



Teacher voices from an online elementary mathematics community: examining perceptions of professional learning

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Abstract

This study compares web usage data with interviews from 41 participants, who are members of an online professional development site called the *Everyday Mathematics* Virtual Learning Community (VLC), to explore how elementary school teachers learn from classroom video. Web usage data reveal that the commentary surrounding video posted to the VLC is sparse and surface level, possibly indicating a lack of serious attention to the videos. Interview data, however, indicate that participants felt they learned from this resource. Participants reported that the videos provided them with the opportunity to view and reflect on model lessons, plan curricula, and consider student thinking, among other learning outcomes. Participants also identified key factors that prevented them from posting comments to the site to convey their learning. These results can be used to understand not only how teachers perceive their own learning from classroom video, but also to redesign online professional development experiences to promote expression of that learning.

Keywords Online professional development · Elementary mathematics education · Teacher education · Educational technology

Introduction

Teacher learning is a broad construct that has different meanings to different people. For many professional developers and researchers, teacher learning is defined as the acquisition of specific knowledge, attitudes, and beliefs, such as Shulman's (1986) famed triumvirate of subject-matter, pedagogical, and curricular content knowledge. For teachers themselves,

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learning is a situated process (Borko 2004) that can happen anytime, from hallway chats with other teachers to engaging with new curriculum materials (Davis and Krajcik 2005), to simply experiencing the effects of classroom practice in the moment or over time. In these cases, as Webster-Wright (2009) described it, teacher learning is defined by teachers as “situations where they feel they have learned.” For policymakers, however, teacher learning occurs only when activities promote positive changes in practice (Desimone et al. 2002), or, more specifically, changes in practice that lead to improvements in student learning outcomes (Yoon et al. 2007).

Important to all these perspectives is *video-based learning*, which involves teachers viewing and analyzing classroom videos to reflect on familiar and unfamiliar practices, to examine student thinking and engagement, and to plan revisions to their own practices based on that reflection. From the knowledge-building perspective, Shulman (2005) championed the building of rich video cases of classroom practice for prospective teacher education. From the situated-learning perspective, lesson videos provide artifacts of everyday practice through which teachers can learn (Borko et al. 2008). And, from the policymaker perspective, teachers’ analysis of classroom video has been positively associated with effective teaching practices in mathematics (Sherin and van Es 2009; Sun and van Es 2015; van Es and Sherin 2010) and student learning (Kersting et al. 2010; Kersting et al. 2012). Likely because of this synergy across professional-learning perspectives, video-based learning—both in theory and in practice—has become an integral component of professional development (or PD, Ball and Cohen 1999; Brophy 2004; Seago 2004) for educators in all stages of their career (Borko et al. 2008; Chval et al. 2009; Hollingsworth and Clarke 2017; Santagata and Angelici 2010; Sherin and van Es 2009; Sun and van Es 2015; van Es and Sherin 2010).

Because video-based learning has been successful in *traditional* PD settings (e.g., Borko et al. 2008; Jacobs et al. 2010; Sherin and van Es 2009; van Es and Sherin 2010), this practice has been taken up by *online* teacher professional development (OTPD) websites (e.g., the Teaching Channel, Math Forum, INDISCHOOL, and the *Everyday Mathematics* Virtual Learning Community) to promote teacher learning. OTPD websites are valuable—and typically free—resources where users can share artifacts of practice, forge connections with educators and curriculum developers from around the world, and learn by watching and analyzing classroom video cases. Concentrating on the latter, as more OTPD websites become developed, the reach of video now extends across school districts, state lines, and international borders. OTPD websites have the potential to increase educators’ access to high-quality PD, which can become critical during times when schools’ on-site provision of PD is limited (e.g., due to funding- or location-related constraints). But, just as in traditional forms of PD, simply providing teachers with access to video online does not guarantee learning and improved practice (Putnam and Borko 2000). Indeed, researchers have called for more empirical work to understand the complexities of how teacher learning occurs in the online setting (Borko et al. 2009; Dede et al. 2009; Moon et al. 2014).

Given this need, we chose to examine how elementary school teachers experience learning from OTPD video resources by collecting and analyzing interview data from users of the *Everyday Mathematics* Virtual Learning Community (VLC), a National Science Foundation-funded website with more than 56,000 members. In particular, we wanted to understand how teachers *defined their own learning* from OTPD video resources. Previous research on the VLC had analyzed teachers’ website-use behavior by examining their comments on lesson videos. These studies sought to understand the potential of OTPD videos to promote teacher analysis, which relates to changes in practice (Sherin and van Es 2009) and student outcomes (Kersting et al. 2012). Findings indicated the following: First, rich

analysis of VLC videos rarely exists in a natural online setting, as measured by user comments left in response to these resources (Bates et al. 2016a). Second, prospective teachers could produce deeply analytical commentary in a setting outside of the VLC, as measured by comments written in response to prompts designed to elicit commentary (Beilstein et al. 2017). This suggests that teachers may be interacting with and analyzing videos in ways we cannot see by examining their *posted* online commentary. Thus, we needed to dig deeper into teachers' perceptions of their learning to understand what they take up from video in the online space.

By comparing quantitative website analytics and qualitative posted online commentary with interviews from individual VLC members, the current study goes beyond reporting what teachers *do* online and seeks to understand whether teachers *experience* video-based learning and how they define what video-based learning means to them. It also examines why teachers may not provide comments on videos, which is important because commenting both provides insight into how teachers are analyzing videos and allows other teachers to see and interact with those insights, increasing the learning potential of the online community as a whole. The current study investigates the following overarching research questions: (1) How, and to what extent, do individual VLC members perceive their own learning from the video resources? (2) What reasons do VLC members report for not posting comments on the videos? By understanding how teachers define their own learning from videos and why teachers may not comment on videos posted to an OTPD website, this study seeks to provide a fuller picture of OTPDs' possibilities—and limitations—within one consistent and well-established platform, the VLC.

Theoretical framework

Nearly 20 years ago, Putnam and Borko (2000) contextualized the foundational theory of the “situative perspective” (e.g., Greeno 1997; Lave and Wenger 1991) within the PD of teachers. Because this theory primarily had been explored in educational research on *student* learning, Putnam and Borko (2000) advocated for its application to research on *teacher* learning. By focusing on “how they [the teachers] themselves learn new ways of teaching,” Putnam and Borko (2000) refocused the situated perspective lens onto research examining different teacher PD models, which included classroom observations, school workshops, and video case analysis, among others. They considered how these different contexts—and the “discourse communities” within them—“give rise to different ways of knowing” (p. 6) by drawing on the following three premises: Cognition is (1) “situated in particular physical and social contexts”; (2) “social in nature”; and (3) “distributed across the individual, other persons, and tools” (p. 4).

Since then, the situative perspective has framed research in traditional settings for teacher PD, especially in relation to classroom video analysis (Borko et al. 2008; Kersting et al. 2010, 2012; Putnam and Borko 2000; Santagata and Yeh 2016). In light of the growing popularity of OTPD websites, conversations about new PD models and the emerging contexts that support teacher learning remain important today. OTPD websites offer users a variety of learning formats, ranging from synchronous, in-the-moment activities such as webinars, to asynchronous, self-directed activities such as viewing classroom videos. For VLC members, learning from the video resources and contributing to the discourse surrounding them largely occurs asynchronously.

