

Pre-service teacher reflections, video-conference and WebCT: An exploratory case study

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Abstract

Introduction. The development of video-conference and WebCT technology offers new possibilities for the education of pre-service teachers; opportunities that are only just beginning to be touched on. In this exploratory article, we investigate the opportunities for reflection that technology afforded three pre-service teachers in Canada as they taught five elementary mathematics lessons to a remote school from their faculty of education.

Method. Three pre-service teachers taught a series of mathematics lessons in a remote school via video-conference technology. Between lessons the recordings were reviewed by the pre-service teachers who subsequently engaged in WebCT discussions amongst themselves and their instructor (the third author). These commentaries were analysed in terms of the pre-service teachers' level of reflectivity, as either 'commonsense thinkers' or 'alert novices.' From this initial analysis, we then investigated three areas which the data suggests are important in assisting pre-service teachers to improve their capacities for reflection.

Results. These three areas are: the biography of the pre-service teacher; the provision of content for pre-service teachers' reflections, and; the capacity of pre-service teachers to access the reflective opportunities afforded by the technologies.

Conclusions. Based on our work, we believe that the increasing interest in utilizing video-conferencing technologies for pre-service teacher education calls for an understanding of these issues as a means for increasing the efficacy of that utilization.

Keywords: Pre-service teachers, reflection, biography, technology.

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Reflexiones de los docentes en formación, videoconferencias y WebCT: un estudio exploratorio

Resumen

Introduction. El desarrollo de la videoconferencia y la tecnología de WebCT ofrece nuevas posibilidades para la educación de los maestros en formación; estas oportunidades están comenzando a ser exploradas. Este artículo exploratorio investiga las oportunidades para la reflexión que la tecnología ofrece a tres a futuros docentes en Canadá, ya que uno enseña cinco lecciones de matemáticas de primaria a una escuela alejada de su Facultad de Educación.

Método. Los tres profesores enseñaron una serie de lecciones de matemáticas en una escuela a distancia a través de la tecnología de video-conferencia. Entre las lecciones de las grabaciones fueron revisadas por los profesores en servicio que posteriormente participan en las discusiones de WebCT entre ellos y su instructor (el tercer autor). Estos comentarios fueron analizados en términos de "nivel de reflexividad, como 'los profesores en servicio piensan con sentido común' o 'novatos en alerta.'" A partir de este análisis inicial, se procedió entonces a analizar tres áreas que los datos sugieren que son importantes para ayudar a los profesores en pre-servicio para mejorar sus capacidades de reflexión.

Resultados. Estas tres áreas fueron: la biografía de la maestra en pre-servicio, la provisión de contenidos para la reflexión a los futuros docentes y, la capacidad de los maestros en pre-servicio para acceder a las oportunidades de reflexión que ofrece la tecnología.

Conclusiones. Basándonos en nuestro trabajo, creemos que el creciente interés en la utilización de tecnologías de videoconferencia para la formación docentes en pre-servicio requiere una comprensión de estas cuestiones como un medio para aumentar la eficacia de su utilización.

Palabras-clave: Pre-servicio de los profesores; reflexión; biografía; tecnología.

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Introduction

Pre-service teachers face many challenges along the career path they have chosen. As well as the traditional academic challenge of learning both subject and pedagogical knowledge, there is the challenge of melding educational theory and practice when confronted with the reality of the classroom. Mule (2006) has pointed to an ongoing reconceptualization of teacher education towards an inquiry ethic that is consistent with the notion of teachers as inquirers. This shift calls on pre-service teachers to become 'active participants in their own professional growth, knowledge constructors, and agents of change' (Mule, 2006, p. 205).

For pre-service teachers this engagement is complicated, as Harkavy (1999, p. 226) reported: 'We (pre-service teachers) are experts in learning to become teachers, but we do not often think of ourselves as teachers.' Britzman (2003, p. 228) speaks of the same difficulty: 'student teachers dwell in two uncertain worlds: they are being educated as a student while educating others as a teacher.' In this ongoing process, teacher education programs are often seen as incidental, with the 'development of a professional identity ... perhaps best seen as a by-product of teacher education programs, rather than as a targeted outcome, at least from the student teacher's perspective' (Franzak, 2002, p. 259). This situation does appear to be gradually improving, as teacher educators recognize the importance of helping pre-service teachers reflect on their developing identities as teachers (Korthagen, 2004). In this article we will investigate the use of video-conferencing and WebCT as a means of assisting pre-service teachers in the development of their capacities for reflection.

