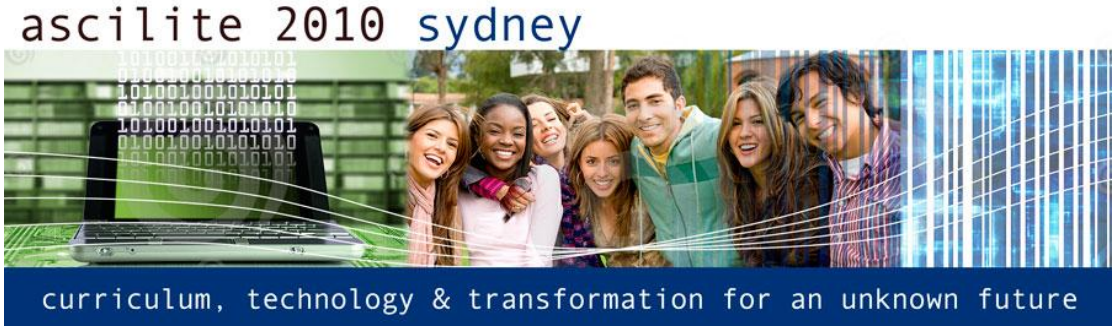

Reflection of teaching: A glimpse through the eyes of pre-service science teachers

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This paper examines pre-service teachers' reflection on teaching after participating in an online course using teaching videos of micro-skills coupled with self-reflection and group blogs. A total of 137 online entries were collected from 26 participants. Larrivee's (2008) four levels of reflection (pre, surface, pedagogical and critical) were used to code the reflection by the participants. The findings showed that 67% of the reflection by pre-service teachers falls in the pedagogical category and 2% in the critical category. These findings show that pre-service teachers are capable of engaging in reflection beyond a surface level even with limited actual classroom experience, and micro-skills teaching videos coupled with self-reflection and online blogs can serve as stimulus for reflection about actual teaching practices. The resources that the pre-service teachers used to make sense of teaching are (1) their knowledge of learning theories; (2) their ideas of teachers' roles and responsibilities; and (3) existing ideas of what makes good teaching. The pre-service teachers reflected upon their learning and showed evidence of willingness to incorporate the learnt ideas of good teaching into their future classroom teaching. The use of videos and reflection allowed them to restructure their teaching knowledge through identification, comparison, modification and synthesising.

Keywords: Reflection, microteaching, pre-service science teacher education, video technology, online blogging

Introduction

This study sets out to establish the forms, depth and extent of pre-service teachers' reflection using micro-skills teaching videos that are coupled with online self-reflection and blog. The trigger for this study stems from two key issues highlighted extensively in teacher education literature: (1) the need to prepare pre-service teachers as reflective professionals (Osterman & Kottkamp, 2004; Schon, 1987) in the absence of actual classroom teaching experiences; and (2) the possible role of technology in enhancing reflection and peer discussions in teacher preparation programs (Bryan, Recesso, & Seung, 2008). In the next few paragraphs, we present the intertwined complexities of time, design and objectives of teacher preparation programs and explain how they inform this study.

Designing teacher preparation programs is challenging due to the demands on knowledge, skills and values that a teacher is expected to possess. There has been no agreement to the ideal model of teacher preparation since demands of teaching are culturally and contextually dependent (Korthagen, 2004). Further, teacher preparation programs also have to deal with the challenge of helping new teachers translate what they have learned in their teacher preparation program into practice (Bryan & Abell, 1999; Greddis & Roberts, 1998). Debate is still raging as to whether academics or practitioners should be the primary faculty for teacher education (Levine, 2006), or whether teacher education institutes or schools should be the sites for teacher education (Humphrey & Wechsler, 2005). Time, relevant

