

Using Video to Collaborate around Problems of Practice

By Elizabeth A. van Es

Introduction

An important tenet of high quality professional development includes teachers collaborating with colleagues to investigate problems of practice over sustained periods of time (Guskey, 2003; Hawley & Valli, 1999). This focus stems from research that recognizes the importance of basing teacher learning in their own practice and using one's own classroom as a context for learning, as well as the value of teachers collaborating with each other for sustained periods of time to make sense of challenges that arise in teaching (Little, 2002). Kazemi and Hubbard (2008) propose that as professional development becomes more long-term, sustained, and collegial in nature, different questions need to be asked about learning in these settings. In particular, they propose that research attend to the *coevolution* of teacher learning. In other words, researchers need to examine both what teachers learn in professional development and changes in teachers' classroom practice over time, as well as the interplay between these contexts.

This article adopts this perspective and investigates how the goals of participants in a video club evolved and became more shared over time. A video club brings groups of teachers together to analyze video from one another's classrooms (Sherin, 2004). The purpose of the video club I investigate was to bring teachers together to analyze student thinking, an important goal of mathematics education reform efforts (NCTM, 2000). Like most forms of professional

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development, the facilitator established the goals of the group (Webster-Wright, 2009). Schoenfeld (1998) explains that this can pose problems because teachers may bring different goals to the learning setting. This raises several questions for studying teacher learning in the video club, including: What goals do the participants bring to the video club environment? How do the facilitators and teachers coordinate their efforts to accomplish their goals? and How do the participants goals and interests evolve as teachers adopt new practices and bring them to the group for analysis and reflection? These questions, centered on the establishment, evolution and coordination of goals, are the focus of this study. In particular, I investigate how learning through participation in the video club travels into the classroom and how new experiences in the classroom travel back to professional development to influence the goals that are put forth and taken up by the group. To be clear, this study does not report on teachers' instruction (see van Es & Sherin, 2010 for an analysis of the influence of participation in the video club on teachers' practice). Rather, I use teachers' accounts of practice, as they are described, narrated, and represented in the video club meetings, to attend to the interplay and evolution of the participants' goals and to examine if and how they become more coordinated over time.

Learning to Notice Student Thinking

This study is motivated by research on noticing student thinking. The construct of noticing has received increased attention in the last decade (Mason, 2002; Sherin, Jacobs, & Philipp, in press; van Es & Sherin, 2002). Noticing refers to what teachers attend to in the moment of teaching, as well as how they reason about what they observe (van Es & Sherin, 2008). Mathematics education reform initiatives point to the importance of teachers slowing down their instruction and making sense of student ideas and using those ideas to inform teaching decisions (Ball & Cohen, 1999; NCTM, 2000; Rodgers, 2002). Thus, pre-service and in-service teachers need to learn to notice student thinking. I propose that video can be a useful tool for helping teachers learn to notice student thinking because it can capture student ideas that may be difficult for teachers to examine in substantive ways during teaching (Chamberlain, 2005), enable them to analyze and reason about them outside of teaching, and provide a context to develop strategies for inquiring into student ideas during instruction. However, it is important to note that it is not natural for teachers to attend to the particulars of student ideas. Ball and Forzani (2009) frame their discussion of the challenges of teacher education in terms of the unnatural acts of teaching. Pressing, probing, and examining student ideas from different angles, for example, is counter to what individuals do in everyday conversation. Thus, teachers need to learn to problematize student thinking and develop discourse practices for engaging in this work.