Although OTPD websites have the potential to enrich—and even change—the experiences by which teachers learn, researchers are just beginning to understand how to create meaningful contexts by extrapolating successful design features from the various learning formats found in these communities (Community for Advancing Discovery Research in Education 2017). These new learning formats for OTPD challenge the scope of the situative perspective because the discourse community is distributed across place and time, and the social and cognitive nature of learning can take place asynchronously, among people who may not know each other and may never meet. Although we rely on the situative perspective as a framework, we also interrogate it because shifts from traditional, face-to-face settings to asynchronous online contexts require shifts in the situation, the social nature, and the distribution of cognition. Perhaps because of these shifts, we need to rethink our understanding of how teachers view learning in OTPD communities and question why teachers may or may not comment on resources designed for learning in those communities. By understanding why teachers express their thinking and how they perceive their learning from video resources, our goal is to develop actionable items that motivate teachers to share analytical commentary online so that other teachers, interacting with multiple videos and other community members, can respond to and potentially learn from posted online commentary over time.

Online settings for video-based teacher professional development

A central idea behind the body of work on video-based learning is that, by guiding teachers' attention to and fostering productive analysis around the mathematical thinking displayed by students in the video, teachers will be better equipped to attend to varying student perspectives in their own classrooms (e.g., Borko et al. 2008; Jacobs et al. 2010; Kersting et al. 2012; Santagata and Angelici 2010; Sherin and van Es 2009; van Es and Sherin 2010). Because of this, OTPD websites have embraced classroom video cases as a source for reflective and analytical discussion among their users.

Critical differences between traditional, structured live settings and online, asynchronous ones, however, have problematized the nature by which video-based learning occurs in OTPD communities (Borko et al. 2009). To illustrate, in traditional settings, a skilled facilitator can be vital in structuring analytical discussions (Coles 2013), especially around important issues related to students' mathematical thinking (van Es 2010; van Es et al. 2014)—issues that teachers may not initially attend to in video (Star and Strickland 2008). On asynchronous OTPD websites, however, users' analysis of and discussions about video do not have the opportunity to benefit from an expert facilitator. Instead, users must rely on the contextual information and instructions that accompany the clip to guide their analysis. Or, if available, users can draw on the commentary posted by other teacher–learners on the videos, although such commentary varies widely in quality and utility for learning (Bates et al. 2016a). And, now that OTPD communities are providing larger numbers of teachers with access to video resources, researchers have stressed the need for more empirical studies to examine learning in these online settings (Borko et al. 2009; Dede et al. 2009; Moon et al. 2014).

Another serious issue facing OTPD websites is a replication and amplification of the same issues facing live video-based learning. For instance, although Chokshi and Fernandez (2004) report impressive successes with Lesson Study, a sticking point in this approach is that teachers are reluctant to be critical of teaching, and it takes concerted effort to get them to be so. Without a leader who understands, believes in, and can effectively guide

teachers to embrace a critical stance, we expect that the reluctance to offer critiques would be exacerbated on OTPD websites. Teachers—especially new teachers—may also focus on characteristics of the teacher as a person (“nice smile”) or student engagement (“I like the way they raised their hands”) rather than crucial parts of the lesson that lead to improved student understanding (Miller and Zhou 2007). These issues are likely to be go unchallenged in a space without a facilitator, and thus it would not be surprising to find high instances of superficial commentary on OTPD websites, given the difficulty of providing support for analytical commentary in asynchronous, unmoderated spaces.

In an article framing the emerging world of online mathematics teacher education, De Carvalho Borba and Llinares (2012) explored how collaboration in asynchronous spaces functions to support both community and learning. However, much of the prior work focused more explicitly on collaboration to support community rather than to support learning. For example, research on the Inquiry Learning Forum, an early video-based learning community (Barab et al. 2001), described the struggle of engaging teachers online. The researchers noted that the lack of dialogue had a snowball effect of discouraging the users who were invested in the community. Similarly, Farooq et al. (2007) and Hur and Hara (2007) reported on specific features that encouraged community building on their websites and barriers that discouraged community. These studies provided important insights into how to design websites for sustained community, and these principles were utilized in the design of the website studied in this paper. However, the issue of how to understand and improve teacher learning in such asynchronous communities remains a problem for OTPD.

Video analysis on the VLC

Launched in 2011, the VLC was designed to engage preK-6 teachers in sharing and reflecting on artifacts of practice in elementary mathematics. A key website feature is a database of 400+ lesson videos and 750+ other PD and instructional resources. Members can browse resources, look at organized collections of videos, or search for resources along many dimensions (e.g., grade, Common Core State Standard, mathematical topic, etc.). The website is free and open to any educator who makes an account, although it is likely especially appealing to *Everyday Mathematics* teachers, given its affiliation with the curriculum’s author team and its use of videos from curriculum lessons.

The quality—or depth—of teachers’ analysis of video has been used to measure teacher knowledge (e.g., Kersting et al. 2010, 2012) and to provide a window into professional learning (e.g., Sherin and van Es 2009; Sun and van Es 2015; van Es and Sherin 2010). Various systems designed to assess teachers’ analysis of video, however, differ by attention paid to the commentary’s *content* (i.e., focus) and criteria used to measure the commentary’s *depth*. For example, Sherin and van Es’ (2009) *professional vision* (see Goodwin 1994) system attends to the commentary’s content by documenting the actor (e.g., student, teacher, other) and the topic (e.g., management, climate, pedagogy, mathematical thinking) under analysis. Their measure of the commentary’s depth ranges from the lowest level, *description*; to *evaluation*, in which the teacher judges the quality of interactions; to the highest level, *interpretation*, in which the teacher makes inferences about what took place in the video.

Kersting et al. (2010), on the other hand, developed the Classroom Video Analysis measure for which the commentary’s content can address four possible dimensions: Mathematical Content, Student Thinking, Suggestions for Improvement, and Depth of Interpretation. Kersting et al.’s (2010) measure of the commentary’s depth is also on a 3-point

scale, ranging from the lowest level, 0, in which the teacher does not mention the dimension; to 1, in which the teacher only describes observable events in the video; to the highest level, 2, in which the teacher analyzes or interprets aspects of the video beyond observable events. In spite of differences across systems such as these that assess teacher commentary, video analysis has been taken up as a major part of teacher education and PD because deeply analytical commentary (i.e., commentary that moves beyond description to include evidence-based inferences) has been linked to both the use of effective teaching practices (Sherin and van Es 2009; Sun and van Es 2015; van Es and Sherin 2010) and student learning (Kersting et al. 2012) in mathematics.

