



## Exploring the links between pre-service teachers' beliefs and video-based reflection in wikis



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### ABSTRACT

In teacher education, video has been used frequently for the development of competencies for effective teaching. However, few empirical studies have investigated reciprocal relationships between pre-service teachers' beliefs and video-based reflection activities. The present study investigated the influences of epistemological beliefs about mathematics on video-based reflection in wikis. Elementary school pre-service teachers had carried out reflective writing and questioning activities after watching a video clip about mathematics learning or instruction in wikis for six weeks. This study also explored the relationships between video-based reflection activities and the change of mathematical beliefs for teaching (MBT). Both quantitative and qualitative data were collected to examine the links between beliefs and reflection activities. This study found that epistemological beliefs partially influenced reflective writing and questioning activities in wikis. In addition, video-based reflection activities were beneficial for the beliefs of mathematical knowledge and students. This study also identified a few reflection and question categories that were closely related to the change of MBT. Lastly, implications of this study were discussed in regard to video-based reflection practices in teacher education.

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### 1. Introduction

Video has been used effectively to support professional development and reflection on teaching practices (Pryor & Bitter, 2008; Sherin & van Es, 2009; Stockero, 2008). Video allows pre-service teachers to observe an important or problematic event repeatedly and negotiate the meanings of the event with their peers for in-depth reflection. Recently, a growing number of studies have shown that video-based reflection is much beneficial for the improvement of pre-service teachers' competencies to notice key features of classroom activities and make sense of them on the basis of professional knowledge (Star & Strickland, 2008; Stockero, 2008).

The effectiveness of video-based reflection may depend on individual differences like pedagogical content knowledge (Hill, Ball, & Schilling, 2008; Shulman, 1986), learning and teaching styles (Felder & Silverman, 1988), and beliefs about knowledge, students, and pedagogy (Hofer & Pintrich, 1997; Philipp, 2007). Pre-service teachers who favor sensing over intuition, for instance, may

observe carefully and memorize details of a lesson in a video clip, whereas those who prefer intuition to sensing are likely to reflect on concepts and principles related to the video (Felder & Silverman, 1988). Although there are a variety of factors that influence reflection on a video, the current study focuses on pre-service teachers' beliefs. Literature of teacher education shows that individuals selectively pay attention to the events relevant to their beliefs and interpret the events in a way to confirm their existing beliefs (Ambrose, 2004; Borko, Mayfield, Marion, Flexer, & Cumbo, 1997; Cooney, Shealy, & Arvold, 1998; Pajares, 1992; Philipp, 2007; Yadav & Koehler, 2007). Nevertheless, few studies were carried out to investigate what kinds of beliefs influence video-based reflection in teacher education.

In addition, video-based reflection can help pre-service teachers to change their naive beliefs. Reflection has been emphasized in teacher education because teachers need to recognize problems in their classroom practices and change their beliefs through continuous reflection activities (Dewey, 1933; Mewborn, 1999; Philipp et al., 2007; Schön, 1987). Particularly for pre-service teachers with little teaching experience, video-based reflection can be much helpful because video provides authentic and vivid classroom situations. In addition, pre-service teachers may experience expectation failure, which is necessary for belief change (Ambrose, 2004), when they view novel teaching practices or

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unexpected students' learning behaviors in video. In-depth reflection on the events conflicting with existing beliefs can help pre-service teachers to change their naive beliefs about learning and teaching. More research is necessary to explore what kinds of video-based reflection activities are associated with the change of pre-service teachers' beliefs.

The current study aims to explore reciprocal relationships between pre-service teachers' beliefs and video-based reflection activities in the domain of elementary school mathematics. It is important to understand what kinds of beliefs make differences in noticing and reflecting on an event in video. Based on literature reviews, we predicted that epistemological beliefs (i.e., beliefs about knowledge and knowing) would influence what pre-service teachers notice in video and how they reflect on the event. In addition, this study intends to explore how video-based reflection activities are related to the change of pre-service teachers' beliefs about mathematical knowledge, students, and pedagogy. Although these beliefs have been considered as important goals in teacher education (Cooney et al., 1998), few empirical studies were carried out to improve the beliefs, particularly through video-based reflection. The current study can provide an implication about what kinds of video-based reflection activities should be fostered for the change of pre-service teachers' beliefs. To promote in-depth reflection on video, this study used wikis that enable pre-service teachers to easily create, revise, organize, and share their reflective writing and questions in the Internet.