Collaboration in Teacher Professional Development

High quality professional development is characterized by teachers coming together for sustained periods of time to inquire into teaching and learning, with teachers contributing to the overall purposes of the professional development activities (Hawley & Valli, 1999; Wilson & Berne, 1999). When teachers come together and focus on challenges that arise in teaching, they can share experiences and knowledge to help construct pedagogical solutions, reflect on the effectiveness of their proposed solutions, and receive feedback and support from their colleagues (Hiebert, Morris, & Glass, 2003). Teacher collaboration has proven to be beneficial to teachers and students alike. For instance, Meirink, Meijer, and Verloop (2007) found that teachers who collaborated learned about one another's teaching methods and received confirmation of their beliefs and practices from colleagues. Moreover, schools with greater levels of teacher collaboration have shown evidence of increasing student achievement in mathematics and reading (Goddard, Goddard, & Tschannen-Moran, 2007). Finally, Desimone and colleagues (2002) provide additional evidence that teachers' ongoing collaboration impacts their understanding of children's thinking and learning, a key ingredient for adopting student-centered, reform-based practices.

However, simply bringing teachers together to collaborate does not ensure that learning occurs. Horn and Little's (2010) investigation of high school teachers' collaboration, for example, shows that the conversational routines of two different teacher work groups afforded different opportunities for learning. This study points to the need for teachers to develop discourse norms for interacting around artifacts of practice so they can engage in substantive conversations of teaching and learning. Similarly, Gallimore, Ermeling, Saunders, and Goldenberg's (2009) study of grade-level teams collaborating to inquire and analyze practice highlights the need for teachers in professional communities to have access to human resources to support their improvement, as well as structures and tools, such as the inquiry-focused protocol, to help them focus their discussions to advance their knowledge and practice. This is consistent with other research that identifies the need for social and institutional support to help teachers change their instruction (Gamoran et al., 2003; Sandholtz & Scribner, 2006; Stoll & Louis, 2007).

Examining Problems of Practice

Finally, situated learning theory highlights the important role of tools and artifacts in advancing learning (Wenger, 1998). They become the materials around which members of a community develop a shared discourse about their practice (Little, 2003; Putnam & Borko, 2000). Research on teacher learning has argued for teachers to analyze artifacts from their practice to develop their knowledge, skills, beliefs, and dispositions to improve teaching (Ball & Cohen, 1999; Borko, 2004; Putnam & Borko, 2000). Many professional development programs use artifacts of

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teachers' work as objects of analysis and learning. Studies on the use of student work samples and video of student thinking identify the value of these tools in helping teachers learn about children's thinking (Kazemi & Franke, 2004; Sherin & Han, 2004; van Es & Sherin, 2008). van Es & Sherin (2010) also found that as teachers developed strategies for inquiring into student thinking through video analysis, they adopted similar strategies in their classroom practice. In particular, as they became more student-centered and evidence-based in their analysis of classroom interactions via video, they adopted strategies in teaching to make student thinking visible and to probe student thinking and then used what they learned about students in these interactions to inform their teaching decisions. Thus, bringing teachers together to analyze artifacts of practice can result in learning in professional development as well as changes in teachers' classroom practice.

The video club that is the focus of this study was designed to synthesize these lines of research (see van Es, 2009; van Es & Sherin 2008 for details on the video club). Specifically, it was designed to bring teachers together on a regular basis to help them learn to attend to and reason about student thinking by analyzing video segments of student-student, teacher-student, or whole class discussions that took place in the participating teachers' classrooms. The group consisted of fourth and fifth grade elementary teachers, ranging from one to over 15 years teaching experience. They met once or twice a month over the course of a school year and typically viewed two clips from the teachers' classrooms at each meeting. At the same time, the district was in the third year of implementing a reform-based mathematics curriculum, *Everyday Mathematics* (University of Chicago School Mathematics Project, 2001). While half of the participating teachers adopted the curriculum in the first two years, the other half of the group were using the curriculum for the first time during the period that the video club took place. This paper is centrally concerned then with how the facilitators of the video club, who were interested in understanding how video could be used to help teachers attend to student thinking, and the participating teachers, who were concerned with implementing a new reform-based curriculum, negotiated these goals in the video club context.