Prior work on the VLC has sought to examine teachers' depth of commentary on the video resources (Bates et al. 2016a; Beilstein et al. 2017). Unfortunately, we found that teachers on the VLC tend to express praise and encouragement over analysis of the teaching and learning displayed in the videos (Bates et al. 2016a). For example, in response to a fractions-related video clip with more than 400 views, only three VLC members posted comments, all of which were positive. One member posted, "I found this very interesting. The teacher did a nice job leading the discussion and thinking without giving the students the answer." Although this member pointed out a successful teaching practice, the comment remained superficial, failing to explain why not giving students the answer would support student learning. We (Bates et al. 2016a) concluded that although teachers have the option to share their analysis of video with other community members by posting comments online, they rarely do; and when teachers do post comments online, the depth of commentary is overwhelmingly shallow, which potentially indicates their own shallow thinking and consequently may not support others' learning.

This trend toward surface-level positivity in posted online commentary, however, is complicated by experimental research that demonstrated prospective teachers' capability of generating analytical commentary in response to video in other contexts (Beilstein et al. 2017). It is important to note that, in addition to demonstrating teacher analysis of classroom practice, comments on VLC videos may serve at least two other important functions. First, comments express teachers' thinking about what they have seen in the video. By explicitly commenting on video, teachers may actively reflect on what they know, thereby opening up the possibility to grow in their thinking (i.e., learn) and, as a result, potentially change their practice. Second, posted online commentary on VLC videos can be read by community members, and in reading posted comments, community members may gain new insights (i.e., learn) from interaction with other teachers' analysis. Thus, although commenting cannot be equated with learning, it certainly reflects teacher thinking and has the potential to impact one's own and others' learning.

The current study

Given that the VLC provides teachers with PD opportunities in an online, asynchronous setting distributed across time, place, and people, we examined how teachers describe their own learning from video and what teachers offer as reasons for not posting commentary about video. Furthermore, we expand on these research aims by also exploring how the factors of perceived learning and reasons for not posting online commentary differed according to VLC members' online behavior. Drawing from web analytics and posted online commentary, or *website-use data*, we classified VLC members into four categories

based on their *user behavior*¹: video-user deep commenters; video-user shallow commenters; video-user noncommenters; and rare video users, which we define further in the Method section. We privileged the use of video and commentary on video in these behavioral profiles because of the relation that previous research has demonstrated between depth of commentary on lesson videos and teaching and learning outcomes (e.g., Kersting et al. 2010, 2012; Sherin and van Es 2009; Sun and van Es 2015; van Es and Sherin 2010). Indeed, one of the VLC's foundational principles is that engaging in analytical commentary on videos, as well as viewing and responding to others' analytical commentary, can lead to teacher learning through effects such as deeper commentary and improved analysis of classroom interactions. Ultimately, this type of video-based teacher interaction and learning could result in changes in classroom practice and student outcomes.

Based on our previous findings (Bates et al. 2016a; Beilstein et al. 2017), we theorized that producing comments online versus other contexts can lead to varying levels of commentary depth. As discussed previously, teachers' online behavior and surface-level commentary may suggest superficial engagement with the video resources (Bates et al. 2016a). But it is also plausible that, in light of our subsequent findings (see Beilstein et al. 2017), teachers may be analyzing videos deeply, but refrain from posting their analysis to the website. In other words, absence of posting analytical and reflective commentary online may not necessarily indicate absence of analytical and reflective behavior.

Because a central aim of OTPD websites is to encourage teachers to engage in analytical discourse around the video resources for the benefit and potential learning of the community, the current study seeks to understand the schism between teachers' depth of commentary online (Bates et al. 2016a) and their depth of commentary in less public contexts (Beilstein et al. 2017). Therefore, we have added a third research aim: to examine how teachers' perceptions of learning differ—or not—across VLC user-behavior categories. Our ultimate goal in conducting this study was to develop actionable ideas that motivate teachers to make their deep, analytical commentary visible and to build an online community that promotes rich discourse among its members.

By applying the situative perspective to the VLC, this study examines how the online setting and discourse can support substantive teacher engagement with video resources. We used web analytics, posted online commentary, and interview data to address the following research questions:

1. How, and to what extent, do individual teachers, who are members of the VLC, perceive their own learning from the video resources?
2. What do teachers report as reasons for not commenting on the VLC videos?²
3. How do teachers' reported perceptions of learning relate to their website-use data?

¹ Throughout this paper, we use the term *website-use data* to refer to both quantitative web analytics and qualitative posted online commentary. We use the term *user behavior* to refer to participants' user profiles derived from web analytics and online commentary.

² We note that the reasons for not commenting could range from those that are personal (e.g., shyness) or structural (e.g., aspects of the website's design may not effectively communicate to users the goal of commenting on video). We approached this question inductively and did not assume users were aware that commenting on video was an option and also a goal of the website.

Method

Given the current study's aims and research questions, we employed a mixed-methods approach because it is well suited to investigate the complex phenomena of how, to what extent, and why teachers use and perceive that they learn from the VLC (Greene 2007). We accessed quantitative data on usage patterns from web analytics, coded VLC members' posted online commentary, and conducted individual interviews to shed light on teachers' own perceptions of their VLC use and how the website helps inform their practice. Furthermore, we relied on grounded theory (Corbin and Strauss 1990, 2008) to guide our theoretical sampling, data collection, and analysis.

Overview of theoretical sampling, data collection, and analysis

From our initial analysis of VLC members' website-use data, we observed patterns by which individual members interacted with video, and from these patterns, classified members as either (1) rare video users, those who logged on more than 10 times since creating their accounts, but never viewed a video; (2) video-user noncommenters, those who viewed a video but never commented on a video; (3) video-user shallow commenters, those who viewed a video and commented superficially on a video; and (4) video-user deep commenters, those who viewed a video and commented deeply on a video. We approached sampling based on our theory that the depth of posted online commentary may not necessarily indicate VLC members' engagement with, and perceived learning from, the video resources. Therefore, we intentionally tried to sample participants across these user-behavior profiles, not only to explore how teachers publicly engage with the website, but also to explore how they understand and interact with video resources.

Because grounded theory emphasizes that data analysis should begin at the onset and continue throughout the data collection process (Corbin and Strauss 1990), our team conducted check-in meetings after every 5–10 interviews to discuss emerging concepts and categories during the sampling, interview, and data-analysis phases. For example, we met to discuss emerging themes after our first 5 interviews, and we met again to discuss recurring and emerging themes after the next 10 interviews. To recruit our first 15 participants, we employed stratified sampling (Teddle and Yu 2007) by randomly selecting participants within each user-behavior profile from the population of VLC members. However, this technique resulted in low enrollment. To obtain a larger sample, we then turned to convenience sampling by posting a recruiting announcement to the website. Despite the change in recruitment technique, we note that theoretical sampling guided the entire process of data collection and analysis.³ We met several more times to discuss recurring themes and observed, after 35 interviews, that no new themes were emerging. This indicated data saturation—the point when participant responses were not providing new information—was reached (Corbin and Strauss 2008). We interviewed the remaining 6 participants who signed up for the study before the announcement was removed, and when interviews were complete, we generated a comprehensive set of categories that captured teachers'

³ During theoretical sampling, we observed that for some participants their self-identified user behavior conflicted with their user-behavior profile, thus calling into question the need to find participants to fit the predetermined categories. We address these divergent data in the Results section.

perceptions of learning from and reported reasons for not commenting on videos (for more detail on how these emerging categories were developed, see Corbin and Strauss 1990).