The use of video-conferencing is increasing in an array of human activities such as the delivery of education services and courses to students and professionals in regional and remote areas, and courses offered to pre-service teachers (Andrews & Klease, 2002; Cifuentes & Murphy, 2000; Lara & Repáraz, 2007; Passmore, Fredrikson & Bowen, 2005). Hu, Sharpe, Crawford, Gopinathan, Khine, Moo and Wong (2000) used desktop video-conferencing in a way that has particular relevance to the work described in this article. They had pre-service teachers critique their own, and their colleagues, teaching strategies using video-conference clips of their practicum teaching. Using video-conference technology to observe and comment on teaching situations was said to enable a reflective process that facilitated pre-service teachers' growth and development. Their

position supports a notion put forward by Jonassen (1996, p. 3), that the most appropriate use of technology is ‘as a cognitive tool for accessing information and interpreting and organizing personal knowledge.’

For this article, we recorded elementary mathematics lessons that were delivered once per week by three pre-service teachers to a remote Canadian school from their faculty of education, using video-conference technology. Between lessons the recordings were viewed by the student teachers who subsequently engaged in WebCT discussions amongst themselves and their instructor (the third author). These commentaries were analysed in terms of the pre-service teachers’ level of reflectivity, described by LaBoskey (1994) as either ‘commonsense thinkers’ or ‘alert novices.’ The characteristics of these two groups are shown in Figure 1.

COMMONSENSE THINKER (Unreflective)	ALERT NOVICE (Reflective)
Self orientation (attention on self and / or subject matter)	Student orientation (attention on the needs of the children)
Short-term view	Long-term view
Reliance on personal experience in learning to teach (learn by doing; trial and error)	Differentiation of teacher and learner roles
Metaphor of teacher as transmitter	Metaphor of teacher as facilitator
Lack of awareness of need to learn; feeling of already knowing much from having been in classroom as a student	Openness to learning; growth-oriented
Overly certain conclusions	Acknowledgement of need for conclusions to be tentative; need for feedback and triangulation
Broad generalizations	Means-end thinking; awareness of teaching as a moral activity
Existing structures taken as givens	Strategic thinking
	Imaginative thinking
	Reasoning grounded in knowledge of self, children and subject matter

Figure 1. Characteristics of Commonsense Thinkers and Alert Novices (LaBoskey, 1994, p. 29).

From this initial analysis, we then investigated three areas which the data suggests are important in assisting pre-service teachers to improve their capacities for reflection: the biography of the pre-service teacher; the provision of content for pre-service teachers' reflections, and; the capacity of pre-service teachers to access the reflective opportunities afforded by the technologies. The increasing interest in utilizing video-conferencing technologies for pre-service teacher education calls for an understanding of these issues as a means for increasing the efficacy of that utilization.

Method

Participants in this experience

Lessons involving video-conferencing are uncommon in traditional education courses, but may offer a previously unobtainable authenticity to the pre-service program (Geelan & Fiege, 2004; Griffin, 2004; National Education and Research Network, 2004; North, Strain & Abbot, 2000). Video-conferencing has the potential to lend authenticity to a pre-service program through replicating in-class instructional practices better than other distance education technologies (Cavanaugh, 2001), portraying many "real-world" experiences (Hu et al., 2000) thereby providing pre-service teachers experience with real-world authentic classrooms (Edens, 2001). From the perspective of better preparing pre-service teachers, Pemberton, Cereijo, Tyler-Wood and Rademacher (2004) argue that desktop video-conference software offers considerable potential for observing and recording pre-service teachers during teaching sessions and provides a means to increase contact with pre-service students in field-based settings. Given the above, we feel it is not unreasonable to argue that video-conference technologies might be used to provide pre-service teachers with more authentic teaching experiences as part of their regular teacher education exercises.

