Title: Using video technology as a catalyst to developing reflection skills in pre-service science teachers

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Abstract

This paper examines the use video playback technology coupled with the use of blogs and wikis in developing the reflection skills of 22 pre-service science teachers. Specifically, this paper illumines what pre-service teachers notice and subsequently make sense of teaching as they watch video segments of teaching taking place. It is found that pre-service science teachers primarily took notice of teaching skills and then used that as a primer to reflect upon classroom management, students’ learning need, the learning environment and how teachers plan their lesson. The use of videos and reflective blogs offers a systematic and structured way from evidence-based reflection of teaching for pre-service teachers.

Keywords: Reflection, Teaching skills; Pre-service science teacher education; Video technology; Blogs

Introduction

There is a vast body of research on teaching and teacher education that are produced through diverse research methods. The multiplicity of research methods used has resulted in equally divergent understanding of teaching and teacher education. This has led to some scholars like Gilroy and Hartley (2002) claiming that the knowledge base for teaching and teacher education is dubious and contestable. There is indeed a need to understand and resolve the tension that exist between the need for teachers (whether pre-service or practicing teachers) to understand teaching and the need to perform teaching (Calderhead & Shorrock, 1997). Hence, while learning to teach and being able to teach is sometimes presented as a dichotomy, we argue that in reality, unless a teacher knows the principles of teaching, it is difficult to move teaching from a level of ritual to a higher and more innovative level. In this paper, we present evidence to show that pre-service science teachers can move from a ritualistic comprehension of teaching to a preliminary understanding of the principles of teaching through reflection aided by video playback technology.

We perceive the goal of teacher education as three-fold as it aims to equip pre-service teachers with (1) content knowledge of the discipline; (2) teaching skills; and (3) professional attitudes and disposition of being a teacher. Recent research also emphasized on the need for teachers to have pedagogical content knowledge (Shulman, 1996) so as to increase their professionalism. With this array of knowledge, skills, attitudes and evolving demands on the learning that pre-service teachers are expected to fulfill, the challenge of teacher education is to reinvent its curriculum such that it can help to realize these responsibilities in teacher learning for the 21st century.

This paper examines how explicit instruction of teaching skills through the use of video playback technology coupled with blogs and wikis can serve as a catalyst to help high school pre-service biology teacher develop reflection skills. By teaching skills, we refer to basic skills like opening and closing skills of a lesson, questioning techniques and also explaining and concept development skills. We believe that explicit instruction of these skills is necessary for two reasons: (1) to sensitize pre-service teachers to the finer (and often taken for granted) art of teaching and (2) to enable pre-
service teachers to develop a common meta-language and understanding of teaching skills. In this paper, this issue of developing reflection skills is explored through interaction with a group of 22 pre-service science teachers (with specialization in biology) as they embark on a 12 hour course to learning the basic teaching skills in science. The central thesis of this paper is that pre-service teachers can learn and develop reflection skills through the use of videos coupled with blogs.

This research adds to our understanding of the process pre-service teachers engage in as they develop their knowledge and professionalism in teaching from a ritualistic level to a more principled level. Our knowledge of the roles and usefulness of videos and blogs in development of teaching skills is also enhanced through this research. Further, the implication of this study for teacher educators is crucial as we seek to increase our understanding of teacher development and growth in education so as to meet the needs of the 21\textsuperscript{st} century. To guide this research, we focus on the research question of “What elements of teaching did pre-service teachers notice when they watch videos of teaching segments?”

Background

In this section, we consider research literature in two different areas that are relevant to frame this research. Firstly, we describe concerns of teaching and pre-service science teacher education. Secondly, we reviewed the literature on the impact of reflection on the development of pre-service science teachers.