contextual experience and developing professionalism in teacher preparation programs are issues that are challenging and need to be addressed. This study fits squarely into the three key constraints highlighted. The program of interest is a teacher preparation program that aims to develop pre-service teachers' reflective capacity of teaching practices in actual classrooms prior to their teaching practice. The program is short, has participants who lack actual classroom teaching experience and are graduates fresh from college. The mission here is to examine whether reflective pre-service teachers can be developed efficiently prior to having teaching experience. Technology appears to hold some solutions to this problem. Consequently, in this study we examine how technology can be integrated with micro-skills to enable pre-service teachers to learn teaching skills and reflect on how the skills can be applied in their future practices. The use of micro-skills is a common feature in teacher education programs (Bell, 2007) and while there are numerous studies indicating its effectiveness in helping pre-service teachers learn about and reflect upon their practices (I'Anson, Rodrigues, & Wilson, 2003; Kpanja, 2001), it is also fraught with criticisms for its skills-focused training that is often devoid of contextualised information (Bell, 2007).

Our research is guided by these questions:

1. What forms of reflection do pre-service teachers engage in when viewing videos about micro-skills?
2. What kinds of knowledge do pre-service teachers use to make meaning of teaching from watching videos of micro-skills?

Theoretical underpinning

This research focuses on the core constructs of using micro-skills in teacher preparation programs, and reflection and learning in an online environment. In the following sections, we review the literature in these areas and present how the ideas presented in literature shape this study.

It is a conventional practice in pre-service teacher education to develop novice teachers in their teaching skills before they encounter the challenging and complex teaching situation in real classrooms, and the use of micro-skills (or microteaching) is one approach of achieving this. Microteaching refers to the scaled-down teaching to a small group of peers in a non-threatening environment (Hargie & Maidment, 1979; McIntyre, MacLeod, & Griffiths, 1977). It focuses on the development of specific teaching skills. Research into microteaching showed enhancement in teaching performance, improvement in pupils' learning and positive student-teachers' attitudes to their course of teaching (Akalin, 2005; Wilkinson, 1996). Innovative approaches that aimed at improving the implementation of microteaching were also reported, which include modifications to the components in the microteaching program, applications of video technology, collaborative learning with peers and reflection (Hoban, 2000; Kpanja, 2001; Lee & Wu, 2006; Wilkinson, 1996). Research has provided evidence to show the effectiveness of microteaching through videotaping, self reflection and additional feedback (Fernandez, 2010; Kpanja, 2001; Wilkinson, 1996). The approach we adopted in this study is similar to earlier studies in the use of video technology, although we adopted a different mode of student self reflection by incorporating blogs in the online learning experience. The inclusion of self and group blog presents the pre-service teachers with a different platform for reflection and critique.

There has been considerable emphasis on the role of reflection to improve teacher professional development (Korthagen, 2004; Larrivee, 2008), especially with the need to ensure that we do not treat reflection merely as an intellectual exercise (Boud, & Walker, 1998). In teacher education, there is an even greater need to ensure that pre-service teachers reflect upon the academic knowledge they learn in pre-service teacher courses, and are able to translate academic knowledge into field experience effectively. As such, reflection as a learning tool and activity is useful in pre-service teacher education courses to enable pre-service teachers to link between academic knowledge and their actual practices in the future. Reflection, as described by Dewey (1910), is a process whereby an individual engages in "active, persistent and careful consideration" (p.6). Teachers are able to engage in meaningful reflection about their learning at different levels of thinking when guided by a reflective framework (Hoban, 2000). The reflective thinking involves the process of making meaning of teaching through connecting the learnt theories and past experiences with their practices. Subsequently, a new learning is generated and serves as practices for professional development (Postholm, 2008). There have been attempts to define reflection so as to devise a generally agreeable language to discuss reflection and promote the reflective practice (Day, 1993; Farrell, 2004). Larrivee (2008) built on the work of earlier researchers and developed a tool to assess teachers' level of reflective practice that encompass four

hierarchical levels from (1) pre-reflection (interpretation of classroom situations without consideration of other events or circumstances); (2) surface reflection (considerations of teaching confined to tactical issues concerning ways to achieve predefined objectives and standards); (3) pedagogical reflection (teacher considers how practices are affecting students' learning and how improvements can be incorporated); and (4) critical reflection (ongoing reflection and critical inquiry on teaching taking into consideration philosophy and ideology). In this study, we chose to adopt Larrivee's levels of reflection for analysis since it takes into account a pre-reflection level that we hypothesise would likely apply to pre-service teachers.