This article draws on data collected from an ongoing research project conducted by a faculty of education in Ontario, Canada. As part of this project, three pre-service teachers were selected to present (by way of advanced video-conference facilities in a University Smart Classroom) five geometry lessons to grade 6 students in a small isolated school (119 students and 12 teachers) in a rural region of Ontario.

The three pre-service teachers were selected from an online 9-week undergraduate educational technology course run by the third author. The pre-service teachers were selected for the study from their positive response to a request for potential participants and from their positive response to a meeting with the third author, wherein the study was described and the equipment they were to use was demonstrated and described. The students indicated that they had been members of university courses that had taken place in the Smart Classroom. Prior to the equipment demonstration the pre-service teachers did not have experience with the Smart Technology or the Videoconference equipment. They indicated that they had some teaching experience as part of their Education program. The online course ran as normal while the three pre-service teachers delivered the lessons as an alternate final assignment.

The school was sufficiently isolated that four students constituted the entire grade 6 class. It was selected for the study as it had been awarded a high-end videoconference system as a result of a successful OASBO (Ontario Association of School Business Officials) grant application submitted by the third author. All ethical protocols were completed before commencement of the study.

The first videoconference session was reserved for introductions and for the pre-service teachers to observe the students and their classroom. The remaining lessons were taken from five consecutive geometry sections of the grade 6 mathematics text, *Math Makes Sense 6* (Pearson Education, 2003). The lessons were delivered over six consecutive weeks (an introduction and then 5 lessons {one lesson per week}) during the winter semester of the 2005/2006 academic year.

The pre-service teachers were given a planning and teaching schedule by the course instructor (the third author) prior to the commencement of the lessons and were instructed that they could teach the lessons in teams (similar to co-teaching; Roth & Tobin, 2002), as pairs (which offers other advantages; see Bowen & Roth, 2002), or individually. They were also told that whatever schedule they ultimately devised, each of them needed to feel comfortable with their workload. In the end, the pre-service teachers decided that they would each teach one lesson individually and for the other available sessions, one team of two pre-service teachers would teach one week and another team the next. Lesson delivery began with the pre-service teachers using the technology to review homework assignments (student work was sent to the pre-service teachers by

courier from the school for marking) then the topic of study was introduced and example problems were provided. Next the pre service teachers asked the students to solve related problems that they had developed, or that they had found in the school text. The pre-service teachers observed the students working on the problems and they responded to questions as they arose. They asked the students to provide explanations for their answers in addition to the answers themselves. This approach continued until the end of the lesson when a homework assignment was presented to the students. All of the lesson sessions were recorded to a media streaming device and made available to the pre-service teachers (within 24 hours of each lesson) by means of a web page.

When the archived lesson first became available it was viewed by all of the pre-service teachers who added their comments about the session, including personal reflections on the efficacy of the lesson, in a discussion forum in WebCT. The pre-service teacher(s) who taught the lesson was instructed to add the first commentary to WebCT in this week, and every following week that lessons occurred. The remaining pre-service teachers were to add supplemental commentary to WebCT each week to support, or critique, the initial submissions. The supplemental commentary was to consider areas where the teaching performance was particularly strong, and provide constructive criticism where it was weak. The pre-service teachers were informed, before they added their initial commentaries, that the overriding goal of the reflective commentary was for them to develop the capacity to guide themselves toward improvements in their teaching over the course of the semester. By introducing these protocols for the use of the archived lessons and commentaries, the instructor sought to create ‘a sense of co-presence of all participants ... [that] help create a feeling among all participants that they are learning together through close collaboration’ (Hu et al, 2000, p. 385).

Design and procedure

In this exploratory case study, we are investigating the process (Cresswell, 2003) by which three pre-service teachers utilize opportunities to develop their reflective capacities. In pursuing this investigation, we have two major objectives. The first is to understand the use of video-conference and WebCT technologies in providing opportunities for pre-service teacher reflection. Second, we are interested in understanding the conditions under which these opportunities can be deliberately shaped

to assist pre-service teachers move towards the preferred status of alert novices (LaBoskey, 1994).