Sample

Forty-one VLC members participated in this study, and each participant was compensated \$100, which approximately represents payment of 2 h for tenured teacher-participants. We recruited 38 women and 3 men, who averaged 44.8 years old, with 15.9 years of teaching. Thirty-one of the participants held a master's degree or higher; 29 were currently classroom teachers; 6 were instructional coaches or curriculum coordinators; 5 were classroom teachers and instructional coaches; and 1 was an intervention specialist.

Website-use data sources: classifying VLC user behaviors

Web analytics

We used embedded web analytics to access data on video usage, including the total number of videos each member watched and whether the member commented on a specific video. In our sample, 8 members were classified as rare users (24%); 19 as video-user noncommenters (41%); and 14 as video-user commenters (34%). To get a sense of the typicality of our sample, we analyzed all 1909 VLC members who viewed a video within 6 months prior to initiating the interviews. This subset included 1857 video-user, noncommenters (97%) and 52 video-user, commenters (3%), indicating that the participants whom we interviewed were more likely to comment than the typical VLC member.

Posted online commentary

To assess teachers' depth of commentary, we created a simplified coding scheme, which borrows from two existing and popular measures, Sherin and van Es' (2009) professional vision system and Kersting et al.'s (2010) Classroom Video Analysis. The simplified coding scheme classified comments as either *shallow* or *deep*, rather than the more common 3-point scale. Shallow comments only provided a description of observable events in the video (i.e., description according to Sherin and van Es 2009, and Level 1 according to Kersting et al. 2010). Deep comments went beyond describing *what* teachers saw and (1) provided an explanation of why or why not the *teaching* would benefit the students; (2) made an inference about *student thinking* and provided evidence for that inference; or (3) analyzed the *math content* to delineate its constraints and affordances for teaching or student thinking (i.e., interpretation according to Sherin and van Es 2009, and Level 2 according to Kersting et al. 2010). Table 1 contains examples of commentary coded as shallow and deep. We categorized participants as a video-user deep commenter if they generated at least one deep comment. We achieved substantial inter-rater reliability (Landis and Koch 1977), Cohen's (1960) $\kappa = .77$. Our sample included 14 participants identified as video-user commenters, and of this subsample, we classified 5 participants as deep commenters, and 9 as shallow commenters.

Table 1 Examples of shallow and deep online commentary posted to the VLC by video-user commenter participants

Level of analysis	Example
Shallow	I noticed how the teacher took the concept of data collection and tied it to what they had learned in science. I also loved how she related both situations to real life
Deep	I notice in this video that the student self-corrects when she mistakes “630” for “640,” which suggests to me that she has sufficient number sense for the task at hand. Her strategy of filling out the hundreds and tens place first suggests to me that she understands the “number” pattern required to complete number scrolls up to 1000. My concern is how to help those students who fill out multiple rows of the number grid erroneously without self-correction. I have encouraged students in my own class to check with a partner while working, but not in any systematic way. What do others do in your classrooms? Would it be wise to hang up a complete number scroll to use as a guide?

Data source for perceptions of learning and reported reasons for not commenting on VLC videos: participant interviews

We employed a semi-structured interview protocol to understand how and why participants used the VLC and their perceptions of learning from the website. Two of the authors conducted the interviews, which lasted approximately 45 min. The interviews focused on four major themes:

1. Watching the videos, in general (e.g., how often they access the video resources; what they look for when they go to these resources, etc.);
2. Reactions to the videos (including questions that probed whether participants posted comments to the website or talked to their colleagues about what they learned from the videos);
3. Impressions of the prompts that accompany VLC videos and responses to other members’ comments about the videos; and
4. Ideas for improving teachers’ experiences with the VLC.

Coding

After completing the interviews, we analyzed all responses to questions about commenting on the website or learning from video, and, as a team, we finalized a set of categories that

were repeatedly present in our data along the following two dimensions: VLC members' (1) *perceptions of learning from videos* and (2) *reported reasons for not commenting on videos*.

VLC members' perceptions of learning from videos We used participants' responses to questions about watching, reacting to, and discussing with their colleagues the video resources to capture this dimension. Coding 53% of the data pertaining to these interview themes, we achieved substantial inter-rater agreement, Cohen's $\kappa = .74$. The coders reconciled disagreements, and all authors reconciled any case of uncertainty for the remaining data. This process yielded six distinct categories: Model Lesson, Curriculum Planning, Confidence and Validation, Student Thinking, Assessment, and Understanding Concepts (Table 2).

VLC members' reported reasons for not commenting on videos We used participants' responses to "Do you ever comment on what you see in a video?" to capture this dimension. Depending on their response, we then asked either "Why not?" or "How often would you say you post comments to the VLC?" Coding 32.5% of the data pertaining to these interview questions, we achieved substantial inter-rater agreement, Cohen's $\kappa = .79$. Coders reconciled disagreements, and all authors reconciled any case of uncertainty for the remaining data. This process yielded five distinct categories: Too Busy, Not a Discussion, Did Not Know, Personality, Fear of Misinterpretation or Offense, and Nothing to Say (Table 3).

Analysis

We analyzed the prevalence of each code in our sample by comparing the number of participants whose interviews contained a given code to the total number of participants. In a similar manner, we investigated participants' own perceptions of learning as well as their reasons for not posting comments to the website. Furthermore, we stratified the data by user-behavior categories to see whether these factors vary across website-use data.

Results

Returning to our research questions, we address: (1) participants' reported perceptions of learning from the VLC video resources; (2) participants' reported reasons for not commenting on these resources; and (3) the relation between participants' reported perceptions of learning and their website-use data. In addition to reporting descriptive statistics, we draw from interviews with 5 participants—for whom pseudonyms are used—as examples throughout this section. (Table 4 contains a summary of these participants' reported types of learning, reasons for not commenting on videos, and background information.) We selected these participants to demonstrate the range in types of reported learning from and reasons for not commenting on the VLC videos because their interviews conveyed richness in detail and a variety of categories. We note that these examples do not serve as case studies, but instead are intended to display the multifaceted experiences of the study's participants. We also note that these examples are not intended to represent all of the participants' experiences in each user-behavior profile.