Issues with pre-service science teacher education

The issues and concerns about teaching inevitably impact and become issues in teacher education. Some of the issues of pre-service science teacher education include (1) currency of scientific knowledge; (2) lack of teaching skills; (3) accurate assessment of teacher learning; (4) lack of opportunities to develop authentic teaching experiences; (5) poor grasp of curriculum requirements; and (6) diverse teachers’ beliefs and perception about science. Bryan, Recesso, and Seung (2008) also highlighted the fact that novice teachers of science tend to teach as they have been taught. Besides, a significant challenge facing new teachers of science is translating what they have learned in their teacher preparation program into practice (Adams & Krockover, 1997; Bryan & Abell, 1999; Greddis & Roberts, 1998). The dilemma here is hence not about increasing the duration of teacher preparation programmes or increasing assessment of pre-service teachers. Rather, we argue that it is necessary to research the impact or effect which existing teacher preparation programmes have on the pre-service teachers and to enhance existing programmes by examining

- To allow teachers to purposefully and systematically analyze their own approaches to teaching science. Only then will they be better equipped to implement new and innovative approaches to teaching science as well as plan and manage their professional development throughout their career.
- Having evidence is the only way we come to understand if event did or did not occur.
- Credibility and relevance are two critical dimensions of evidence (Schum, 1994). Video evidence has been found to possess high credibility when it captures the intended practice.
- Current research has also shown video as relevant when investigating teacher learning and development (Pea & Hoffert, 2007).
Generating a common framework and language among pre-service teachers to discuss good practices about teaching. Students attempt to generate an explanation about what they have observed in the teaching segment.

Video of classroom practices has since been a tool used on teacher education programs as a way of promoting reflection (Abell, et al, 1996; Yerrick, Ross, & Molebash, 2005).

helped beginning teachers develop a disposition of inquiry toward their science teaching. Bryan, Recesso and Seung (2008) found that oftentimes the focus of student teachers’ analysis was on technical and managerial (although not unimportant) aspects of teaching such as monitoring wait-time, or counting the number of questions asked by boys and girls.

Pre-service teachers

*Use of reflection in supporting the development of teaching skills*

To be beneficial, video must be used in activities that induce particular mode of inquiry. To reap the benefits that video has to offer, teachers must participate in structured activities around the use of video.

- In this study, we aim to examine the feasibility and effectiveness of harnessing the use of video, blogs and wikis in secondary biology teacher education, specifically in learning teaching skills.
- Feasibility here is measured by degree of students’ learning in an online environment as compared with face-to-face instruction. Effectiveness is measured by students’ ability to translate what they have learnt into their own practices. This is measured by using students’ test scores in their final teaching assessment. Other data sources include students’ interview and questionnaire to measure students’ perception of using videos, blogs and wikis in learning teaching skills.
- Video is chosen as a means of portraying teaching as it has the ability to capture the richness, simultaneity, and complexity of classroom instruction. This ways of portraying teaching is not possible with written case stories or using textual narratives.
- Research (Borko, Jacobs, Eiteljorg, & Pittman, 2008) suggests that the ability to meaningfully view video of classroom instruction is a skill to be learned. Hence for teachers to develop structured ways to make sense of video for their professional development, it is necessary to devote time and effort to equip teachers with the skills so that they are empowered to critically examine their teaching.

- Colestock and Sherin (2009) carried out a study with 15 middle and high school mathematics teachers of their sense-making strategies as they watched four short video clips of mathematics instructions. They found that while all the teachers share common professional vision about classroom instruction, they differ in their interpretation and also sense-making strategies. Their study concurred with the knowledge that teachers view and make sense of videos in different ways.
Research Design

Data collection

The participants are pre-service teachers enrolled in a one year postgraduate diploma in education programme. The 22 participants are all university graduates in Biology with little or no formal teaching experience in school. They have not had any prior exposure to explicit instruction of teaching skills before this course. To help the participants develop teaching skills, they are exposed to this 12-hour course which is carried out in an online environment. The students have at least three weeks to complete the course online.