Videos could serve as a good mode of inquiry that allows respondents to review rich content that includes various aspects of teaching: pedagogy, climate, management, classroom characteristics and student characteristic (Colestock & Sherin, 2009). The amount of attention given by teachers on each domain was different with instructional strategies receiving more concern than other aspects. Colestock and Sherin found that teachers applied different strategies in interpreting teaching videos and subsequently developed their professional view of teaching through their interpretation and discussion. Video technology has also been implemented in microteaching to show examples of teaching or case-based learning by illustrating the actual and complex teaching environment. Videos allow student-teachers to learn teaching skills and teacher-student interaction through modelling and developing problem solving skills through observing the case in video playback (Kpanja, 2001; Lee & Wu, 2006). Video recording and playback is a useful technology to improve reflection in teaching (Akalin, 2005; Albrecht & Carnes, 2006; Benton-Kupper, 2001). Video-enabled and video-oriented discussion followed by critical reflection helped pre-service teachers to identify areas for improvement in professional growth (Fernandez, 2010; Kpanja, 2001). As a result, they could develop an increased awareness of their instructional strengths and weaknesses by observing the videos. The use of videos allows student-teachers to have evidence-informed discussion and this fostered reflective practices among teachers (Albrecht & Carnes, 2006; Fernandez, 2010).

Web logs (commonly known as blogs) are a well accepted learning technology in education. Similar to online discussion forums, which allow participants to post their thoughts and subsequently read and comment on what is posted, blogs foreground the individual and cater to a much wider audience – anyone who happens to find the blog online can read and comment. As such, the fundamental difference between someone writing for an online discussion forum and a blog is that a blogger writes to a diverse and probably unknown audience. In education, the use of blogs is still being explored and developed (Jonassen, 2000) and this is also the case in teacher education. Duffy and Bruns (2006) proposed that technologies like blogs, wikis and RSS promote desirable practices such as collaborative content creation, reflection of learning experiences and enable peer and formative evaluation to take place. Hernandez-Ramos (2004) carried out a comparative study between the use of web logs and online discussion to promote reflection in an instructional technology course in a teacher preparation program. His study reported that while teachers prefer web logs to online discussion forums in their reflection, the availability of information to a wider audience resulted in some apprehension in using web logs. However, once the teachers become familiar with using web logs, they reflected on events ranging from their reactions to the time they spent with their students, to their own professional learning and also classroom management strategies. In this study, pre-service teachers worked on an individual blog to reflect upon the videos. Peers reading these blogs will be able to gain diverse perspectives from watching the same video by reading the blogs.

The literature reviewed indicated different views about the use of microskills in pre-service teacher education. Further, evidence indicates the increasing popularity of incorporating videos and Web 2.0 technology due to its usefulness in helping pre-service teachers reflect and attain levels of professionalism that would previously take a longer period of time to achieve. As such, this study builds on previous studies carried out using microskills, video technology and Web 2.0 on reflection of pre-service teachers to examine exactly what forms of reflection pre-service teachers engage in with regard to learning teaching skills.

Context

In this study, pre-service teachers learnt in a self-directed inquiry, video-enabled and web-based discussion environment. Using videos as a source of inquiry, the pre-service teachers assumed the roles of a self-directed learner to observe the videos and discuss the necessary teaching skills to improve student learning. The teaching skills that this course focussed on include opening and closing skills,

explaining skills and questioning techniques. Using Dewey's idea of reflection (1910), the course was designed to engage pre-service teachers in 'active' consideration when they view videos of teaching segments and to encourage them in 'persistent and careful consideration', they were asked to blog, both individually and as a group about their thoughts of the videos. We argue for the need for pre-service teachers to be engaged in reflection so that they can make a reflective link between the teaching skills they have learnt (an external stimulus) to their own schema or ideas about teaching (an internal domain). Hence, reflection on and about learning serves as an important component for teachers' learning in this study given the important role reflection has in teacher education (Amobi & Irwin, 2009).

