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Research paper

Prompting meaningful analysis from pre-service teachers using elementary mathematics video vignettes

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HIGHLIGHTS

- Seeing short videos (<4 min) can produce analytical comments from pre-service teachers.
- Participants' responses appear to be malleable and sensitive to prompt types.
- Participants were most analytical when asked to focus on the teacher portrayed in the video.
- Participants were most descriptive when asked to focus on the students.

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ABSTRACT

Learning from video is a theoretically grounded and popular professional development activity. In online professional development communities, however, responses to video are often shallow and lack meaningful commentary about issues that surround teaching and learning mathematics. By altering the framing conditions that accompany video clips posted to the *Everyday Mathematics* Virtual Learning Community, this study examined whether more deeply analytical comments could be elicited from pre-service teachers. Findings highlight the malleability of pre-service teachers' commentary, as their levels of analysis varied in relation to manipulations of perceived audience (expert or peer) and focus requested (on students, the teacher, or unspecified).

1. Introduction

Recruiting and developing highly qualified science, technology, engineering, and mathematics (STEM) teachers is an issue of national importance, as recent literature has demonstrated the need to improve the quality of instruction and the nature of interaction teachers provide their students, especially in elementary mathematics classrooms (Pianta, Belsky, Houts, Morrison, and the National Institute of Child Health and Human Development Early Child Care Research Network, 2007). Alongside the need to support STEM teachers, we note a recent rise of video-based learning increasingly becoming touted as one of the most highly effective practices for STEM teacher development. Importantly, research has linked changes in what teachers notice in classroom video to changes in their beliefs (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Chval, Lannin, Arbaugh, & Bowzer, 2009) and classroom practices (Sherin & van Es, 2009), which have been associated with improved student outcomes (Kersting, Givvin, Sotelo, & Stigler, 2010).

Video's potential to convey the "richness and complexities" of classroom interactions (Brophy, 2004, p. ix) has caused the medium to become an integral part of pre-service teacher education (Chval et al., 2009; Santagata & Angelici, 2010; Star & Strickland, 2008; Sun & van Es, 2015). But simply providing pre-service teachers with the opportunity to watch video does not automatically lead to their learning, and ultimately implementing, effective classroom practices. At the outset, pre-service teachers may not know what to focus on (Star & Strickland, 2008). Thus, learning how to notice key features of instruction and student thinking from video is an essential part of successful teacher preparation and education (Jacobs, Lamb, & Philipp, 2010; Santagata & Angelici, 2010; Sherin & van Es, 2009; Star & Strickland, 2008). Because the ability to analyze and learn from video clips is argued to be malleable,

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researchers have examined practices designed to enhance this skill among pre-service teachers (Santagata & Angelici, 2010; Star & Strickland, 2008; Sun & van Es, 2015).

Although the bulk of literature surrounding the use of video in pre-service teacher education explores traditional, face-to-face settings, few studies have examined the use of video online—despite the number of high profile and popular online communities that allow teachers to interact with video (e.g., Inside Mathematics and the Teaching Channel). And despite significant investment in online communities, few studies have systematically investigated whether these resources are effective in promoting teacher learning (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009).

According to Ball and Cohen (1999), teachers often encounter difficulty critically analyzing specific elements of their own practice with peers—a possible by-product of the prevailing belief that "every teacher has to find his or her own style" (p. 19). Correspondingly, in online professional development communities, the commentary generated by teachers in response to video clips tends to be shallow, rarely engaging in the depth of analysis that leads to teacher learning (Schleppenbach & Beer, 2012; Kling & Courtright, 2003). This shortage of analytical responses to video clips in online communities does not necessarily indicate that learning is not occurring within the individual. At the individual level, teachers may be reacting to and learning from classroom interactions portrayed in video clips, but also may withhold from responding publicly online due to a number of reasons (e.g., fear of harming others' feelings, lack of time, etc.). Granted, it is possible that the analysis of video clips is not as common in online communities as professional developers and researchers in education would hope. Although research suggests that the analysis of video clips is a malleable skill (Jacobs et al., 2010; Santagata & Angelici, 2010; Sherin & van Es, 2009; Star & Strickland, 2008), its development through discourse requires guidance and facilitation (van Es, Tunney, Goldsmith, & Seago, 2014), which becomes an issue for online professional development sites where the presence of an expert facilitator or moderator is lacking (Bates, Phalen, & Moran, 2016). Indeed, one of the key questions about online learning from video is how can reflective commentary be produced in a setting where teachers view video asynchronously, with no guarantee of supportive facilitators or colleagues to push thinking forward.