Table 2 Description of the categories for VLC members' perceptions of learning from videos

Learning code	Description	Example
Model lesson	Participants watched specific classroom videos to view exemplar lessons or to learn pedagogical tips or techniques, often in preparation for an upcoming lesson, particularly those that they had not taught before or found difficult in the past	"I like seeing teachers teaching particular lessons. So... I thought that was pretty neat. Because it's not someone talking at you and telling you what you can do. It was the actual filming of the class. ... I definitely like to see how a teacher does it in an actual classroom"
Curriculum planning	Participants watched a series of videos to obtain a broad overview of a sequence of lessons, a unit, or a grade-level curriculum. Teachers indicated that this helped them decide which of their lessons to prioritize	"[You] watch them before you start to teach the unit because they give you the whole gist of what's happening in the unit"
Confidence and validation	Participants expressed feeling a sense of validation or a boost of confidence in their teaching after watching another teacher using similar pedagogical techniques in a VLC video	"What sticks out in my mind, it's [the video] validating what I do, and if I see the teacher doing it, then I'm like 'Okay, I'm doing it the right way'. ... It just gives me a better sense that I'm doing it in a manner that could be effective or... I'm like 'Yep, okay. I'm in line with what I should be doing'"
Student thinking	Participants reported that the videos improved their understanding of students' content background, providing them with more realistic expectations about how students might respond to or talk about a range of mathematical concepts.	"I look for videos to see how children would talk about the lesson. To see how the children interacted. How they use the vocabulary. This helps spark me to use certain vocabulary when I teach"
Assessment	Participants reported that the videos imparted an enhanced understanding of the variety of assessment practices they could use in their own classrooms	"Learning about assessment and progress checks in PD was kind of overwhelming. Watched a video on progress checks and how to differentiate assessment. The video pointed out why the check-ins are broken down that way"
Understanding concepts	Participants watched videos to learn, or revisit, the mathematical content they were planning on teaching their students	"Like for example if I don't quite understand the concept of what they're getting at, ... if there's something that I don't quite understand, a concept. I will usually go to the VLC. That's the first place I go"

Table 3 Description of the categories for VLC members' reported reasons for not commenting on videos

Commenting code	Description	Example
Too busy	Participants said that they were too busy to comment or finding the time to comment would be difficult	"I think the number one factor would be time. I usually don't have a lot of down time to look at the videos, let alone comment on them"
Not a discussion	Participants offered that they did not contribute to the discourse because it lacked key features of online discussion threads that include fast community response speed and a high number of posts, among others	"If it were more interactive then I would make comments—if there were a dialogue and going back and forth"
Did not know	Participants acknowledged that they did not realize there was a commenting section or that they never thought of leaving a comment	"I never thought about doing it... Like I said, the videos, they're really helpful. I think I never thought about commenting on it"
Personality	Participants suggested that willingness to comment is a personality trait or that some people are simply "not commenters."	"For me, I have to say, you're that kind of person or you're not"
Nothing to say	Participants indicated that they did not comment because they felt they had nothing unique or meaningful to contribute to the discourse	"I probably see others' comments, and think that to say, 'Ditto.' Something like that is not going to be that helpful... It's not that I don't care, but I think maybe... I feel like my input is what is on there already. I'm not opposed to commenting if I have something completely different to say"
Fear of misinterpretation or offense	Participants shared their worry that if they posted comments, they feared their words would be misinterpreted or would offend others	"Well, I ditched Facebook because a lot of times, people misinterpret what's important. And they don't know your emotion behind it—they don't know if you're joking because you don't have any facial expression or any mannerisms... I don't really give feedback or voice anything because I don't want anyone to misinterpret what I'm thinking or saying"

Table 4 Illustrative examples

Pseudonym	Maria	Carolyn	Serena	Justine	Grace
Current role	Pre-kindergarten teacher	Fourth-grade teacher	Fourth-grade teacher and mathematics coach	First-grade teacher	Fourth-grade teacher and mathematics coach
Experience	20 years	23 years	25 years	5 years	14 years
User-behavior profile	Rare	Video-user noncommenter	Video-user noncommenter	Video-user shallow commenter	Video-user deep commenter
Reported learning	Curriculum planning, model lesson, student thinking	Curriculum planning, model lesson, confidence and validation	Curriculum planning, model lesson, student thinking confidence and validation	Curriculum planning, model lesson, student thinking confidence and validation	Curriculum planning, model lesson, student thinking
Reported reasons for not commenting	Too busy	Personality, fear of misinterpretation or offense	Did not know		Not a discussion

Table 5 Frequency and rank of VLC members' perceptions of learning categories as mentioned by participants

Learning code	Number of participants	Percentage of participants
Model lesson	36	87.8
Curriculum planning	20	48.8
Student thinking	14	34.1
Confidence and validation	8	19.5
Assessment	6	14.6
Understanding concepts	2	4.9
Mentioned any learning	37	90.2

Research question 1: VLC members' reported perceptions of learning from VLC videos

The frequencies of learning themes identified in participants' responses are presented in Table 5. The vast majority of participants (90.2%) claimed that they learned from watching the videos, and more specifically, they (87.8%) provided responses indicating that they learned about Model Lessons. We also examined whether individual interviews contained multiple learning categories, thereby expressing that the videos informed participants' teaching in several ways. In most interviews (70.7%), participants mentioned multiple types of learning, and within this subset, 36.6% of interviews contained three or more learning categories.

Additionally, participants not only described different types of learning, they did so in great detail. In their interviews, they pointed to particular aspects of the videos that were vital to their PD. Participants also provided clear evidence that they purposefully sought out content in the videos to improve their practice. Consider, as an example, Justine, who was categorized as a video-user shallow commenter.⁴ In her interview, Justine recounted how a video helped her reflect on a lesson that did not go as well as she had hoped. She recently taught her first-grade class about equivalence using pennies and nickels, and upon reflection, she concluded that the way she pictorially represented an exchange on the board between 5 pennies and 1 nickel confused students. She turned to the VLC to find another way of approaching the lesson. Justine said, "When I was teaching the lesson, I was crossing coins off, which the children thought I was getting rid of it. [The teacher in the video] was clearer for children to understand. She circled the coins, then used an arrow to show the exchange."

Justine's interview also illustrates the range of learning that VLC members can experience. Her interview contained four different learning themes. In addition to searching for videos to "see other teachers' techniques" (Model Lesson), Justine used videos to watch "how the children interacted (and) how they use the vocabulary... This helps spark me to use certain vocabulary when I teach" (Student Thinking). With 5 years of teaching experience, Justine considered herself to be a new teacher and, in this capacity, she reported experiencing both good and bad days. On the not-so-good days, Justine shared that the

⁴ We discuss how Justine's depth of commentary relates to her perceptions of learning in the Points of Convergence and Divergence subsection.

Proportion of Participants' Reported Reasons for Not Commenting by User-Behavior Profile

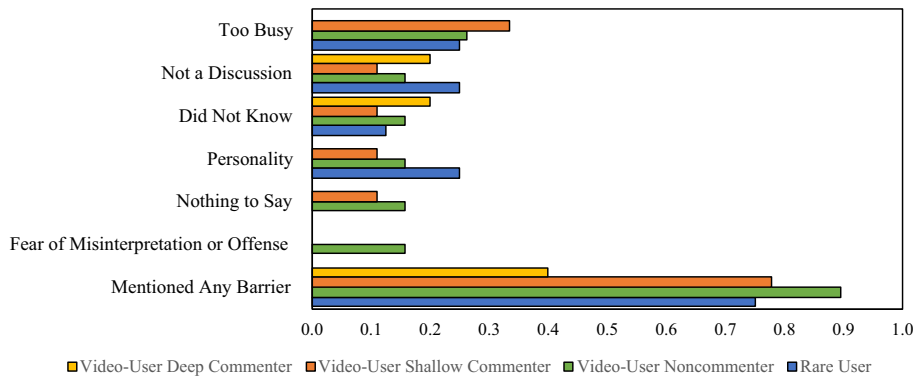


Fig. 1 Proportion of participants' reported reasons for not commenting by user-behavior profile

VLC served as a “pick-me-up,” a place to boost her Confidence and Validation. She said, “Let’s say I’m looking at videos after I’ve had a rough day. I think I did lousy. ...I look to see what [other peoples’] reactions are. Sometimes it helps me realize that it wasn’t me.”