The data corpus consists of online blog entries made by the pre-service teachers after they have viewed each of the video segments. There were two types of blogs entries – individual reflection entries as well as group blog entries. While some reflected and commented on individual segment of the videos, others made collective comparison and reflection of the all video segments. The online learning activities was designed and structured to have six phases consisting of (1) an online lecture on skills like opening and closure of a lesson, developing an explanation and finally questioning technique; (2) a connect phase where the students watch at least two video segment of teaching; (3) a reflection phase where the students work 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 comment on the problems found in the video and finally (6) an extension phase where they consolidate their knowledge of good teaching skills in the form of a wiki.

Data analysis

Data analysis took an interpretative angle that is described by Gallagher (1992, p. 80) as examining our experiences by exploring “the possibilities of recasting, revising, or reforming our preconceptions, our possibilities would reduce to an overly narrow range, and, at the extreme, experience would no longer be educational.” With these insights, the study focused on interpretation not as a univocal truth of the data to be revealed or a definitive conclusion to be reached, but rather as possible understandings to reopen new and generative instances of thinking about how pre-service teachers learn teaching skills.

As far as the interpretation and analysis of data is concerned, the entire data corpus made up of online blog entries by the participants was examined in detail. Through this process, we surfaced possible themes which pre-service teachers took notice of when they watched the video segments of teaching. These themes included teachers’ behavior, students’ behavior, knowledge claim, and classroom management. Later, we examined the themes and data further to develop our reinterpretations of what is perceived as important to the participants in their learning of teaching skills through watching videos of teaching segment.

Results and Discussion

Analysis of the group reflection blog suggested five areas which the group of pre-service science teachers commonly focused on when they are viewing videos of teaching segment. These five areas, in decreasing order of frequencies are: (1) skills in questioning, opening, closure and explanation, (2)
classroom management, (3) students’ learning needs, (4) learning environment and (5) planning of lessons. We will discuss each of the areas in detail.

Technical skills in questioning, opening, closure and explanation

The participants highlighted several instances of inadequacies of specific technique from the videos they watch. In nearly every blog entry, they articulated some technical aspects of teaching which was either carried out well or could have been improved. Technical skills were highlighted by comments like:

“She did not prompt the students any further.”

“The teacher hinted too much in her questioning.”

“He was reading from the book with no explanation.”

The first reflection was made in response to the video segment where the teacher asked the same question to the students several times and her failure to paraphrase or simplify the question when her students failed to answer the question. One of the technical aspects of questioning technique which the participants learnt was to paraphrase, prompt and guide the students should they be unable to answer questions posed to them. In the second instance, the teacher in the video has embedded strong hints in the questions asked leading to the students almost immediate answers to the questions asked. This led to the participants questioning about the purposes of the questions used by the teacher. Again, the participants have learnt that in crafting authentic questions for assessing students’ learning, they need to be sure that answers to the questions are not hinted in the questions asked. In the last comment, the participants reflected upon the technical and procedural aspects of formulating a good explanation. They commented on the teacher’s observed behavior of reading directly from the textbook and related this to an inadequate providence of an explanation. Here, the students understood the component parts (for example identifying the key questions, the key principles and the general rules used in the concept) which needed to be present in a good explanation and when this is not shown clearly in the video, the participants attributed it to the fact that the teacher was merely reading from the book.

The focus here appeared to be on actions carried out by the teachers as these are concrete describable technical aspects of teaching. We postulated that the participants find these technical aspects of teaching simpler to notice, articulate and probably less contentious. While Bryan, Recesso, and Seung (2008) cautioned against the focus on technical and managerial aspects of classroom teaching as they are often superficial and limited, it appears that for pre-service teachers, a focus on these technical aspects of teaching serves as a primer or trigger to start discussing and reflecting upon the teaching process. Focusing on the describable actions which are visible from the video segments and using these actions to comment on the technical aspects of teaching offers a concrete, structured, objective and less contentious means to enable them to start a dialogue on teaching with each other. This we argue can be one concrete way to facilitate the reflection of and on teaching for pre-service science teaching.

