Video Excerpts to Support Collaborative Teacher Inquiry

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Research on teacher learning increasingly emphasizes the situated nature of learning (Horn, 2005; Putnam & Borko, 2000) and the potential benefits for teachers of working with colleagues to explore teaching and learning. Central to this perspective is the notion that the activities, discourses, and tools used by a community are central influences on the learning that takes place (Lave & Wenger, 1991). One implication for professional development, therefore, is that close attention must be paid to how groups of teachers are organized for learning, and to the artifacts that are used in such contexts (Ball & Cohen 1999).

In this essay I discuss the use of one kind of artifact to support teacher learning, namely video. Since the 1960s when video equipment became more portable and less costly, video has become a common feature of both teacher education and professional development programs. Video is generally thought to be a valuable medium for exploring teaching and learning because it captures much of the richness of the classroom setting (Brophy, 2004). Furthermore, in contrast to the fast-paced nature of instruction, watching video can provide teachers with the time and space needed to reflect on classroom interactions. At the same time, however, little is known about how to select video excerpts that promote worthwhile discussions among groups of teachers. In what follows I describe our preliminary efforts to explore this issue. In doing so I draw from my research with mathematics teachers in the context of video clubs.

Video Clubs as a Context for Collaborative Teacher Inquiry

In a video club, a group of teachers meet together regularly to watch and discuss excerpts of videos from their classes (Sherin & Han, 2004; Sherin & van Es, 2009). Typically, a researcher serves as facilitator, and in that function videotapes one or two teachers' classroom prior to each meeting and selects a 5-7 minute video clip from each class for the group to view at next meeting. Most of the video clubs we have organized so far share a common goal: to promote teacher investigation of student mathematical thinking. Toward that end, we attempted to select excerpts that involved student thinking and that were "interesting" – that we found captivating, compelling, and worth discussing. At the same time, we were committed to showing video from all participants' classroom. As student thinking looked quite different from classroom to classroom, we found that over time, we often used quite a variety of video clips in any one video club group. Because of this variety, the video club context seemed to us like a reasonable place to explore whether we could identify certain types of video clips as being particular productive for promoting teacher discussion of student mathematical thinking.

To be clear, we had to first clarify what we meant by teachers having "productive discussions of student mathematical thinking." To us, three features of such discussions were key. First, teachers needed to be engaged in *investigating student thinking*. That is, participants should treat students' ideas as objects of inquiry that deserve "careful consideration" (Cohen, 2004, p. xiv) and are worth trying to understand. Second, we hoped that teachers would explore *substantive mathematical ideas*. Thus rather than focus on primarily superficial mathematical issues, we hoped to see teachers looking deeply into the mathematics under consideration (e.g., Ma, 1999). Third, it was important that teachers engaged in *joint-sense making*. The idea is that for video club discussions to be truly effective, participants must be engaged in a collective endeavor, working together to share their ideas about teaching and learning (Chamberlin, 2005; Heibert & Stigler, 2000). How might video support these goals? Were there in fact certain kinds of video clips that tended to engender such discussions among teachers?

Three Dimensions of Video Clips of Student Mathematical Thinking

Based on our own experiences as well as a review of recent research on video-based professional development, we identified three dimensions of video excerpts of student mathematical thinking that we believed would influence teachers' discussions. The first dimension concerns the extent to which a video clip provides *windows* into student thinking, that is, ways of "seeing" what a student is thinking. Lave and Wenger (1991) discuss the importance of access to community practices if one is to learn to participate in such practices. Similarly, we expected that for video to be a means for teachers to explore student mathematical thinking, student thinking would need to be clearly visible in the video, whether through verbal, written, or gestural evidence.

The second dimension refers to the *depth* of student mathematical thinking, in other words, the extent to which the mathematical ideas that students consider in the video are substantive in nature. Several research studies demonstrate that as student responses move beyond a focus on correctness and rote use of algorithms, teachers begin to develop a deeper appreciation for the complexity of student mathematical thinking (e,g., Schifter, 1998). Similarly, we hypothesized that video clips illustrating substantive student thinking would most effectively promote teacher learning.

The third dimension concerns the *clarity* of student thinking portrayed, whether a student's idea is transparent or requires some work on the part of the viewer to understand. In line with Seago (2004) and others, we believed that videos considered low in clarity, in which one wonders about a student's statement, or how a student arrived at a particular answer, would serve as particularly valuable catalysts for teacher examination of student mathematical thinking.