Data analysis

These two objectives are reflected in our analysis of the data. First, utilizing LaBoskey's (1994) descriptions of commonsense thinkers and alert novices, we seek to describe the pre-service teachers' initial capacity for reflection, and any changes that occurred over the course of the research. These changes can occur in the content, process and attitudes of reflection (Goodman; 1991; LaBoskey, 1994). The descriptions of each pre-service teacher's reflections are presented in chronological order. Secondly, we seek to interpret those descriptions in order to uncover those conditions under which improvements in pre-service teacher reflective capacity might be made. In analyzing the data, the authors viewed the archived lessons and read through the WebCT commentaries, independently generating interpretations of the pre-service teachers' reflections. These interpretations were then discussed in order to form a consensus as to the salient issues raised by the data. The data that we present thus moves from syntheses of each individual's WebCT commentaries to a more global interpretation of the conditions that promote reflection. Pseudonyms are used throughout the article.

Results

Alert Novices and Commonsense Thinkers

One can consider that there is a broad range of possible ways in which students could be categorized according to LaBoskey's characteristics (Figure 1) and that it is not surprising that within any group of students that there would be individuals who lay not just in one polar category or another, but rather along the continuum between those categories. In our analysis we identified individuals who were at each polar position, as well as along that continuum. In the description of our findings we describe the responses of each individual and how they lay along that continuum, including changes that occurred in the responses of some individuals as they moved along the trajectory from 'Commonsense Thinker' to 'Alert Novice' (which is, ultimately, the goal of education programs).

Rachel: Alert Novice

Through her postings, Rachel demonstrates many of the characteristics of the alert novice, constantly looking to improve both her own classroom performances and those of her colleagues. Before viewing the third archived lesson, Rachel expressed the opinion that the lesson had gone well: ‘Well, I thought I did well today.’ Given the opportunity to review the lesson, however, she became more critical of both herself and of her colleagues, although her overall impression remained positive. Her self-criticism centered on two areas, her classroom presentation and questioning technique. Rachel described her classroom presentation as lacking animation and needing to improve her verbal communications: ‘When I looked at myself in this movie, I am very stiff ... I need to loosen up! ... I need to quit using words like "awesome, perfect, and how about"... its unprofessional sounding.’ In terms of questioning, Rachel used the review opportunity to address an issue with her questioning skills: ‘I sometimes pause in the middle of a question and then go on again (that's because I was regaining my thoughts) but it's distracting.’ Regarding her colleagues, she was deeply concerned about Bob’s spelling of pentagon: ‘your spelling!! You spelled pentagon, "penagon" and the kids noticed! So we need to be more thorough in what we put up on the white board. Double check, as in the lesson!’ That she recognized that the students noticed highlights both her own student orientation, while her preparedness to point out the mistake was a moral choice, for students should not be misled.

Rachel’s later commentaries indicate her developing education philosophy, which is based on the metaphor of teacher as facilitator. Building from this metaphor, Rachel also appears to have embraced the notion of reform-based mathematics (See *Principles and Standards for School Mathematics*, 2000). This notion of reform-based math education appears to provide Rachel with a structure around which to build her capacity for reflection. In effect, it provides her with the content of her reflection, content that she can engage with in ways that demonstrate the two other concerns of reflection: process and attitude (Goodman; 1991; LaBoskey, 1994). In developing her focus on reform-based mathematics, she is encouraged by the teaching of her colleagues. This encouragement manifests itself in three of the attitudes necessary for reflection, open-mindedness, responsibility and wholeheartedness:

‘I like the way Bob approached the lesson last week. It was very reform-based in nature which is what allows students to learn for themselves. This type of learning needs to be facilitated by the teacher, but the students need time to explore on their own’.

By focusing her reflection on reform mathematics, Rachel uses her observations of Bob, and her theoretical knowledge, to develop the framework for her next lesson. In so doing, she is preparing to experiment with a range of teachers’ knowledge. Rachel is interested in teaching a syntactic knowledge of mathematics, and explores her own attitudes towards the subject. Simultaneously, she is exploring curriculum knowledge, knowledge of teaching and her cognitive knowledge of learners. In this endeavour, she is moving beyond her earlier self-criticism:

‘By reform teaching, I mean not giving the students the answers, but letting them guide their own thinking and learning at their own pace. I will be giving them the text questions to do on their own, but they can work together if they want/need to. But I will not be going through the questions as a group. I will demonstrate, model and then they explore on their own’.

