DSL connection. If we wanted to use longer videos, (more than 10 minutes) the file sizes would become too large for downloading and streaming would become the better option.

All video was transferred to Macintosh computers and processed using Apple's QuickTime Pro. One justification for QuickTime was expediency, as our group had access to two Apple laptops (a 14" iBook and 15" PowerBook) and the iMovie software makes transferring, editing, and compressing video very easy. Additionally, because teachers may have Macintosh computers, we also needed a video format that would play correctly on both Macs and PCs.

We decided to eschew the new QuickTime 7 compression scheme (H.264) because if played on a computer with an older version of QuickTime, no video would appear, possibly confusing users. We used MPEG4 video compression instead. One teacher was only able to hear the audio, and not view the video, possibly due to having an even older version installed.

We used existing footage from the previous study of the same group of teachers delivering an inquiry lesson unit on economics that looked at Enron and the California energy crisis. Our focus was on the introduction of the unit. Hence, we went through video that was taken on the first or second day of the unit for each teacher. One version consisted of approximately 10 minutes of raw footage taken directly from the classroom during the economics lesson. But because some of this footage included classroom "dead time" such as students gossiping or writing, we also decided to edit together a 2 to 3 minute montage of the most salient aspects of the lesson. This worked well as we discovered that the teachers introduced and taught the same ideas but in vastly different ways. The theme of these montages were: the teacher introduces the lesson, the teacher asks the class to brainstorm on the idea "What would life be like without electricity?", the teacher discusses the students' responses, and the teacher goes on to address the salient policy issues either through a newspaper article or movie.

Finally, the QuickTime architecture includes the ability to add additional tracks to the video. We decided to add a text track with a transcript to Kathy's clip to test whether having the dialog captioned increased the value of the video. Not only does the captioning help when dialog is difficult to comprehend, being a separate track the text can be searched and indexed. For example, chapter markers can be created from the text, so users can jump directly to specific sections in the text.

A very simple web site gave an introduction to the project and links to the dialup and high-speed versions of each video clip. On the pages with video we included some general questions that the teachers could use to think about the teaching as they watched. The questions were based on Observation Skills for Effective Teaching (Borich, 1999). Borich gives a set of "lenses" for pre-service teachers to use while observing experienced teachers. Questions included classroom specific observations (i.e., pace, clarity, interruptions), and more general reflections (what might you do differently, etc.).

After the participating teachers had a chance to review the videos online we moderated a conference call with them to discuss their experiences. The call was done with a commercial service that allowed us to record it for later analysis.

Findings

The findings of our study were both positive and optimistic. We conducted a phone discussion with our three participants and focused our questioning on three areas: (1) Content, (2) Usefulness, and (3) Technical aspects. The conversation was conducted as a pilot for an actual professional development session and to get feedback from the participants. The call took place in a real time setting with each participant calling into the conference from home.

The first question that we asked was whether the teachers would change the way they taught the lesson in the future after watching the videos. Overwhelmingly, the participants responded positively. Sarah enthusiastically exclaimed, “Heck, yes! I think after every lesson there’s a ton of stuff that I want to do differently.” She explained that she felt that her class had run too slowly and that she would have liked to elicit more student participation. Interestingly, the other two participants felt that, although the pace was a little slow, Sarah did a good job of setting up the scenario and explaining details. Kathy noted, “I felt that she [Sarah] gave them the chance to react...and pause and absorb the material.”

Bill did not feel the need to change anything that he had done, but in the future, he noted that he might try to lead more discussions. Sarah and Kathy were both excited about how he presented the “What would my life be without electricity” exercise with a Family Feud-style game by challenging the students to guess the ten most popular responses.

Kathy could not believe how much she repeated the same directions to her class. She admitted that it might have been a result of the number of interruptions that happened during the class. She also liked how she had her students think independently about a question before beginning a discussion. Finally, she said that watching video was useful because it helped her focus on intangibles such as pacing.

The next questions focused on the usefulness of watching the video. All of the participants felt that it was helpful to watch their own teaching on video. Bill noted that, “Yeah, I think it’s always helpful to watch myself teaching...I don’t really like it but it’s helpful.” Sarah said that she actually does this regularly and sets up the video camera herself even though it’s quite time consuming. Kathy was the most enthusiastic of the three saying, “I like watching myself on tape...as a teacher it doesn’t bother me or freak me out at all. I know some teachers are scared to death of it...I like seeing it and is something I’ll remember in the back of my head now.”

Surprisingly, when asked if it was helpful to hear their peers’ criticisms, everyone answered positively. Sarah said, “I think it’s awesome to be able to discuss with your peers about what’s going on in your room.” Bill said that it was helpful but that he was a little self-conscious when being filmed while Kathy said that she had no problem with others watching her video adding, “You learn a lot from watching other people teach and unfortunately in the profession when you’re in your classroom for five class periods a day, you don’t have the opportunity to watch other people teach.”