Classroom management
The second most frequent entries in the participants’ reflection were comments on classroom management issues. The participants noticed the classroom context in which the teaching techniques were carried out as they commented on the teachers’ (mis)management of students’ behavior. Given the strong institutional authority, also known as traditional authority (Driver, Newton, & Osborne, 2000), given to teachers in Singapore, teachers’ responsibilities and competency in management of students’ behavior is perceived as one of the key components to the success of any lesson. Institutional authority is defined as the power to act which is bestowed upon the teachers by the school. These powers included power to discipline the students, to plan and structure lessons and to exercise control that the teachers deemed fit. Some elements of classroom management highlighted by the participants in the video included:

“She started the lesson with students still talking and not listening to her.”

“... she plunged right into the lesson without the class settling down.”

“The teacher could have improved on classroom management.”

In all the three entries, the participants noticed that the teachers in the video exhibited some forms of inadequacies or inappropriate behaviour in managing students’ behavior during the lesson. Ensuring that the students and properly settled down and paying attention to what is being said in class seemed to be an area of great importance. This appears to suggest that the participants perceived teachers’ control and influence to be instrumental in ensuring the success of lessons.

Students’ learning needs

Moving beyond techniques of teaching and classroom management, the students progressed further to discuss students’ needs. The participants showed that they were able to link observable behavior to what is less observable like what the students’ in the video segment require in order to learn. For example, they commented on the lack of interaction between the teacher and the students and suggested that this could possibly cause behavioral issues like boredom and inattentiveness. This is suggested in the entry: “There was no opportunity given to assess students’ learning...this lack of interaction with students led to problems such as inattentive and bored students.”

The participants’ ability to link observable behaviour to reflect on students’ needs is visible by the entry: “I think a proper opening is necessary to help the students focus on the lesson and have a sense of what they will be doing in their lesson.” Here, we see how the participant used the lack of a proper opening to a lesson and related it to students’ need for a structure to be in place so that they are able to know what will be taught during the lesson. Evidently, we are able to see how an action or the lack of action displayed by the teachers in the video serves as a trigger for the participant to reflect more in-depth about what teaching ought to be. Awareness of students’ learning needs is the heart of teaching. Although it is often linked to classroom management, awareness of students’ needs is more complex and can serve as evidence that reflection has moved beyond the level of observable actions.

Learning environment

To a lesser extent, some participants highlighted elements in the video segment that deals with the affective aspects of teacher behavior and how that would impact students’ learning through building
a supportive and warm learning environment. Two entries highlighted here illustrated the participants’ view that teachers have the responsibility to create a conducive and encouraging learning environment for students to learn.

“The teacher did not provide a conducive and non-threatening learning environment as she gave a “tsk” sound upon hearing the wrong answer from the class.”

“It is very important to acknowledge the students such as praising them when they answered correctly and not to embarrass them when they fail to answer correctly.”

In the first entry, the teacher’s disapproving “tsk” sound is picked out and heard as her failure to be warm and encouraging to the students’ attempt in answering questions. This action by the teacher is further perceived as her inability to create a “conducive and non-threatening” learning environment for her students. In the second example, to lack of an expected behaviour is highlighted to illustrate that absence of appropriate praises can also lead to an undesirable learning environment. The participants view giving explicit praises and acknowledgement of students’ contributions as important and necessary for building a positive classroom learning environment.

Planning of lessons

The last aspect that the participants noticed about the video segments they viewed was perhaps less obvious evidentially and more arguable since it is open to debate about preferred teaching and learning styles. The participants commented on the preparedness of the teacher in the class and we categorised this as planning of lessons. Here, the participants made a value judgment of the teachers’ preparedness and style for their lessons based on the proficiency of the teaching techniques they exhibit, their classroom management skills, and the learning environment. Some comments made by the participants included:

“I noticed that both teachers were poorly prepared for their lessons...”