In her closing comments, Rachel acknowledged the importance of working with Bob and Luke, and the value of the technology in providing an opportunity for her to reflect in ways that are not usually available in undergraduate teacher education courses. By watching her colleagues, and having the opportunity to critique their lessons, Rachel believed that she ‘picked up on some good pointers as well as things not to do.’ The real benefit of this was that she could experience ‘different teaching styles and modes of delivery ... and different ways to look at concepts in math that I didn't or couldn't think of on my own.’ These experiences made her think ‘differently in terms of lesson delivery, assigning questions, and so on. It also developed a sense of reflection in me.’

The opportunity to review the videos and write commentaries appears to have been beneficial in allowing Rachel to develop her capacity for reflection:

‘I know that through writing reflections I gained knowledge about how I really thought about my lesson ... The movies helped me identify areas for growth as well as areas I did well. Through writing the reflections and reviewing the movies, I could critique myself. The movies also provided ways

to reflect would not otherwise be possible in a regular teaching situation because that situation would not be taped’.

Luke: Struggling with self

In contrast to Rachel’s status as an alert novice, Luke’s commentaries appear to indicate a pre-service teacher who is struggling with questions of self and the attitudes of reflection: open-mindedness, responsibility and wholeheartedness (Goodman, 1991; LaBoskey, 1994). Luke’s early reflections focused on two pedagogical issues: the use of examples in math education and the sequencing of material. On the use of examples, Luke praises his colleagues: ‘I really like how you guys used examples, even the one in the real world about the ramp? Examples are an excellent teaching strategy to convey lessons and eases more complicated concepts.’ He was, however, more perplexed on the question of sequencing in the lessons. After the first lesson which he participated in designing, was taught, Luke questioned the sequencing and how he would have integrated the learning strategies into other lessons. His commentary, however, shows a pre-service teacher who is not yet comfortable with the role of teacher: ‘personally *if* I was a teacher I probably would have skipped it ... and just implement the strategies while teaching other lessons’ (emphasis in original). Luke may have initially been struggling with issues of teaching and learning, but there are clear signs of movement towards being an alert novice.

Luke later commentaries show him to be grappling with issues of student understanding. These included the class seating plan in relation to the technology, where ‘the first student sitting near the camera and [the] speaker always seem to do most of the talking and action. Rotate students sitting so that everyone is heard on a fair level.’ Related to this was his concern for the learning of all the students in the class:

‘... does *every* student really understand the concepts? What about the girl with the long hair and the girl with the blonde hair that sits in the middle? Are they hesitating to say “no I do not understand?” If we rotate, maybe it will motivate them to say something and everyone gets a fairer chance of being heard (emphasis in original)’.

Third, he considers communication is to the key 'to teaching students and I read somewhere that students learn the best when they are more involved and not letting their peers move ahead. Just an idea that I thought we could touch up, but we do not know what these students are thinking.'

Commentaries such as this demonstrate that Luke is increasingly concerned with the students' understanding of what is being taught; a leap from his earlier concerns about the use of examples and sequencing. The change was clearly noted by the instructor: 'you've gone from concern about yourselves to concern about the students' learning – awesome.'

This shift in Luke's capacity for reflection became evident in his final commentaries. For Luke, the content of reflection (the how, what and why questions) appear critical at the end of the course: 'this opportunity really taught me to use my thinking and imagination skills and expand my knowledge of teaching-instead of just using the normal everyday classroom setting, we had to teach it a different way with different teaching tools.' In this excerpt, Luke explicitly states three of the qualities of an alert novice, the need for strategic and imaginative thinking and a preparedness to reason based on knowledge of self, his students and the subject. He went to describe how his development as a teacher was both a long-term process in which he would constantly be looking to learn:

'That is to say, the objective of this for me was to learn how to expand your teaching variety and meet challenges as every classroom each year will change; you will have different students and they will have different learning needs... so you have to always change your lesson and adapt to student needs so that they learn to their fullest potential'.