Research Methods

Data for this study consist of videotapes and transcripts of the 10 video club meetings. Qualitative methods informed the data analysis (Strauss & Corbin, 1998). I first segmented each video club transcript into "idea units" (Jacobs & Morita, 2002). I then coded the units in terms of what they attended to (Topic) and how they reasoned about what they observed (Stance). I coded what teachers noticed in terms of one of the following topics: classroom management, climate, pedagogy, and student thinking (Frederiksen, Sipusic, Sherin, & Wolfe, 1998; van Es & Sherin, 2008). I reviewed the idea units coded as pedagogy and identified curricular issues as a particular focus of pedagogical comments. Each curricular issue was further

analyzed to identify themes related to this topic. Next, I examined the Stance that was used to discuss each topic, including whether the group described, evaluated, or interpreted the issue under discussion. Describe includes conversations intended to recount events that occurred in the clip. Evaluate refers to statements in which the teachers judge what was good or bad or could or should have been done differently. Interpret includes statements in which the teachers reasoned about what they noticed. I then examined group members' participation (Goffman, 1981) in the idea units coded as student thinking, pedagogy, and curriculum, including who initiated, participated, and concluded segments of talk to understand the extent to which participants collaborated with one another to investigate these two topics. Third, I analyzed the substance of the conversations related to student thinking and curriculum to capture both the quality of the talk and the collaborative nature among the participants as they discussed these issues. I coded the idea units as one of three categories: Substantive, Surface-level, and Closed. This classification is line with the kind of discourse proposed by mathematics professional development (Borko, Jacobs, Eiteljorg, & Pittman, 2008). Substantive conversations include multiple participants engaged in joint sense-making of mathematics teaching and learning, developing one another's ideas with evidence and detail to support claims. In surface-level discussions, the group discussed mathematics teaching and learning issues, but they talked generally about these issues and they provided little or no elaboration of one another's ideas and little or no evidence to support claims. In Closed conversations, the group did not analyze the issue initially raised. Table 1 illustrates the four categories of the analysis.

Two researchers created data displays (Miles & Huberman, 1994) for each meeting that identified, per idea unit, the topic and stance of the discussion, member participation, and substance of discussion. When the memos differed, the transcripts were discussed until consensus was reached. Analysis involved examining relationships between topics of conversation and the substance of the discussions, as well as shifts over time in the quality of discussions and how participants interacted to accomplish their goals.

Table 1
Analytic Categories

Topic	Stance	Participation	Substance
Classroom management	Describe	Initiate discussion	Substantive
Classroom climate	Evaluate	Participate in discussion	Surface-level
Pedagogy	Interpret	Conclude discussion	Closed
Student thinking			

Results

Data analysis reveals several important findings. First, the teachers raised a variety of themes related to curriculum, suggesting that this was a primary goal for their participation in the club. Second, both the goals of the facilitators and the teachers were achieved over the course of the video club meetings. Finally, the group came to collaborate around one another's goals as the meetings progressed. I use these shifts to propose that the teachers' experiences in the video club influenced their relationship to the curriculum, providing them with tools to more substantively inquire into the design, as well as providing a context to contemplate and explore problems of practice that they experienced as they adopted a reform-based curriculum.

Using the Video Club to Explore Challenges in Curriculum Implementation

While the facilitator had an explicit goal of helping teachers attend to student thinking in the video clips, analysis revealed that a main topic of interest for the teachers was implementation of the mathematics curriculum. The teachers consistently raised curricular issues over the course of the ten meetings, initiating most of the segments focused on curriculum and shifting the conversation from analysis of student thinking to discuss curriculum issues. Moreover, they raised a variety of issues related to the curriculum. These include: how to teach particular lessons or concepts; assumptions of student understanding in the curriculum design; level of difficulty of the materials for the students; assessment; teacher learning from curriculum implementation; and the overall curriculum design. Several subtopics fell under the curriculum design, namely, the spiral approach, lesson sequence both within and across grade levels, analysis of individual lesson designs, and the overall goals and purpose of the curriculum. As they discussed these issues, they considered "how-to" teach a particular lesson, curricular links between grade levels, and the goals and structure of the curriculum.