Because videos posted to online professional development sites rarely produce meaningful commentary about the issues that surround teaching and learning mathematics, the impact of these clips on teacher learning is questionable. Thus, the goal of this study was to examine whether more deeply analytical comments could be elicited from pre-service teachers in response to video clips posted to the *Everyday Mathematics* Virtual Learning Community (VLC). Modeled after Hur and Hara's (2007) Korean online community, the VLC is a National Science Foundation-funded site with approximately 43,900 members. The present experiment was designed to address this overarching research question: Do differences in prompts accompanying video clips cause variations in pre-service teachers' analytical commentary? More specifically, by altering pre-service teachers' perceived audience and by shifting their attention to specific video elements, could more sophisticated commentary be compelled? By merging two avenues of research, video-based teacher education and online resources for professional development, we hope to contribute to extant literature (Borko, 2004; Borko et al., 2008; Brophy, 2004; Seago, 2004; Sun & van Es, 2015; van Es & Sherin, 2008) and to further understanding on how to promote analytical discourse and teacher learning online.

1.1. Video-based learning in the development of mathematics teachers

The use of classroom video clips in teacher development, or video-based learning, can be an effective tool to guide and refine those aspects of instruction that teachers notice—the goal being attending to and interpreting students' mathematical ideas (Jacobs et al., 2010; Santagata & Angelici, 2010; Sherin & van Es, 2009; Star & Strickland, 2008). Often used as case studies, video clips provide teachers with opportunities to analyze specific learning situations, consider the role and extent to which various classroom factors are involved, and consider alternate approaches and strategies to optimize student learning (Stigler & Perry, 2000; Brophy, 2004). In the past decade, and particularly in the field of mathematics education, video-based learning has become a prevalent area of research (Sherin, 2004) in both in-service teacher development (Jacobs et al., 2010; Sherin & van Es, 2009) and pre-service teacher education (Chval et al., 2009; Jacobs et al., 2010; Santagata & Angelici, 2010; Star & Strickland, 2008; Sun & van Es, 2015).

Here, we highlight some important recent findings. Sherin and van Es (2009) found that the dialogue among teachers in a video club progressed from initially focusing on instructional dimensions of the video—classroom management and environment, among others—and describing what had transpired to focusing on and attempting to understand the mathematical thinking displayed by students. Jacobs et al. (2010) captured, in a cross-sectional design, that differences in teachers' noticing and treatment of students' mathematical thinking were related to differences in their years of experience both in the classroom and with professional development. The more experience teachers had, Jacobs et al. (2010) concluded, the more likely they were to *attend*, *interpret*, and *decide how to respond* to relevant aspects of student thinking with specificity and skill. In addition, Santagata and Angelici (2010) demonstrated that the depth with which pre-service teachers, enrolled at an Italian public university, analyzed video increased when asked to consider the impact of instruction on student understanding and to suggest additional approaches for teaching. Further, Star and Strickland (2009) tracked changes in the classroom features pre-service teachers noticed and, subsequently, did not notice before and after they took a course designed to improve their observation skills. At the course's outset, pre-service teachers more readily focused on teacher actions related to administration and classroom management, whereas by the end, their noticing expanded to include other dimensions such as classroom environment (e.g., the layout of the classroom, class size, etc.), discourse, and subject matter. Central to each of these studies is the notion that the ability to focus on important or purposeful classroom activities is a malleable skill that can increase with experience and guidance.

Research also has indicated that improvements in how teachers view video clips are related to the use of effective classroom practices in mathematics (Sherin & van Es, 2009) and enhanced student outcomes (Kersting et al., 2010). Sherin and van Es (2009) applied Goodwin's (1994) framework—a discourse-based, socially situated process through which practitioners identify and analyze events relevant to their particular field—to teachers. By doing so, they developed a metric for teacher commentary on video, determining what teachers notice most and how teachers respond to what they notice. Sherin and van Es (2009) found that when teachers spent more time discussing student thinking in the professional development sessions, similar progress was observed in their own classroom instruction. For example, at the beginning of the study, one group of participants tended to superficially regard their students' ideas during classroom interactions. By the end, however, these teachers were more likely to respond to their