“... teacher-centredness of the lesson.”

There is a wide variety of instructional strategies which can be used by teachers for their lesson and it appeared that the participants focused broadly on the level of teacher control of the strategies chosen. The participants noticed the strong control by the teachers in the video segments they watched. Due to the strong teacher control of the strategies chosen, once there is evidence of a “lost” of control by the teachers, it is perceived as ill-preparedness for the lesson on the part of the teachers (as seen in the first comment). While the comments of teachers planning of lessons were less common in the participants’ reflection, the presence of these comments is indicative of more in-depth analysis of what the participants observed in the video.

Further discussion

In this paper, we set out to examine the aspects which pre-service science teachers observed as they watched videos of teaching segments in their pre-service course. From their reflection in the group blog, five common aspects as observed by the pre-service teachers surfaced as essential for teaching. These five aspects of technical skills in teaching, classroom management, an awareness of students’ learning needs, conducive learning environment and planning of lessons are commonly noticed by
pre-service teachers. These different aspects which are noticed by the pre-service teachers are different as some of the aspects occurred at the “action” level while others occur at the “judgment” or “awareness” level. For example, comments on the technical skills of teaching and classroom management occur at the “action” level since they involved noticing the actions carried out by the teachers in the classrooms. Assessing students’ needs occurred at the “awareness” level as it requires the teacher to focus on the students and be cognizant of the students’ prior knowledge, learning styles and learning capabilities. Knowledge of how the learning environment and the planning of the lessons will impact the overall learning of the students is classified to be at the level of “judgment” since it involved the participants making a value judgment of the teachers’ choice of instructional strategies and behaviour. These various levels at which the various aspects of teaching are operating on is summarized in Table 1.

Table 1: Classification of observations made by participants

<table>
<thead>
<tr>
<th>Aspects observed</th>
<th>Level</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical skills in teaching</td>
<td>Immediate Action (focus on teacher)</td>
<td>Immediate and concrete warrant for pre-service teachers to start reflecting on teaching practices</td>
</tr>
<tr>
<td>Classroom management</td>
<td>Immediate Action (focus on teacher)</td>
<td>Context for good teaching skills to be actualised</td>
</tr>
<tr>
<td>Students’ learning needs</td>
<td>Awareness (focus on student)</td>
<td>Shifting focus from the teacher to the students</td>
</tr>
<tr>
<td>Learning environment</td>
<td>Judgment (focus on environment)</td>
<td>Realisation of the wider context which will influence teaching skills, classroom management and students needs</td>
</tr>
<tr>
<td>Planning of lesson</td>
<td>Judgment (focus on teacher)</td>
<td>Issues of teachers’ preparation, competencies etc also influence practice</td>
</tr>
</tbody>
</table>

Conclusions and implications

The use of concrete actions as warrant serves as a primer to help pre-service science teachers reflect upon teaching practices as they observe them. This will help to facilitate reflection upon their own practices that should lead to their development. Concrete warrant helps to move their reflections away from emotional and unjustified judgment of lesson based on “gut feel” to one which is more systematic and holistic. This will in turn help them in their decision making while they are preparing or are engaged in the teaching process.

The implication of the results of this study would inform three groups of people. For teacher educators, this increased understanding about novice teachers thought processes would facilitate conversations and interventions to help pre-service teachers translate what they learnt in pre-service teacher education into the actual classroom. This study also provided evidence to show that video playback technology can be used to facilitate the reflection process of pre-service teachers and hence help to increase repertories of strategies in developing teaching skills of novice teachers.
For teacher mentors, this study showed that it is important to establish a common language and general teaching principles to “talk” about teaching skills with pre-service teachers. Finally, for educational researchers, this study provided an increased understanding of development/changes of thought processes in novice teachers.

References