In terms of analysis, pre-service teachers' reflections were analysed to examine how pre-service teachers interpreted the purposes of teaching actions. We postulated that pre-service teachers would be able to identify the purposes and the examples of strategies used in teaching videos if they have learnt what make good teaching skills. Their reflection and interpretation will indicate their concerns and understanding of teaching. While much of the evidence in the literature showed that video technology enhanced reflection of pre-service teachers, little is said about what forms/levels of reflection pre-service teachers are capable of. The levels and forms of reflection hence form the core of this study

Methods

An instrumental case study methodology was used to study pre-service teachers who learnt microteaching skills through self-directed analysis of videos followed by reflection using blogs. Data for this research were collected from 2008 to 2009 from three cohorts of students who have since graduated from the program.

Participants

There were 26 participants from three cohorts of pre-service teachers enrolled in a one-year postgraduate diploma in education program. All the participants have a Bachelor of Science degree and the majority of them have minimal formal teaching experience in schools. The participants specialised in the teaching of general science and biology at high school level. They volunteered to participate in an online microteaching course.

Intervention

This research was conducted in a 13-week science methods course that aims to equip pre-service teachers with the different strategies and methods of teaching general science and biology. Specifically, the participants would learn: (1) methods of science teaching; (2) teaching skills; and (3) ways to align the methods and teaching skills to teach a lesson. In this course, we specifically focus on the learning of four teaching skills: opening a lesson, closing a lesson, explaining skills, and questioning skills.

As part of the course, the participants were expected to select a specific topic from the science/biology curriculum, plan a lesson and practice teaching this lesson with their peers as students. Peer critique and self-reflection form part of the evaluative framework for their learning. They learnt the concepts and knowledge of microteaching through the online materials and were requested to view some teaching videos, followed by writing their reflection in online blog at different phases in the online course. The data corpus consists of 137 online blog entries made by the pre-service teachers.

The online course was designed and structured into six phases: (1) an online lecture on microteaching skills that include opening and closing skills, explaining and questioning techniques; (2) a connect phase where the students viewed few teaching videos to assist them to make a connection between the lectures and teaching situation; (3) a reflection phase where the students worked on a personal blog after watching the video segments; (4) a problem based video segment where the students watched a video segment where problems and issues are embedded; (5) an application phase where the students commented on the problems found in the video; and finally (6) an extension phase where they consolidated their knowledge of good teaching skills in their group on the wiki platform. Wiki is an online platform that allows collaborative construction of a document. The package was uploaded to the university learning management system, Blackboard. Pre-service teachers are able to access the materials at their own convenience within a week.

In this study, the pre-service teachers were requested to reflect individually as well as in group blogging. All written reflections were available for all the respondents. Their reflections were not rigidly structured, but some respondents reflected by referring to the guided questions and instructions such as: "What is good about the teaching and why?", "Would you be able to incorporate these in your own practice?" or "Discuss two examples for improvement". Overall, they reflected and commented on all videos according to their own perspectives and understanding. They also gave additional comments to other members in the groups. All the excerpts quoted in this paper use pseudonyms.

Data analysis was carried out inductively on the online entries to thematise the ideas reflected by the pre-service teachers. This is carried out by going through all the online entries so that the themes are saturated and categorised into the different aspects of teaching. Next, we examine the individual entries in each category and code them using Larrivee's (2008) four levels of reflection and calculated the frequency of reflection in each of the four categories of pre-reflection, surface, pedagogical and critical reflection. Through this interpretive process, we set out to find out the multiple ways through which pre-service teachers make sense of teaching through watching teaching videos.