An example discussion from the fourth video club meeting illustrates some of the issues related to curriculum that they raised. The students were paired together to play a version of the card game *War*. Each pair had a deck of cards, and each card had a value of 1 through 10 with the corresponding number of dots. The students each drew two cards, multiplied the values, and the one with the greater product won the round. If one member of the pair thought the other had the wrong answer, the player could challenge the opponent to win the round. The clip was chosen to view in the video club because one of the students in the pair uses a variety of strategies to multiply the values on his cards. He appears to use a finger-counting strategy, he guesses in some instances, and he uses the values of his partner's cards to come up with an answer (e.g., the partner draws a 5 and a 1, and this student responds that the product of his cards is 51). The goal was to have the video club group examine the different strategies to consider if the student understood multiplication.

After viewing the clip, the teachers raise a variety of curriculum issues. They

wonder if card games such as the one in the clip are effective because the students do not appear to challenge each other when one member gets an incorrect answer. One teacher, Yvette expresses her concern about the design and goals of the curriculum when she states, "That's where *Everyday [Math]* is at a really high level at this point in fourth grade. What they need is a taste of facts everyday..." Another teacher, Elena, comments on how the games are designed from one grade level to the next, stating, "I don't know how it is in fourth grade, but in third grade, it's not necessarily the kid with the most cards wins." Linda contemplates adaptations they can make to the curriculum when she remarks, "We could have separate decks with just ones, twos, and threes..." Yvette follows with a comment about understanding the goals of the curriculum, stating that they need to understand what students need to know and what would be nice for them to know by the end of each grade and use that to guide curricular decisions. Thus, the teachers used the video club as a context for exploring an important issue in their practice, namely, implementing a reform-based mathematics curriculum.

Achieving the Facilitators' and Teachers' Goals

A second result is that the discussions of both student thinking and curriculum issues became more substantive over the course of the meetings. In prior research, I found that the teachers in this study came to analyze student thinking in new ways over the course of the meetings (van Es & Sherin, 2008), shifting from general evaluations of the whole class's thinking (e.g., "They all struggle with comparing fractions.") to adopting a more interpretive stance and using evidence from the segments to support claims they made about particular student's thinking (e.g., "Well, the first time he said 4. The difference between 5 and 9 is four. Maybe that's where he got it from.") Rodgers (2002) describes the importance of specificity in teacher talk, as it enables the group to get a more fine-grained look at the details of their teaching and student learning. In the video club discussions, the group became more specific in their analysis, honing in the details of student thinking and using the transcript and video as evidence to build and support analyses.

Similarly, the teachers became more focused and interpretive in their discussions of curriculum issues. At the beginning of the club, the teachers evaluated the curriculum, commenting on what they liked and disliked in the design and how it could be improved, making comments like, "I'm not sure I would do [this lesson] again... I didn't like the improper fractions"; or "I think that this particular series, when it comes to fractions, moves too fast. There isn't enough computation to go with it." These comments reflect the evaluative stance they adopted to discuss curriculum issues early on, as well as the broad, high-level perspective they had of the curriculum.

Later in the meetings, however, the group became more interpretive when they discussed issues related to the curriculum. They inquired about the design - wondering about the order of lessons, the relationship between one grade and the

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next, or how the assessments measured learning—and considered how the design may influence student learning. For instance, in one meeting, Daniel remarks about an assumption in the fourth grade curriculum that the students understand place value entering this grade because it is not emphasized in the fourth grade materials. He expresses his concern that this may be an unfair assumption because all the students are not at the same level in terms of what they know and do not know from previous years, so he grapples with how much time to spend on particular lessons and topics. Another teacher wonders if the warm-up activities in the curriculum are intended to scaffold learning for students who are still struggling with certain topics and then the teachers discuss the tension they experience related to how much time to spend on the warm up in order to support learning while also progressing through the curriculum. They then shift to contemplate how to support students who struggle but who are making incremental progress and how to design assessments to reflect this growth in learning. Daniel states, “Then, Tanisha, she got a 74% on the *Everyday Math* test. I was impressed with that but she’d look around and see Maria had a 94%. I’m trying to figure out how to let students like Tanisha know that she’s made improvements...” The group then discusses the assessment system that accompanies the curriculum and ways they can adapt it to support student learning and to help students see that they are making progress. These conversations illustrate the group becoming more analytic and specific in their discussions of the curriculum.