## 2. Role of epistemological beliefs in video-based reflection

Literature of educational psychology and teacher education has shown that epistemological beliefs are influential in teaching and learning practice (Hofer & Pintrich, 1997; Kang, 2008; Schommer, Crouse, & Rhodes, 1992). Epistemological beliefs are defined as "individuals' beliefs about the nature of knowledge and the processes of knowing" (Hofer & Pintrich, 1997, p. 117). Previous studies have suggested multiple dimensions of epistemological beliefs including beliefs about the structure, stability, and source of knowledge (Buehl & Alexander, 2005; Hofer & Pintrich, 1997). People with more advanced epistemological beliefs tend to believe that knowledge consists of highly interrelated concepts and facts (structure of knowledge); knowledge is evolving and changeable (stability of knowledge); and people construct their own knowledge (source of knowledge). By contrast, people with less advanced epistemological beliefs are likely to believe that knowledge involves isolated facts (structure of knowledge); knowledge is absolute and fixed (stability of knowledge); knowledge comes from an external authority (source of knowledge).

However, these epistemological beliefs are not fixed independently from domains or contexts (Buehl, Alexander, & Murphy, 2002; Hofer, 2000). Buehl and Alexander (2005) found that college students had different epistemological beliefs in two domains: mathematics and history. Students tended to believe that knowledge in mathematics is more certain than knowledge in history; knowing mathematics depends on an authority more than knowing history. In addition, Kuhn, Cheney, and Weinstock (2000) found that the development of epistemological beliefs varied across the domains of personal taste, aesthetic, value, social truth, and physical truth. The transition from *multiplists* to *evaluativists* tended to be more difficult in the domains of personal taste and aesthetic than truth domains. Multiplists believe that all opinions are equally right, whereas evaluativists tend to judge the value of opinions by analyzing and comparing their rationale and evidence.

Epistemological beliefs may play a critical role in video-based reflection when it comes to the quality of reflective thinking.

Pre-service teachers with the belief that knowing is to memorize information given by an authority may not be spontaneously engaged in analyzing events noticed in a video. Mewborn (1999) found that pre-service teachers were more engaged in reflective thinking when the locus of authority was internal to themselves. By contrast, when pre-service teachers believed that teacher educators had the authority of evaluating classroom practice, they merely recalled classroom events without generating hypotheses on the events that they observed. In addition, Mason, Ariasi, and Boldrin (2011) assumed that epistemological beliefs are activated in the form of reflective thinking when students carry out a specific task like searching for information in the Internet. They identified two patterns of epistemic reflections by asking high school students to think aloud during navigation in the Internet. Students in the first pattern not only evaluated the credibility of web sources but also examined scientific evidence to support claims. On the other hand, students in the second pattern merely evaluated the credibility of websites without reflection on the justification of knowledge. The former outperformed the latter in learning from web resources. This study indicates that epistemological beliefs influence learning gains through reflection about knowledge and knowing.

In addition, epistemological beliefs can influence the motivation of students on video-based reflection. Buehl and Alexander (2005) found that students with more advanced domain-specific epistemological beliefs had higher motivation in studying history and mathematics than those with less advanced ones. Literature of epistemological beliefs also indicates that students are more motivated when they conduct tasks consistent with their epistemological beliefs (Cho, Lee, & Jonassen, 2011; Tsai, 2000; Windschitl & Andre, 1998). Students with more advanced epistemological beliefs are motivated by open-ended tasks and inquiry-based learning, whereas students with less advanced epistemological beliefs prefer close-ended tasks and didactic instruction. Windschitl and Andre (1998) found that students with more advanced epistemological beliefs gained more conceptual knowledge by exploring and testing their own hypotheses with a computer simulation of the human body. In contrast, confirmatory tasks in which students follow a step-by-step instruction in the simulation were more beneficial for students with less advanced epistemological beliefs.

Lastly, epistemological beliefs can influence what pre-service teachers notice in video. Pre-service teachers with the belief that knowledge comes from an authority may pay more attention to teaching practices in video (Yadav & Koehler, 2007). By contrast, pre-service teachers with the belief that students construct their own knowledge may have more interests in student activities, which determine what students learn. A number of researchers argue that beliefs have a filtering effect, which allows selective attention to the event closely related to their beliefs (Ambrose, 2004; Borko et al., 1997; Cooney et al., 1998; Pajares, 1992; Philipp, 2007). Grant, Hiebert, and Wearne (1998) investigated the relationships between teachers' observation of reform-oriented lessons and their beliefs of mathematical learning and teaching. Teachers, who believed that they should have much of responsibility in teaching mathematical problem solving skills and algorithms, tended to pay little attention to students' discussion about alternative problem solving strategies. The teachers also perceived discussion as a confusing and detrimental activity. In addition, Yadav and Koehler (2007) found that pre-service teachers selected different video cases as the best teaching practices and described a very similar situation in very different ways according to their beliefs about knowledge and learning. Thus, epistemological beliefs may play an important role in video-based reflection. Nevertheless, this assertion has been seldom examined empirically in teacher education contexts.

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