Research question 2: VLC members' reported reasons for not commenting on VLC videos

Many of our participants (75% of rare users, 89.5% of video-user noncommenters, 77.8% of video-user shallow commenters, and 40% of video-user deep commenters) brought up at least one reason for not commenting on a VLC video. In Fig. 1, we present participants' reported reasons for not commenting on VLC videos, organized by user-behavior profile. The rare users, video-user noncommenters, and video-user shallow commenters presented more reasons for not posting comments than the video-user deep commenters. The most frequent reason for not commenting was Too Busy, with Not a Discussion as second most frequent. For the participants who cited Not a Discussion, they explained that the online discourse surrounding the video resources fell flat due to such factors as a low number of posts and insufficient interactivity between members.

Personality and Did Not Know were third and fourth most frequent; although no video-user deep commenters cited Personality as a reason for not commenting, 20% of participants from this subsample cited Did Not Know.⁵ When pointing to Personality, participants—like video-user noncommenter, Carolyn—expressed that you either are someone who comments online or you are not. Carolyn mentioned, “[Commenting is] just a personal preference. I can see where leaving a comment provides feedback to you, as the creator, and also to other teachers, but ... I just don’t. [laughter.] Is that terrible?” In addition, for Did Not Know, several of our participants echoed what video-user noncommenter Serena had to say:

⁵ This participant only posted an online comment once, and in her interview, did not recall this event.

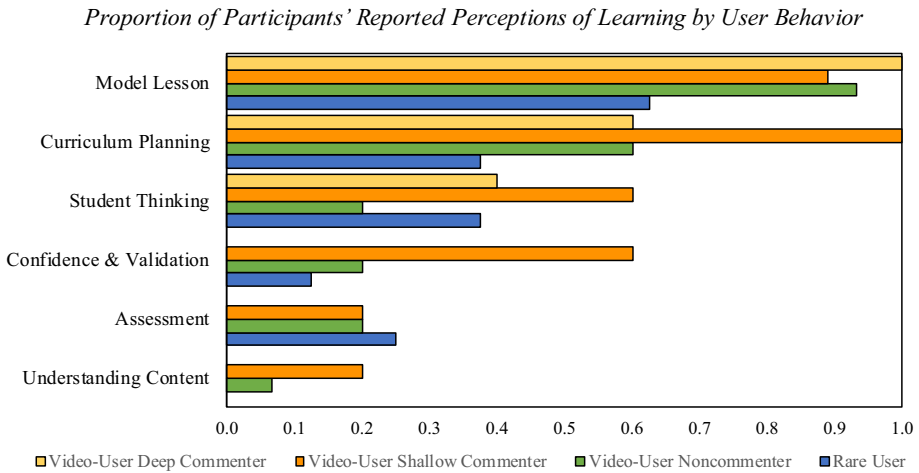


Fig. 2 Proportion of participants' reported perceptions of learning by user behavior

When you asked, 'Do you comment?' I was like, 'There's a comment section?' I didn't even see that there's any place on the videos where you would comment... I completely missed it!

Nothing to Say and Fear of Misinterpretation or Offense were the least frequently cited reasons. These two reasons were not mentioned by rare users or video-user deep commenters.

Research question 3: points of convergence and divergence—exploring the relation between VLC members' perceptions of learning and website-use data

Next, we asked how participants' website-use data converged with or diverged from their reported perceptions of learning, as captured by interviews. To find patterns among the data sets, as well as the inconsistencies or paradoxes among them, we consolidated data (see Fig. 2, Caracelli and Greene 1993).

We found great consistency across the groups of participants who view the videos (i.e., everyone except rare video users). Thus, it appears that the participants who use the video resources felt they learned from watching them, regardless of whether they posted a comment or not and, if they posted, whether a comment was shallow or deep. The implications of this finding are twofold: First, it appears that for the video-user deep commenters, website-use data and participant interviews converge. Second, it appears that for the video-user noncommenters and video-user shallow commenters, website-use data and participant interviews diverge: VLC members who do not comment or who comment superficially still experience learning, and this learning appears to be similar to those who post comments.

Points of convergence

For the video-user deep commenters, website-use data and participant interviews converge: 100% of these members reported at least one learning theme in their interviews. Not only have these members shared their thinking by contributing to the online discourse, they also, in our interviews, relayed how the videos impacted their own learning. Another match

exists between the website-use data and participant interviews for a portion (37.5%) of rare users. However, convergence among data sources for rare users cannot be seen in Fig. 2 because interviews with these two members did not contain any identified themes.

To illustrate how website-use data and participant interviews can converge, consider Grace, a fourth-grade teacher and instructional coach with 14 years of experience. Grace, a video-user deep commenter, described in her interview that she found in the videos a guide for instruction (Curriculum Planning), exemplar lessons (Model Lesson), and a window into the range of student thinking (Student Thinking). For example, to demonstrate Model Lesson, Grace explained that lesson videos provided a “preview for myself of what is expected when I do it with my own students.”

The VLC videos also offered Grace a window into the range of thinking students can experience during specific lessons. She reflected, “It’s one thing to have somebody tell you about it, to have somebody walk you through it, ... but it’s another thing to actually see real kids and real teachers doing the same thing you’re doing in your classroom.” The following online comment that Grace posted, which was coded as deep, reiterates the themes revealed in Grace’s interview. She wrote,

I noticed that the students were comfortable using multiple math vocabulary words in explaining their thinking. It is evident that the teacher models and uses these words—like array, length, width—within her lessons based on how fluently the students used them. I also noticed that the teacher solicited multiple student perspectives and explanations rather than just one or two “right” answers. The students were eager and willing to participate in this discussion. Kudos to the teacher for fostering such an open environment for mathematical discourse!

Points of divergence

In other instances, the interviews provided a contrasting picture, depicting a deeper attention to the videos than that which was portrayed website-use data. Many of the teachers we interviewed described deep analysis of the videos and reflection on their practice, but, for a variety of reasons—lack of time, wariness of public critique—did not post their thinking to the VLC. In the next three subsections, we examine how teachers’ perceptions of learning diverged from their website-use data for some of the video-user shallow commenters, video-user noncommenters, and rare users in our sample.

Perceptions of learning among video-user shallow commenters To understand how the website-use data diverge from VLC members’ reported learning from video, let us return to our interview with first-grade teacher, Justine. In Justine’s interview, she recalled watching a lesson on equivalence using pennies and nickels. Justine posted this comment to the VLC, “Just watched the video. Crossing out the coins then making a ‘triangle’ certainly reinforces the fact that a trade is taking place. Thanks.” Analyzing this comment in isolation, which was coded as shallow, it is difficult to determine what Justine took away from the video other than observing a specific instructional move. Her interview, however, helped us see that upon reflecting on a lesson that did not go well, she searched for a video to improve her practice in the future by finding better ways to represent the concept of equivalence. Like Justine, all (100%) of the video-user shallow commenters reported at least one learning theme in their interviews. Many of these interviews portray a deeper attention to the videos than what can be inferred from their user behavior.