Additionally, as the video club progressed, several teachers commented during the meetings that they reasoned through the design of the curriculum as they prepared to teach lessons: “I wonder about the examples in the book. I try to figure out why it is that they gave that example.” Or “Sometimes with this [series] I have to think through, why are they doing this, why do we have to teach this, what is the goal for the kids?” Thus, it appears that over time, the group shifted to inquire into the design of the curriculum in the same ways that they came to analyze student thinking, suggesting that they were adopting discourse norms for analyzing student ideas to analyze curriculum issues that were central to their practice.

Collaborating to Investigate Student Thinking and Curricular Issues

The third result is that over time the group began to collaborate to accomplish each other’s goals. Early on, when the facilitator raised issues related to student thinking, the teachers responded with one or two speaking turns and then shifted the discussion to pedagogical strategies and curricular issues. As the meetings progressed, the teachers participated more when the facilitator prompted them to discuss student thinking. By the end of the series of meetings, the teachers began initiating conversations about the student thinking in the clips and taking on roles that demonstrated that they had learned norms for analyzing video together (van Es, 2009).

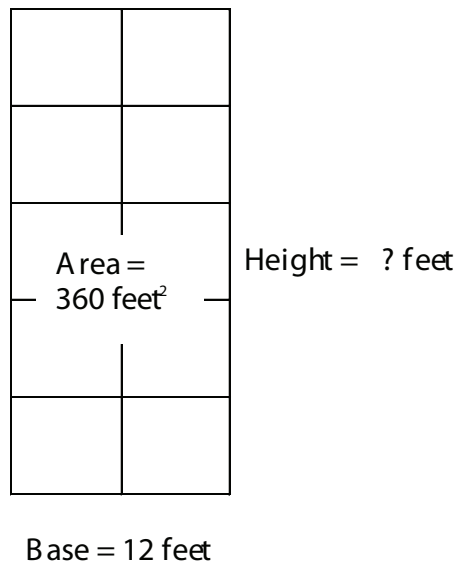
Likewise, the facilitators shifted to participate in discussions about curriculum issues in the later meetings. Initially, when the teachers raised curricular issues, the

facilitator provided time to discuss these issues but did not actively participate in these discussions. Moreover, the facilitators redirected the conversations to focus on student thinking represented in the clips. At the end of the series of meetings, the facilitator asked questions to better understand the curricular issues they raised and probed them to explain their analysis of the curriculum in light of their analysis of student thinking.

For instance, in the ninth meeting, the teachers viewed a clip in which the teacher was leading a group discussion about area. The group determined the height of a rectangle, given a base of 12 feet and an area of 360 feet² (see Figure 1). Several students divided 360 by 12 to solve the problem. Other students explored if the height could be determined by using the squares that comprised the rectangle in the figure. For example, one student, Maria, added the two rows in the figure to determine the height.

After viewing the clip, the teachers analyzed the student thinking. For instance, Yvette says, “I didn’t understand when she said, ‘since there’s five going down, you can just put one up and over...What did she mean?’” Another teacher, Frances, responds, “Yeah, I couldn’t figure out what she was saying either...” A third teacher, Wanda, enters the conversation and states, “She wants to count the boxes... to figure out one and then just add it again to find the next one.” Wanda then illustrates what she thinks the student is doing by drawing the figure on the board and counting each box in the figure. The facilitator asks the group, “What

Figure 1
What is the height of a rectangle with base 12 feet and area 360 feet²?



does she mean by, ‘can you just put a one up over that?’” and one teacher reads the transcript out loud and Yvette says, “It looked carrying to me...” The facilitator then asks, “Might she be thinking that maybe the length on the top is one?” The teachers explore this idea, using the transcript and the figure to help them work through what the student might be thinking.