Results and discussion

To answer the research questions, we present evidence to show: (1) the levels and forms of reflection that pre-service teachers made after watching the teaching videos, and (2) the resources that they use to make the connection between teaching as they observed from the videos and teaching in a real life context.

Levels of reflection by pre-service teachers

Based on each entry in their personal blog, 67% of all blog entries fall into the pedagogical level, with only 2% in the critical category. Table 1 below shows the distribution of the categories of each reflection by the student teachers.

(1) Pre-reflection level
Contrary to the hypothesis we had at the start of the analysis, only 9 % of the reflection falls into the pre-reflection category. Hence, the pre-service teachers move beyond merely interpreting events in the videos without thoughtful connections to other events or circumstances. An example of a reflection at pre-reflection level is: "started lesson by asking the class to recall… He then links to the main lesson by telling them he is teaching them the function of various digestive organs ... he asks various questions to stimulate the interest of students on the topic."

Table 1: Frequency table of levels of reflection

	Four levels of reflection				
Group	**Pre-reflection**	**Surface**	**Pedagogical**	**Critical**	**Total**
Feb2008 (N= 10 No. of Entry: 28)	4.18%	22.18%	72.38%	1.26%	100.00%
Aug2008 (N=4 No. of Entry: 46)	13.95%	16.28%	67.44%	2.33%	100.00%
Mar2009 (N= 12 No. of Entry: 63)	10.33%	24.67%	62.67%	2.33%	100.00%
Total	**8.83%**	**22.16%**	**67.07%**	**1.95%**	**100.00%**

(2) Surface level reflection
Here the pre-service teachers focused on tactical issues relating to achievements of set goals and objectives. 22% of the pre-service teachers dedicated considerable attention to presentation skills for both verbal and visual presentation. They commented on the teaching aids such as pictures, flowcharts, diagrams, computer animation and teachers' demonstration in terms of their relevance to the topics, the appearance and the appropriateness of the usage of visual aids. Comments such as: "The flowchart the teacher used is visually engaging as it is colourful and clear" (Margaret Chin, 31 March 2009).

The pre-service teachers also made considerable reflective inputs on appropriate opening and closure of a lesson in teaching. They gave attention to the procedural aspects of lesson opening including: (1) visual presentation or interaction activities; (2) capture attention, arouse interest and curiosity; (3) apply good questioning skills to lead students to think; (4) recap the previous lesson; and (5) provide clear organiser to introduce what is to be done in the lesson. Examples of statements made by the pre-service teachers include:

> The teacher shows students two pictures, one of a healthy baby and another showing a skinny undernourished baby. (Sagarika, 31 March 2009)

> He used a model to let the student know how the lesson will flow… this acts as an advanced organiser for the students to know what to expect. (Zainah, 10 April 2008).

Table 1 illustrates the number of statements and excerpts stated by pre-service teachers based on different techniques they had observed.

(3) Pedagogical level reflection

The data suggests that most of the reflection made by the pre-service teachers were in the pedagogical level, indicating that they thought about how the various teaching skills and strategies highlighted would impact the learning of students and how they can be applied to improving the teaching and learning experience.

Furthermore, they interpreted the purposes of using visual aids were to engage students in learning and serve as an organiser of the lesson. Their justifications were quoted as follows:

> Use of visual aids…makes a visual impact on the students and allows them to follow the lesson easily. (Sally Chan, 1 April 2009)

> Visual aids such as models could be used to aid in his content delivery…it gives a 3D image…helps to engage students and encourage learning. (Pei Ling, 7 April 2009)

Although the pre-service teachers emphasised the use of visual aids, they were aware not to use them redundantly. In their explanation, they criticised the repeated illustration of the same pictures in two media (cut-out board and PowerPoint slide). Instead, they suggested the best use of video or animation is to improve explanations by showing the complexity and reality of the taught topics (for example the real structure of the enzyme). Their suggestions about the amount and mode of visual aids used demonstrated their extended understanding of visual presentation to meet specific teaching purposes.