Perceptions of learning among video-user noncommenters Regarding the video-user noncommenters, 94.7% of participants mentioned at least one learning theme in their interviews. For example, both Carolyn and Serena said that the videos prompted a depth of reflection on their own practice that went beyond what was portrayed by their online behaviors.

Carolyn, who teaches fourth grade, has been an educator for the past 23 years. Carolyn said she relied on the VLC videos to get a sense of an entire unit when she was lesson planning (Curriculum Planning). Carolyn also consulted the videos when a lesson or game “just didn’t fly” (Model Lesson). “If I notice maybe a game didn’t suit the needs of a learner, I would go to the video and look for the alternative,” she reflected. “I appreciate having them [teachers in videos] model the lessons that I might trip over.” These resources boosted Carolyn’s belief in her teaching (Confidence and Validation), as she shared, “It makes you more comfortable in your skin. Having the VLC gives you more of a foot to stand on ... to give you confidence.” But, her Fear of Misinterpretation or Offense and Personality kept her from joining the online discourse. “I’m not a negative vocal person,” Carolyn said. “That’s why I don’t think I would put (anything) out there. It goes back to what if someone misinterprets what I’m trying to say and is like, ‘Wow, this lady is nuts.’ I don’t want people thinking that.”

Serena, another veteran fourth-grade teacher, also works as a mathematics coach. With 25 years of experience, Serena reported that she sought out videos that depicted Open Response and Reengagement lessons, which are longer videos, showing lessons across 2 days. She mentioned that while watching these videos, she referred to her teacher’s manual and often paused the video to underline sections of the manual or to jot down questions and notes. She said,

One of the things I was trying to take away from the videos is what you can say to a student during a reengagement and what you can say to a student during the initial day one... It’s a much more open process for teacher and student engagement than what we had for assessments and problem solving ... prior.

Also, in her role as a mathematics coach, Serena used the videos to help other teachers plan and reflect on their instruction. She said,

My mentee and I will watch videos and work together... looking at what did you notice; how could this change what you’re doing; or what are you doing that’s similar... We [also] pull all of the teachers for a grade level or district together [for] a free planning video [seminar to] prioritize what’s important.

For Carolyn and Serena, the videos helped them reflect on their practice as teachers. Additionally, for Serena, the videos served as a talking point to explore and discuss pedagogical and content-related issues with her mentees. These interviews broadened our understanding of what video-user noncommenters learn from the video resources beyond what their user-behavior profile suggests.

Perceptions of learning among rare users Within the category of rare users, 62.5% of participants reported having learned from watching VLC videos. Thus, for these rare users—those whose interviews contained one or more learning themes—we found a divergence between participant interviews and website-use data.

To unpack this divergence, consider prekindergarten teacher, Maria. Maria provided clear and compelling evidence that she made use of VLC videos, despite being classified as a rare user. She reported searching the video archives for “new, interesting resources

for teaching preschool” as well as “new lesson plans” when preparing for upcoming units (Curriculum Planning). “It was just helpful to see how the teacher started ... playing the game,” Maria said. “He let the children facilitate the game. ... Once one of the children guessed the number, they seemed really excited. It seemed like it was helping with number recognition.” Analyzing why the lesson helped with number recognition, Maria considered the specific problems the children were presented, which included asking children, “What number is before 10?” and, “What number is between 0 and 2?” Strengths of the lesson included giving children “a different way to think about the numbers” and how these numbers relate to one another on the number line.

Maria elucidated why she does not contribute to the online discourse. “I’m looking on my lunch break in school, so it would be a little time consuming... But I do write comments for myself... I make my own notes from the video on what I liked, what I didn’t like, or what’s going to be helpful for me when I’m trying to teach that lesson.” Maria accessed the video resources from her school’s computer, leaving us to reckon that Maria, and other members classified as rare users, accessed the VLC while the school computer was logged into another teacher’s account. This would explain the divergence between the web analytics, which incorrectly categorized Maria as a rare user, and her interview data where she described in detail her attention to and learning from the VLC videos.

Discussion

In this study, we explored how elementary school educators asynchronously learn from and engage with the video resources posted to one widely used OTPD website, the VLC. Prior research on the VLC found that analysis of the teaching and learning depicted in the videos rarely exists *online*, as measured by posted online commentary in discussion threads (Bates et al. 2016a). Follow-up research, however, indicated that when asked to comment on the videos in a context other than the VLC interface, prospective teachers produced analytical commentary when asked to focus on the teaching depicted in the videos (Beilstein et al. 2017). Motivated in part by these incongruent findings, we compared website-use data with interviews from individual VLC members to answer three research questions: (1) How, and to what extent, do individual teachers, who are members of the VLC, perceive their own learning from the video resources? (2) What do teachers report as reasons for not commenting on the VLC videos? And (3) How do teachers’ reported perceptions of learning relate to their website-use data? Using the situative perspective (Putnam and Borko 2000) to frame the current study, we examined VLC members’ experiences with the video resources.

Reported learning from VLC videos

Overall, the majority of the VLC members we interviewed gave us clear evidence that they felt they learned from videos posted to the website. This is remarkable, especially given the scant evidence of their engagement with these videos from the website itself. These VLC members told us what they learned and did so in great detail, indicating that they had engaged substantively with the videos and that the videos, in turn, encouraged reflection on their practice. Our participants—like Justine and Maria, for example—recalled vividly and specifically the lessons they had watched, and the desire to view Model Lessons was the most frequently cited reason by our participants for watching the videos. This echoes a

previous finding by Bates et al. (2016a) in which VLC members showed a preference for watching videos that portray classroom lessons and games.

Reported reasons for not commenting on VLC videos

Despite their reported perceptions of learning, however, most of our participants had not posted comments that might reveal traces of their thinking and possible learning. We probed participants to determine why they did not provide comments and, given the serious demands on teachers' time, it was no surprise that participants most frequently said they were Too Busy to post a comment. On the contrary, we were surprised that some participants said that they Did Not Know they could leave a comment or contribute to the discussion. Based on this insight, we suggest that OTPD communities make opportunities for commenting and contributing to the discussion more salient. Indeed, based on this finding, the VLC has already been redesigned to make the commenting function more visible when watching videos.

Another compelling finding was that the second-most frequently cited reason for not commenting was Not a Discussion. For these participants, the online discourse—or rather, the lack thereof—prevented them from commenting on the videos. In asynchronous settings where communication among members takes place over time, sustaining a dialogue with others can be difficult. In fact, our video-user commenters complained that to see whether other members responded to their posts, they would have to remember and look up the specific video that sparked their comment. In this spirit, we recommend that online communities send alerts to commenters when others have joined the discussion. Based on this finding, the VLC has already been redesigned to notify members if others have commented on their post. These findings suggest that members may not have a clear sense of their audience both in relation to whom comments are directed and who may respond to their comments. These findings also suggest that commenting alone does not constitute a discussion.