When asked whether or not it would be useful to watch a clip of an expert teacher, Bill felt that watching these videos was more helpful because he might simply try to emulate the expert teacher video. Kathy agreed and suggested that she liked having multiple videos to look at. She felt it was a good idea to have the contrast between the three different teaching styles. Sarah was the only teacher who thought that watching an exemplary teacher would be categorically useful but also agreed that she found it most useful to watch Bill and Kathy's teaching.

The last set of questions focused on the technical aspect of the study. All of the participants liked the size of the video (320 x 240 resolution) and liked how they were embedded into the webpage. They preferred this to having separate videos "pop-up." Everyone watched the videos from home, two on PCs and one on a Macintosh. Sarah was the only participant not using a broadband connection and was the only participant who experienced technical difficulties (she could hear, but not see the videos).

The participants had mixed-feelings about the edited footage versus the raw footage. Sarah preferred the raw footage because she felt that she gained more of a sense of what was going on. Bill liked the edited versions because he felt that they focused more on the research question. Finally, Kathy admitted to not having time to watch all of the raw videos but that she gained a lot from watching the edited videos: "Having that [short] clip was enough to get a real feel for what was going on in the introduction...I was pleasantly surprised at how much I did get out of two or three minutes." She further suggested that time constraints on teachers should be a consideration in the final production of this project.

All of the participants said that their schools had the editing equipment and technical capabilities to support this project. Surprisingly, all participants felt confident in being able (or learn how) to edit their own footage. Sarah said that her school has help, but that she would still need to do it herself. Bill said that he would be fine doing it himself, and Kathy said that she could definitely learn how to do so. All participants agreed that a student within the classroom could do the filming, but they would need guidance as to what should be filmed. Everyone agreed that it would be problematic to ask students to edit video because they would not know what was useful.

Finally, when asked if this type of professional development would be useful, all agreed categorically, but each had additional comments. Sarah said, "It would be a great form especially if you're the only teacher that teaches that subject...here's a chance for you to meet up with folks across the state or across the country..." She further noted that, "I do think it's a habit and can be daunting at first...you have to see the value in it and then persevere." Bill said that this experience was invaluable: "I think it's really a valuable tool...and I'll agree with Sarah that the filming and uploading in a timely manner can be a little daunting but if you get into the habit...the end result is so valuable that what seems as trouble is worth it." Kathy added the point that trust was imperative for such a professional development to succeed: "I know Bill and Sarah and that really helped out in helping us critique one another...if I was on the phone with strangers...I don't know if it would be productive or open...because I know them [Bill and Sarah] I'm more comfortable with criticism...with strangers I might just say, 'it was pretty good.'" The others agreed with this assessment.

Questions

Who Films?

The biggest challenges that we anticipate deals directly with the video. We considered three options for who should shoot the video: the teacher, a student in the class, or by a third-party (a school technology facilitator, media department faculty, or professional). A tech savvy teacher would be able to set up the video camera but because the teacher must also focus on teaching, there would be no camera movement and only the back of students' heads would be visible. And although the teacher would know exactly what should be filmed, positioning the camera might waste valuable class time.

Another alternative would be to involve a student in the classroom. This may be an excellent way to keep an uninterested student on task. A student who may normally act up in class, distract his peers, or sit bored in the classroom might be engaged if involved in the taping process. Inversely, however, taping would detract from the student's involvement in the lesson. Also, if a student is taping, he will need to be told what he needs to focus on.

The easiest option that we considered would be involving a third-party, either a technologically adept colleague from within the school or a professional consultant.

Uploading the footage could be managed either by the teacher or with the help of a third party. There already exists a system for uploading video to a web page (provided by VideoPerception) that seems easy enough for nearly anyone to use. While it may be possible for teachers to edit the footage before uploading it, most teachers would not have time to perform this function. A third party consultant would most likely edit video as part of the facilitation of the entire program.

Discussion Methods

Although we relied on a simple four-way telephone conference call in our research, there are many other systems that could be used in this part of the professional development. We discuss some of the pros and cons of these systems in this section.

Telephone Conference Call

A conference call between the participants, similar to the one we used in our study, is the most cost effective way to hold a discussion with teachers who are not physically close to each other. Furthermore, using a third-party conference carrier allows the discussion to be recorded for future analysis by researchers and teachers. Using the telephone also allows for teachers to be anywhere during the call, which our three participants seemed to appreciate. For example, one teacher in our study needed to leave her house during the call but was able to reconnect to us via a cell phone, which allowed her to continue the discussion.

The drawback of the phone conference is that the participants do not see each other and it is not as easy to add visual elements such as PowerPoint slides that would be easier with virtual conferencing software.

Online Virtual Chat Community (Tapped-In)

Another option is to use an online virtual community such as Tapped-In. Tapped-In was developed by researchers at SRI International and is an attempt to take the concept of a “community of practice” to an online virtual space (Schlager, Fusco, & Schank, 1999). Tapped-In utilizes a java-based chat engine and a virtual “white-board” to create virtual classrooms. The advantage of this type of service is that it is not bandwidth intensive and is a free service provided to the education community.