In terms of verbal presentation, the pre-service teachers stated the importance of clear and concise explanations. They mentioned the importance of appropriate pacing of lesson explanation and suggested that pacing should be determined by students' comprehension of the lesson. In addition, a change of the intonation and intensity of voice can be used to emphasise learning points. Conversely, the wrong use of words and tones potentially creates a negative impression for the students. As one pre-service teacher highlighted:

> He (the teacher) sounded unsure and used vague terms like 'something like that'. It does not inspire confidence of the students and the teacher will quickly lose the respect of the students. (Jeffrey Loo, 22 September 2009).

Another aspect that captured their attention is the use of language. Some pre-service teachers suggested that teachers should use accurate terms in their lessons and avoid using "Singlish" (colloquial accented English used by Singaporeans).

Pre-service teachers agreed that questioning skill was a vital component in verbal presentation. They gave positive feedback on good questioning examples shown in the videos. They perceived that good questioning skills helped to engage students, enhanced higher levels of cognitive development and served as an assessment tool to check students' understanding. Furthermore, they were willing to endorse questioning skills in their future teaching as highlighted by their reflection entries.

> Teacher gave an overview of what has been taught...moved on to a higher cognitive level of questioning.... I think this is good because the transition to the higher-order thinking is smooth and the questions are aptly challenging to the students. (Sharini, 27 April 2009)

> Teacher uses questioning to elicit response from the students...which can be used as a formative assessment of what the students have learnt. (Sally Chan, 27 April 2009)

> I will definitely try to incorporate the questioning skills into my lessons as it reinforces learning and encourages student to think. (Sophie Lee, 6 April 2009)

For the pre-service teachers, effective classroom management, lesson planning and content knowledge mastery were also important components to make good teaching. They realised that these aspects can influence the learning and teaching in the classroom. The following excerpts show that pre-service teachers identified the poor classroom management through students' responses when the students were not attentive and not settling down.

> Teacher tends not to have eye contact with the class...thus it may be hard for him to see who is paying or not paying attention. (Chin Yuen Meng, 31 Mar 2009)

> When students are not attentive, she should stop the lesson but yet continue to carry on. There is no classroom management. (Nurul, 09 April 2008)

Some of the pre-service teachers commented on the appropriateness of the use of analogy and precision of the video teacher's explanation based on their content knowledge.

> I am not comfortable with the analogies she used. For example the 'kueh lapis' (a traditional layer cake) and how the layers represent the internal and external intercostals muscles, I feel that the analogy was not clear enough and the students may get a little confused. (Chin Yuen Meng, 15 April 2009)

> The concept was not well explained because her illustration with arms and overlapping fingers was too abstract and did not seem congruent with what she is trying to express. (Jessy Kang, 7April 2009)

> The teacher did not relate how the process of catalysis of the enzyme and substrate is linked to the lock-and-key hypothesis...he should illustrate how the enzyme acts as the lock and substrate acts as the key. (Teh Soo Meng, 6 April 2009)

Further, some pre-service teachers emphasised lesson planning and preparation. They attributed poor teaching, inappropriate pacing and poor time management to insufficient preparation. They placed importance on the refinement of lesson plans to improve teaching and further suggested and reflected on improvements that can be made.

> The lesson ran into overtime, the pace of her teaching was fast. In future, she might have to revise her lesson plan to take into consideration of time limitation…practise her lesson and time herself. (Pei Ling, 2 April 2009)

> It's usually the closing that's rushing, because especially for us trainee teachers with our lesson plans, we tend to over-plan and be ambitious. Thus, our closing is usually not done properly, especially when we realise that the lesson is ending and we are only halfway through the lesson plan. (Faridah, 9 April 2008)

From their reflection, pre-service teachers showed a preference for student-centred pedagogy and they were aware of the needs of different learners in a classroom. They placed importance on catering to different learning styles and various intelligences. When a teaching technique could not serve all, they suggested alternatives and modifications to meet the needs of different groups. Following were some examples of pre-service teachers' explanation and analysis.