A few participants shared their worry that their comments would be misinterpreted or would offend someone. Similar findings have been observed in research on traditional, face-to-face PD contexts. For example, Lima (1998) found that teachers are more likely to share with colleagues than with acquaintances. From this, VLC developers are implementing steps to promote use of the Groups function. This function allows members to save resources, including videos, to a *closed* group of members or an *open* group that can be viewed publicly. Moreover, Huberman (1983) found that teachers are likely to share in situations they relate to. Future OTPD research should examine whether Huberman's (1983) finding in face-to-face contexts is applicable online. It could be that teachers who feel it is not their personality to comment online might be encouraged to do so in situations they can better relate to, which may be more likely in a closed group.

Furthermore, Garet et al. (2001) found that *collective participation* is a key feature needed for traditional forms of PD. Activities that link directly to teachers' experiences, align with other PD efforts, and encourage collaboration among participants appear to be effective in fostering collective participation. Garet et al. (2001) also found that teachers were most likely to participate when the other participants were colleagues from their school or district or shared their same subject or grade level. Bates et al. (2016b) suggested that the VLC could provide opportunities for teachers to participate online and then, in person, share their learning and discuss pedagogy relative to school goals with colleagues.

Such a situation could provide VLC members' who are reluctant to comment with a safe, in-person environment in which to share their thinking on and analysis of VLC video.

Comparing website-use data with participants' perceptions of learning

We expected to see data from the web analytics, posted online commentary, and participant interviews converge among the video-user deep commenters. In all instances, the interviews among this subset of our sample not only supported, but also enriched our understanding of the motivations that guided these participants' use of the video resources. The interviews also revealed why these participants did not comment as frequently as they hoped to (all mentioned Not a Discussion).

We were gratified to see that almost every participant mentioned how they learned from the VLC videos. Although this may not be surprising given that they volunteered to be interviewed, it was unexpected that the noncommenters and shallow commenters showed almost the same profile as the deep commenters of how they perceived learning from the videos. This suggests that deep analysis and reflection occurs, even in the absence of analytical commentary.

Most surprising were accounts from rare users, most of whom reported learning from videos. This surprising finding could come from how these VLC members accessed the videos. Because members are not required to log in every time they return to the website, it is possible that teachers who view videos on school computers are unaware that they may be signed in under another teacher's VLC account. If this is the case, then participants would have more opportunities to learn from videos than their user-behavior profile would suggest.

Limitations and future directions

Limitations

This study had a few key limitations. First, we recruited some of our participants through convenience sampling. These participants had seen the study invitation and elected to participate, which may have led to a sample that is unrepresentative of VLC users. Second, some of the demographics from our sample do not directly match that of the U.S. teaching population. For example, when compared to U.S. elementary and secondary teachers (U.S. Department of Education 2020), our sample contains more participants who identify as female, hold advanced degrees, and have been teaching upwards of 20 years. Thus, our findings may be skewed and not representative of the U.S. teaching population. Third, the generalizability of our results is limited to asynchronous online learning opportunities and not to OTPD websites in general.

Some limitations may also result from participants' involvement in this study. For example, 4 VLC members who were identified by web analytics as rare users *before* we contacted them changed to video-user noncommenters by the time the interviews occurred. This indicates that participants contacted about the study may have watched (additional) videos for the sake of having something to say for the interview. If this is the case, their interviews may not serve as a genuine reflection of how these participants use the VLC. To be clear, we classified all participants based on their most recent pre-interview, website-use data, and thus these four were classified as video-user noncommenters.

Finally, it is possible that our questions or the way we posed them may have influenced participants' responses. We strove to minimize this bias by piloting our questions with a small sample of VLC members to clarify any confusing questions and fix or eliminate potentially leading questions. These limitations should be kept in mind when considering our results, particularly in other contexts.

Future directions

The findings of this study could be enhanced by research in several areas. First, as a follow-up to the current study, investigating teachers' perceptions of learning from video by surveying a larger sample of VLC members could support and expand on these findings. For example, after VLC members watch a video, we could ask them to fill out a survey that includes user-behavior profiles and provides the option for members to share what aspects of the video they find helpful. Second, interviews and web-analytic investigations of users from other OTPD websites would complement these findings and would shed light on which findings are generalizable and which might be website specific. Third, broader research on how commenters and noncommenters differ in perceived learning and sense of community on internet-based learning websites of all kinds would help place these results in context. Fourth, upon comparison of reported reasons for not commenting between video-user deep commenters and the rest of our sample, the deep commenters cited only one reason, Not a Discussion.⁶ This raises the question: How do we encourage all OTPD websites to provide contexts that make clear the purpose of commenting on video? One possibility is to highlight deep commentary as a model and showcase why it is beneficial for one's own professional learning and for building community. Fifth, more real-time study of teacher website use—using eye tracking, think-alouds, and other immediate measures—would help researchers better understand how users with different behavioral profiles make use of and learn from OTPD websites. Finally, we would encourage developers of other OTPD websites to adopt some of the changes already made by the VLC, such as directly encouraging commenting, making commenting tools easier to find, sending notifications for new replies to a comment, and allowing closed groups for discussing videos.

Conclusion

Web analytics can provide developers of OTPD communities with a wealth of data on user behaviors and preferences—but only to a certain extent. Findings from this study have opened a window into the underlying motivations that guide user behaviors and preferences, including the reasons that markers of teacher learning may not be visible online. For some of our participants, the data sets converged—what is known about their online behavior from web analytics and posted online commentary aligned with how they described their learning on the VLC. For other participants, however, the data sets diverged: Some of our participants reported clear evidence of learning from VLC videos and also identified reasons about why they did not share what they learned on the website by posting public commentary.

⁶ Note: This statement excludes the 1 video-user deep commenter who did not remember ever posting a comment and cited that she Did Not Know this was an option.

Yet, when asked about what they learned from VLC videos, most of our participants talked about the connections they made to their practice. Some participants jotted down comments for themselves. Other participants used the videos as a starting point from which to discuss pedagogy and student thinking with other teachers. Despite this high level of engagement with and attention to the videos, most members did not contribute evidence of their learning to the VLC by posting comments. By not making their learning visible in asynchronous spaces, teachers miss out on opportunities to provide encouragement for other teachers and models of how learning from video can occur. We also believe that by understanding how teachers are using the VLC, specifically, and OTPD websites, more generally, this study can help extend information about the benefits of online spaces to teachers who may normally shy away from these websites. For those who struggle to imagine how they would use the VLC or another OTPD website or why they might comment on video resources, seeing use cases from other teachers might encourage their own use and participation.

Analysis of user behavior alone, prior to conducting these interviews, might indicate that teachers may have missed the value of video resources, both because teachers are not always recorded as having logged in and because they do not typically leave comments after watching videos. But our results from the interviews present a more nuanced and optimistic conclusion. Because of the participants' clear and compelling descriptions of the videos and how they described their learning from them, we are encouraged to believe that teacher thinking is deeper than what is demonstrated on the VLC. That is, teachers perceive themselves as learning, even when researchers and website developers may not. Although this provides a bit of optimism, we acknowledge that it is not enough that *we* learned that teachers learn from the website. When teachers learn from other teachers, we will have realized the promise of OTPDs because collaboration and community are central to professional learning—for *all* teachers, not just *some*.

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