However, like all chat systems, it is difficult to moderate and conversations can wander depending on who is typing. The typing provides another problem and conversations through chat can sometimes take much longer than their telephone counterparts.

Video Conferencing

Video conferencing systems such as those supplied by Polycom provide the visual aspect that is missing from simple VOIP (voice over IP) and telephone conferencing systems. More advanced models of the Polycom also allow for sharing materials such as handouts, Power Points, and other visual material.

However, the cost of such a system would probably obviate its use in many school systems. The larger Polycom systems cost upwards to \$2000 and the school must either invest in a very high-speed Internet connection or a dedicated ISDN line.

Computer Video Conferencing Systems

There are a number of commercial virtual conferencing packages available including Microsoft NetMeeting and Yahoo! chat. These conferencing systems are less hardware intensive than the Polycom video conferencing option and the participants can communicate using a simple \$70 webcam.

Depending on the system, price and quality of the video can be a problem. For example, Microsoft NetMeeting requires dedicated servers that the school or vendor must host while the Yahoo! Chat offers a system that can be used on the web. But, again, this comes at a potential loss of quality, as this chat must travel through the murky waters of the Internet while a dedicated server would almost guarantee uptime during the conference.

Recommendations

Who Tapes?

We recommend that, when at all possible, a third-party should tape the classroom. This way, the teacher does not need to worry about focusing the camera and will not lose time with technical difficulties or setting up the equipment.

If this were not feasible, than a student taping the lesson would be our second choice. Indeed, Bill noted that throughout his video sessions he had a student tape. A student operator would be able to focus and move the camera, thus capturing more of the

classroom atmosphere. However, if the only alternative were for the teacher to handle her own classroom taping, this would suffice. Some research suggests that video collected by placing a camera in the back of a classroom is nearly isomorphic to a physical classroom observation (Duggan-Haas & Gallagher, 2004).

Raw v. Edited

We recommend that *both* raw and edited versions of tapings be posted to a website for participants to see. Teachers who had the extra time to view the longer clips would benefit from a more natural and in-depth look at the classroom, while those with less time available would still be able to see enough to fruitfully join in the ensuing discussions.

Discussion

The best option for holding post-viewing discussions seems to be through a telephone conference call. While teachers would miss the visual cues of face-to-face meetings or video-conferencing, everyone has a phone and they are reliable and convenient. We also suggest that teachers meet in person at the beginning of the process to get to know each other and begin developing group cohesion and the sense of trust that is required for productive discussion.

Conclusions

Timeline

We envision that a well-executed timeline for the Visual Lesson Study will last for an entire school year. In the summer, the collaborators will meet for a summer workshop in order to build a community of learners, develop a lesson and establish a research theme. In our post-interview with our three teachers, they all mentioned that trust was an important factor for their open critique and discussion of the video. Hence, we believe that this initial face-to-face encounter is essential. Furthermore, since the research theme will be established early, the teachers will also be able to plan when to videotape. For example, they may decide that the introduction of the lesson, induction of the students into their research projects, and final project presentations will be good cases of video to discuss in the future.

Sometime during September to February, the teachers will be expected to implement the lesson in their classroom and to tape it based on whatever schedule they have established. (It does not matter when the lesson is presented, as long as it falls within these months.) From March through May, the teachers will have the opportunity to view, edit, and post the video clips that they would like to share with their peers. During this time, sporadic check-in phone calls will take place in order to give the participants an opportunity to discuss, help, and support each other through this professional development. The last conference call will focus on the tapes and the collaborators will be able to critique, comment, and suggest future changes for the lesson. During the last

two months of school in May and June, the teachers will work on a final presentation/publication in order to share their findings with their districts and colleagues.

We hope that this will be an iterative process where the teachers will then use the knowledge gleaned from year one of the professional development to further refine their teaching for the next year.

Suggestions for Future Research

Obviously, our study is far from exhaustive. We feel that future research in this area should use a larger n than we used (perhaps even multiple cohorts of teachers), involve the teachers in a timeline such as the one suggested in the previous section, and be at least a two-year study to discover the benefits of such an iterative process. Finally, we believe that it would be most useful to use existing research instruments to see if this type of professional development results in any changes in teachers' attitudes on teaching and in student achievement.

Such a research study would also be able to refine the delivery mechanism for capturing and uploading the video to the web. One of the weaknesses of our study was that we did these steps ourselves. Although the three teachers in our study said that they would be comfortable doing this, it is imperative that a future study tests this hypothesis. Indeed, another important question involves how the videos will be uploaded. Should the system be a simple FTP site or should it involve third-party software (such as Video Perceptions) that is able to directly capture and upload video from a digital camcorder or camera? These important questions need to be answered.

The Issue of Trust

We want to conclude by stressing that the lesson study plan requires trust that can only be built through initial face-to-face meetings. Once a level of comfort with the group is established, then telephone conferencing and watching each other's videos over the web becomes practical. We believe that the technical hurdles of this project can all be overcome with careful planning and considerable effort. The more difficult barriers are the social and time barriers of the teaching profession where teachers don't have time to do anything extra and are not used to collaborating with each other.

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