As with Rachel, it would appear that the opportunity to review the videos, and the requirement to write reflective commentaries provided an opportunity for Luke to develop his capacity for reflection. There were two main benefits for Luke in using the technology. The first was the necessity to express his thoughts in writing, for as he explained:

'If I did not write anything down, I would not be able to solidify what improvements I would need to make. Writing in WebCT really makes me

reflect on what happens on previous weeks and what you can do this week to make it better. By writing it on a weekly basis you become aware of your different skills that need to be improved’.

Luke also made the point that the commentary writing helped him to develop justifications for the different decisions that he took during the course: ‘Writing reflections was excellent way to solidify and get the point across to other people and gives them a little explanation of why you chose to do the lesson the way you did.’

Second, Luke valued the opportunity to use the videos as a strategy for seeing the classroom from the perspective of others – both colleague and importantly, the students:

‘By everyone writing in WebCT, I can see from their perspective. Since each person is different and by getting each of their views, you learn how to teach in ways that will benefit the most for the students, as there is variety in your lesson. ... By watching someone else teach it, you get the feeling of what the students are seeing and any problems that need to be encountered by the teacher’.

Bob: Commonsense Thinker

Compared to the commentaries of his colleagues on the early lessons, Bob’s early commentaries appear more limited in both scope and depth. Bob’s summation of the lesson is uncritical: ‘I think things went pretty good.’ In response to Rachel’s criticism of his spelling, offered a qualified acceptance, stating that ‘my spelling is pretty bad, I am sorry and it is something I watch for, but because we thought it up [at the] last second I didn’t really think of checking it.’ Bob’s only other comment about the lesson was to acknowledge a difficulty using the video-conference technology: ‘It is not as easy as I thought, its actually really weird teaching to someone in a different place.’

In considering Bob’s commentaries, in our analysis we concluded that he exhibits many of the characteristics of LaBoskey’s (1994) commonsense thinker, especially in relation to his reliance on his own experience and lack of awareness of his own need to learn:

‘The problem in general in this type of teaching is that we, ourselves, have never been taught by someone through a video-conference. I myself find it very difficult to teach the kids. Not being able to walk up to them and show them in front right there. That is the way that I was taught and that is the way I am used to. It is not easy to think of different ways to teach the students’.

In his later commentaries, Bob continues to struggle with the differences between the way he was taught and the way that he is being asked to teach using the technology. Despite these struggles, he did begin to develop some of the characteristics of an alert novice: ‘This class made me expand my imagination, and try to think of new ways of teaching... It made me realize that when they can see math "happen" in front of them then it is easier for them to understand.’

In his final commentaries, Bob acknowledged that being required to write did make him think about the lessons, which he otherwise would ‘not have done ... Maybe if I stopped and thought about things that I have learned I might grow as a person or maybe not.’ He admitted that not much thought went into the commentaries, and that he personally doubted their value: ‘Having to write a reflection did help me take a second and think how my lesson went. I do not know if writing a reflection actually helped me as a teacher or if it helped my lessons.’

From Bob’s posts we concluded that he did not value the opportunities to learn from his colleagues, and was content to learn merely through his own experiences:

‘I really did not learn anything from watching the movies, I learned more watching the person teaching at that moment ... I am stubborn and I have my ways set into my head of how I am going to teach, it may be wrong, it may suck but I am going to do it and it is not until after I mess it up that I am going to learn. I need to learn from my mistakes. I am still a young, naive teacher and I have a lot of mistakes to make, but I need to be the one making the mistakes to learn from them’.