> He was totally auditory and did not cater for students who were not auditory learners…Most of them are visual and kinaesthetic in nature. Therefore it would be been better if he wrote

> something or drew something while speaking so that student could learn better. (Nurul, 9 April 2008)
>
> The teacher repeated the key points quite a few times during the explaining, I think this is good because students may need to hear information presented several times before they can catch all the details and they may also need to hear it presented in alternative ways. I also try to do this by presenting the information from different angles, or with different materials, as I think this will help students with different needs to understand. (Janet Ng, 18 April 2008)

(4) Critical level reflection
Only 2% of the reflections fall into the critical domain. At this level, the pre-service teachers emphasised the development of learner autonomy. They paid attention and gave credit to the pedagogies that related to students' life experience and encouraged students to develop responsibility in their own learning. In contrast, teacher-centred pedagogies generally received negative feedback and criticism from the pre-service teachers. The consideration of students' background and needs outside the context of the classroom exhibit their critical and holistic understanding of teaching.

> The teaching is good as it is student-centred and the teacher manages to focus the energy on the students, asking them to respond and discover the facts on their own… The teacher has devised a lead in, which related to the students' experience. It gives them a better idea of the concept. (Suriyah, 16 April 2008)

Knowledge used to reflect

In this section, we examine the resources (education theories, teachers' roles and responsibilities, and current ideas of what teaching is) used by the pre-service teachers to help in their reflection.

(1) Understanding of educational theories
Pre-service teachers were able to relate the use of teaching techniques to educational theories by elaborating the theory using their personal metaphor. The narratives below illustrated the pre-service teachers' justification of the application of teaching pedagogy grounded on cognitive theory.

> …linking subtopics together encourages the lesson to be committed to long term memory rather than short term memory. Asking the students for learning points forces the students to think through what they have learnt today and organise it into words. This helps to commit the information to memory and checks for understanding. (Jeffrey Loo, 22 September 2008)
>
> He made use of the students' prior knowledge to integrate new knowledge. It would be easy to make quick associations by building new knowledge upon the learners' prior knowledge, pretty much like linking concepts together like a spider web. (Zheng Hui, 18 September 2008)
>
> Closing 1 is good because it gives a comprehensive and summative overview. This is good because by Ausubel theory, it helps to enhance learning and understanding. (Pei Ling, 2 April 2009)

The pre-service teachers applied their understanding of educational psychology to evaluate the appropriateness of using certain teaching techniques. They suggested that a strategy that can arouse students' emotional affection was able to engage students in learning and create greater impact in their memory. The excerpts below expressed their thoughts.

> The use of emotion is good for creating an impact on the students. They are able to reflect and link their daily life to the lesson. (Wong Hui Ting, 16 April 2008)

(2) Teachers' roles and responsibilities in creating conducive learning environment
A pre-service teacher wrote the following excerpt expressing her view about the learning environment:

> The student teacher really took the students' view into account; he gave them time to think and then developed on their answers… she showed that the students' answers were valued and they were willing to share as the environment was non-threatening. The teachers also

> encouraged student to think by not saying that the first answer given was wrong/incomplete. (Janet Ng, 10 April 2008)

Similar reflective entries were repeated among the pre-service teachers. They understood that it is the teacher's responsibility to create a conducive learning environment by asking the right questions, giving appropriate responses to students and taking care of student-teacher interaction. They also highlighted that the teachers' personality and confidence influence the learning environment.

(3) Existing ideas of good teaching

The pre-service teachers engage in self-reflection of their own abilities and conceptions about what they can potentially carry out in their own classrooms to judge if a teaching segment is good. For them, good teaching must be thoughtful, realistic and attainable.

> The videos have certainly given me a lot to think about and ideas on how to focus the attention of the students…I think the 2nd video was the simplest activity yet the most effective at grabbing the attention of the students. (Jeffrey Loo, 25 September 2008)

> I think all 3 videos example are good. Probably I would make use of some components of each and have a hybrid of all 3 (e.g. start off with a picture…, followed by citing a real-life example and get them to share what are their personal reflections and finally, end the lesson off by using a flow-chart.) (Pei Ling, 7 April 2009)

The pre-service teachers evaluated the quality of the teaching showed in the teaching videos and they decided to incorporate the good parts of them. They provided suggestions and modifications on the techniques to improve the quality of teaching. They synthesised their learning from their current ideas and understanding of what constitutes good teaching.