At the same time, during this discussion, the teachers raised issues about the curriculum design and how the representation, in this case Figure 1, may be confusing the students. For instance, in discussing the problem above, the teachers explain that at the beginning of the unit, when students were presented with figures such as the one in Figure 1, the length of each side was 1 cm square and that as the unit progressed, the values of the sides varied depending on the overall area. The teachers discussed confusions students had as the problems shifted from the side being valued at 1 cm to having different values.

In the early meetings, when teachers raised issues of curriculum, the facilitators participated very little, if at all, in the discussions. Moreover, the facilitators redirected the conversation to focus on student thinking. However, in this discussion, as in other discussions about curricular issues later in the series of meetings, the facilitator engaged in these discussions, often asking questions about the curriculum and encouraging the group to discuss it in greater detail. For example, one teacher Frances states that she wishes the curriculum designers would keep the value of the sides at 1 cm square so the students could physically create the shapes. The facilitator probes her to explain what that would look like in this problem and how that might change the problem, which prompts Frances to explain her idea in greater detail. Later, the teachers contemplate students’ confusion about showing the squares in the figure when the value is no longer 1 cm. The facilitator asks the teachers to explain what they would do differently, “So, let’s use the example of 12 and 30. Can you explain what you would do?” This question prompts the teachers to illustrate their ideas and provide detailed explanations of the ways they would adapt the representation in the curriculum to support student learning. In the explanations, one teacher proposes that they eliminate the lines inside the figure and provide the overall area and the value of one side and then students can use division to find the value of the other side. The facilitator then asks, “Well, I’m wondering, is there any way the squares help?” The teachers then discuss how they might be scaffolds to show students what is really going on in the figure, which is lost if they just divide by the area by the length of one side.

These questions illustrate the facilitators participating in discussions that the teachers initiated about the curriculum materials, prompting the teachers to engage in substantive analysis of the curriculum design just as they do of student thinking represented in the clips. Thus, we see the coevolution of the video club group over time. In particular, as the teachers participate in the video club, they develop norms for analyzing problems of practice, and use them to examine issues of curriculum adoption and enactment. At the same time, the facilitators take up these

issues, enabling the teachers to use the video club context to explore, analyze and contemplate important teaching issues together.

Discussion and Conclusion

These results point to several ways that analyzing video helped this group collaboratively inquire into problems of practice. Research advocates that teachers become more reflective and analytic in their practice (Hiebert, et al., 2003). The video club setting appears to have provided a context for the teachers to develop a discourse for inquiring into student thinking and into an aspect of their practice that was of primary concern, namely, adopting a new curriculum. Additionally, viewing video from each other's practice seems to have provided an important window into one another's classrooms. While research shows that bringing teachers together to share experiences from their own teaching can be productive (Horn & Little, 2010; Meirink et al., 2007), it appears that viewing actual teaching episodes of one's colleagues as they adopted a reform curriculum provided concrete images for the group to examine and afforded substantive conversations about their teaching practice. These findings suggest that video clubs can become a forum for teachers to pursue their own interests without taking away from the intended program goals and can provide teachers with productive strategies for analyzing aspects of their practice outside of those that are the explicit focus of professional development.

This study also offers insight into ways that participants collaborate with one another to pursue different goals in order to improve teaching practice. In particular, as the group learned to systematically analyze student thinking, they used these strategies to analyze a core element of their teaching practice, curriculum enactment. I contend that this interplay between the discourse for analyzing student thinking and the teachers' adoption of the curriculum as expressed in the video club, either through their verbal accounts or the videos themselves, illustrates the coevolution (Kazemi & Hubbard, 2008) of teacher learning in and from collaboratively analyzing practice. Such systematic analysis of practice is uncommon in professional development (Little, 2002). However, video records of practice, along with collaborative and collegial interactions and discourse norms for analyzing issues in teaching and learning represented in those videos, can provide teachers opportunities to hone this important skill for teaching.

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