Discussion

The development of video-conference and WebCT technology offers new possibilities for the education of pre-service teachers; opportunities that are only just beginning to be touched on (Coll, Rochera, Mayordomo & Naranjo, 2007). Pemberton et al. (2004) present video-conferencing as a means of increasing contact between teacher educators and pre-service students within authentic instructional settings. Accepting this proposition, we have investigated three pre-service teachers as they engage in reflection through the review of archived lessons and posting their reflections on WebCT. Using LaBoskey's (1994) discussion of commonsense thinkers and alert novices as a starting point for our analysis, we have investigated how these pre-service teachers responded to the opportunities for reflection that these new technologies offer. From our analysis of the reflections of Rachel, Luke and Bob we have concluded that four major points that deserve to be highlighted: the importance of individual biography; the need to provide a scaffold around which to build a reflection; the predispositions to reflection that preservice teachers possess, and; the related capacity of individuals to access the reflective opportunities afforded by the new technologies.

The role of biography

The importance of biography in the development of reflective pre-service teachers is acknowledged in the literature (Kagan, 1992; Korthagen, 2004; LaBoskey, 1994). For a pre-service teacher to develop the identity of a teacher requires the individual to ask, and answer, questions such as 'who am I?', 'what kind of teacher do I want to be?', and 'how do I see my role as a teacher?' (Korthagen, 2004, p. 81). To ask such questions is important, for the beliefs of pre-service teachers help determine their actions as teachers. A major difficulty for pre-service teachers is that, having spent years in classrooms as a student, they have 'developed their own beliefs about teaching, many of which are diametrically opposed to those presented to them during their teacher education' (Korthagen, 2004, p. 81). The influence that K-12 teachers had in shaping the beliefs of pre-service teachers should not be underestimated (Flores & Day, 2006; Knowles, 1992).

The initial WebCT commentaries appear to indicate reliance by the pre-service teachers on their biographies in assessing their lessons. Of the three pre-service teachers, Luke's commentaries initially appear the most reflective focusing on pedagogical knowledge: the use of examples and sequencing. Despite this nascent understanding of teachers' general pedagogical knowledge, Luke does not identify as a teacher: 'personally if I was a teacher.' Luke, it would seem, is already negotiating the transformation from pre-service teacher to teacher, a difficult process that relies heavily upon reflection (Mule, 2006, Britzman, 2003).

Rachel's self-criticism of her classroom manner and questioning technique is described as 'unprofessional sounding.' Such a statement indicates that Rachel possesses a belief, however subconscious, of what it means for a teacher to sound 'professional.' Rachel only begins to really focus her reflections only when she begins to merge her belief of teacher as facilitator with her belief in reform-based mathematics.

In contrast, Bob's initial messages appear somewhat superficial, as he uncritically accepts Rachel's efforts and nonchalantly dismisses the spelling mistakes 'because we thought it up [at the] last second I didn't really think of checking it.' Bob also appears to possess a belief that teaching is easy, a belief that is challenged when he admits that 'It is not as easy as I thought ...' Bob can most clearly be classified as a commonsense thinker, as he most heavily relies on his experiences as a student to guide his teaching and his seeming inability to learn from others: 'I am stubborn and I have my ways set into my head ... I need to learn from my mistakes.'

Recognizing the importance of biography leads us to the second of our issues. This is the need for pre-service teachers to be provided with content around which to develop their practice of reflection.

The need for content

Bearing in mind the demonstrated importance of personal biography, the challenge for teacher educators is to provide opportunities that challenge the beliefs that pre-service teachers hold. To put it another way, reflection and content are inseparable. Reflection begins 'when an individual is perplexed or uncertain about an idea or situation'

(LaBoskey, 1994, p. 4). To be perplexed is insufficient, however, to develop reflective practices. LaBoskey (1994, p. 12) believes that pre-service teachers ‘may need particular encouragement and assistance in considering the reasons behind and the implications of their decisions and behaviours.’ Korthagen (2004) argues that it is insufficient for pre-service teachers to only practice the processes of reflection; they must also learn what teachers can reflect on. Similarly, LaBoskey (1994) calls for preservice teachers to be presented with the procedures and attitudes of reflection, a focus for the reflection and opportunities to practice.

Our data supports these positions. Pre-service teachers must be provided with content around which to focus and develop their reflective practices. They also need time to engage with the process. Rachel’s capacity for reflection developed rapidly when she focused on how her teaching philosophy dove-tailed with reform-based mathematics. This focus also allowed her to learn from her colleagues. Luke focused on the need for students to understand the material that was presented, and the implications that this had for both the use of the technology and individual students. Bob did not appear to focus in on any particular content, as he continued to struggle with the difficulties of moving beyond the way that he was taught.