> I would most definitely include some of the opening and closing examples shown here. …I would definitely think of more "hooks" such as picture and short clips or animation to arouse the students' curiosity. In term of the closing, I would incorporate the questioning sessions at the end. It would definitely be beneficial to the student to know what to expect for the next lesson. (Nurul, 9 April 2008)

> I would definitely be able to incorporate these during my practice…the base line is to ensure that the students get interested, form links to prior and future knowledge (improved information processing skills) and at the end of it, know their position in the learning process of that topic, and consolidate the content and important points delivered during class. (Faridah, 9 April 2008)

> I would want to incorporate this explanation style into my classes in future. The use of something very recent and very relevant to students makes the learning personal. Dissecting the topic into a logical sequence also helps make the topic more bite-size and hence more digestible because there is a rational flow. (Jessy Kang, April 2009)

Conclusion

This study sets out to determine the levels of reflection that pre-service teachers engaged in after an online lecture and through watching a teaching video coupled with the lecture and the resources that pre-service teachers could potentially employ to help make sense of the videos. The evidence suggests that using an online lecture coupled with teaching videos, 67% of reflection made by the pre-service teachers were pedagogical, 22% were surface level reflection, 9% fell into the pre-reflection level and only 2% into the critical level. With 67% reflection relating to how the strategies can impact students' learning, the pre-service teachers showed that they have learnt about teaching from a ritualistic level to that of principled knowledge (Russell, 1993). Hence, the criticism that learning teaching skills in a micro-context is limiting and artificial (Calderhead & Shorrock, 1997) is refutable for this particular mode of learning teaching skills in a micro context provided the pre-service teachers with a platform to reflect on the greater context of teaching in a real classroom. The concern over the tension that exists between understanding teaching and performance of teaching is addressed through reflection on the teaching segment. Engagement in careful reflection of offers an avenue for pre-service teachers to

move their learning from ritualistic doing and listening, to a higher level that challenges their existing beliefs (Clarke & Hollingsworth, 2002).

The resources that the pre-service teachers use to make meaning of effective teaching are: (1) their knowledge of learning theories; (2) their ideas of teachers' roles and responsibilities; and (3) existing ideas of what makes good teaching. These resources that pre-service teachers rely on to make meaning are different from those that in-service teachers used in Ottesen's (2007) study. Ottesen found that in-service teachers use resources such as: (1) commonsense understanding; (2) practical wisdom; and (3) scientific explanations when they talk about their practices. The different experiences that pre-service and in-service teachers have could have influenced the different resources used to make sense of teaching. Prior experiences and personal beliefs impact their interpretation of the videos and subsequently their reflection on teaching and teaching skills. We provided evidence that the pre-service teachers were able to extend their learning from knowledge of basic teaching skills to the larger context of teaching in a real classroom.

The results of this study are encouraging for teacher educators who focus on developing the basic teaching competencies and reflection of pre-service teachers, since it offers evidence of how technology-enable reflection can help pre-service teachers map their learning onto their beliefs and practices of real classroom life. However, we do recognise that beliefs are deep-seated ideas and shaping/changing teachers' beliefs take a long time, but it would be reasonable to initiate the change process by engaging pre-service teachers in active discussion and thought processes. Much research has been carried out using web tools to encourage reflection and change of beliefs (Hernandez-Ramos, 2004), and they occur mainly in instructional technology courses aimed at equipping pre-service teachers with skills of how to integrate technology into their classrooms. As such, the contribution of this study is to provide evidence and argue for the application of video playback technology in a Web 2.0 environment in a teacher preparation course of which the primary objective is not teaching IT skills, but rather teaching skills.

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