In asking specific questions about the lessons, the pre-service teachers were confronted by examples of the ‘why’ questions that are critical for reflection (LaBoskey, 1994). It would seem significant that two of the pre-service teachers could begin to ask these questions, but only after teaching half the lessons. This time delay is indicative, we believe, of the need for pre-service teachers to be given time to develop their reflective capacities. Reflection is not a process that can be rushed. Our data indicates, however, that neither content, nor time, may be all that is required by pre-service teachers. The provision of content for reflection by teacher educators is important, as pre-service teachers appear to need to learn skills in ‘analyzing and commenting on classroom teaching’ (Hu et al. 2000, p. 385). This is particularly true in Bob’s case. Without some guidance, it would seem that pre-service teachers may not develop a capacity for reflection. This leads to our third point. To what extent do the new opportunities of video-conference and WebCT technology assist pre-service teachers in the development of their capacities for reflection?

Technology and reflection

It would appear from our data that for Rachel and Luke, the opportunities to both watch the archived video lessons and engage in the WebCT discussions have been valuable. This concurs, with Hu et al. (2000, p. 381) who believe that as ‘student teachers shared their experiences and discussed possible solutions to problems encountered in teaching, they were exposed to alternative teaching strategies and viewpoints.’ The opportunities to watch the archived lessons of both themselves and their colleagues teaching, allowed Rachel and Luke to critique themselves and to observe different teaching styles in action. For example, the movies helped Rachel ‘identify areas for growth as well as areas I did well’, while for Luke, part of the value lay in getting ‘the feeling of what the students are seeing, and any problems that need to be encountered by the teacher.’ The use of WebCT as a medium for reflection also appears to have been highly effective for Rachel and Luke, for the act of writing encourages the growth of “consciousness out of the unconscious” (Ong, 1982, p. 150). As Rachel wrote, ‘It also developed a sense of reflection in me because of having to write in WebCT and watch the movies.’ Luke found that ‘Writing in WebCT really makes me reflect on what happens previous weeks and what you can do this week to make it better.’ Hu et al.(2000, p. 381) have argued that ‘Being able to watch one and others teach and being able to discuss real life examples of teaching with peers and mentors has long been recognized an ideal for reflective teaching’. While agreeing with the direction of this statement, our data also indicates that such opportunities may not be accessible to all pre-service teachers.

Bob, for example, demonstrated limited capacity for reflection during the course, but often appeared to value his own experience and biography more than the need to learn. In his final commentary, he expresses many of the indicators of the ‘Commonsense Thinker’ summarized by LaBoskey (1994, p. 29). Bob’s commentaries indicate that a person’s capacity for reflection may not be improved simply by incorporating the new technologies into pre-service teacher education courses. Bob, it would seem, would benefit more from the ‘individualization of assessment and intervention in teacher education’ (LaBoskey, 1994, p. 129). The meaningful integration of video-conference and WebCT technology into such a process is clearly an area requiring further investigation.

Conclusions and Implications

We recognize that this case study only involves three pre-service teachers utilizing video-conference and WebCT technology in a unique context. For this reason we have been careful not to attempt any broad generalizations from our analysis of the data. These findings do provide some avenues, however, for further research. Our data suggests that the capacity of pre-service teachers to meaningfully reflect lies at the heart of the potential use of video-conference technologies in teacher education. Video-conferencing allows pre-service teachers to observe themselves, probably for the first time, in a teaching setting. The opportunity exists for the individual to both see themselves as they are seen in the “classroom”, and to critique the actions, words and attitudes that they see. Taken in concert with the reflections, comments and criticisms of their colleagues, teacher educators, and future students, such opportunities are created by the new tools to assist pre-service teachers in the development of reflective practices. To exploit these tools intelligently will require consideration of pre-service teachers’ biographies, the content of pre-service teacher reflections, and the recognition that some pre-service teachers will require individual support in their teacher education program. Taking these into account will facilitate the acquisition of the skills needed to exploit the opportunities provided by the new technologies.

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