With these three criteria in mind, we developed a framework for assessing video clips of student mathematical thinking as low, medium, or high along each dimension (Table 1). We then selected one particular video club as the focus of analysis, and coded all video clips shown at the meetings in terms of the framework. The selected video club involved a group of seven elementary teachers from one school, who meet together once or twice a month across a school year. In all the group viewed 26 video clips across the year.

Table 1. Criteria for Characterizing Video Clips of Student Mathematical Thinking

Criteria	Key Question	Level: Low	Level: Medium	Level: High
Windows into Student Thinking	Is there evidence of student thinking in the video clip?	Little evidence of student thinking from any source (e.g., very few comments from students)	One or more sources of information exist, but little detail provided (e.g., IRE exchanges dominate)	Detailed information from one or more sources (e.g., student narrates and provides written account of solution strategy)
Depth of Student Thinking	Are students exploring substantive mathematical ideas?	Task is routine for student; calls for memorization or recall on part of student (e.g., student applies known algorithm)	Some sense-making applied to routine task (e.g., student questions step in known algorithm)	Student engages in math sense-making, works on task at conceptual level (e.g., student devises invented strategy)
Clarity of Student Thinking	How easy is it to understand the student thinking shown in the video?	Student thinking not transparent (e.g., "What is that student talking about?")	Much of student thinking transparent, though some ideas may be unclear (e.g., "I think I understand, but what did she mean by 'straight?'"	Student thinking transparent; viewer sense-making not called for or single interpretation obvious (e.g., "She gives a very clear explanation.")

We also coded the 26 corresponding discussions of the video clips by assessing the extent to which teachers a) engaged in inquiry around student thinking b) focused on substantive mathematical ideas, and c) engaged in joint-sense making. Details about the discussion coding can be found in Sherin, Linsenmeier, & van Es (in press).

The Influence of Video Clips on Teacher Collaborative Inquiry

Our analysis highlighted three key findings concerning the relationship between the clip dimensions and the discussions of student mathematical thinking that took place. First, we had hypothesized that video clips that were high in depth would promote substantive discussions of student thinking among teachers, that is, clips in which students were hard at work making sense of mathematical ideas, presenting novel solutions rather than routine answers. We found however, that high depth needed to be sustained for the videos to be a valuable resource for teachers to use to consider student thinking. In particular, we had showed teachers a number of clips in which substantive ideas from students were only fleeting — a comment here or there in the midst of conversation that was largely routine (these clips had therefore been coded as high depth and low windows). To our eyes, such moments were quite captivating; as researchers, we found ourselves frequently intrigued by an interesting comment from a student even when it was not pursued in the lesson ("How do you know if you add a zero after the decimal?" "Is it three-hundredths, or three-hundreds?"). This was not the case for the teachers in the video club however. Lave and Wenger (1991) argue that transparency is not a feature of an artifact itself, but of the ways in which the community perceives the artifact. In this case, the brief comments that often stood out to us in the video clip simply did not appear noteworthy to the teachers.

A second finding also relates to the nature of the depth of the video clip. Specifically, we found that low depth clips did at times lead to productive discussions of student mathematical thinking. This was quite a surprise to use as we had hypothesized that high depth was a necessary (but not sufficient) condition for a video clip to promote discussion of student mathematical thinking. In contrast we found that the teachers at times treated mathematical ideas more deeply than had the students in the video. In this way, the depth of mathematical substance in the video did not necessarily constrain the teachers. For example, in one video clip the students were working on their multiplication facts. The clip was considered "low depth" because the students were following routine steps and did not appear to be thinking about why their solution methods worked. At the same time, the clip was high in windows – students were counting, tapping out numbers at their desks, and using a multiplication chart to check their answers — and low in clarity— students did not offer any explanations for varying the methods they used to solve different problems. In discussing the video, the teachers had an in-depth discussion of the meaning of multiplication and of what the students in the video understood about the nature of multiplication. In doing so, the teachers' discussion seemed to us to reflect Ma's (1999) notion of a *profound understanding of fundamental mathematics*, that teaching requires one to think deeply about basic mathematical ideas. Thus at times, even clips in which the students' work appeared routine could serve as catalysts for teachers to think deeply about the concepts underlying those routines.

Third, we initially believed that clips in which students' ideas were unclear would lead to productive discussions. A lack of clarity, it seemed, would prompt teachers to want to understand the ideas presented in the video clip. As we predicted, the teachers did have "more productive" discussions about clips that were high in windows and depth, but low in clarity – in other words, clips that contained substantial student thinking to figure out. Contrary to what we predicted, however, teachers also had worthwhile discussions about clips that contained a great deal of well-explained student thinking. In such cases, the fact that a student's explanation was clear did not deter the teachers from viewing the idea as an object of inquiry.

Conclusion

In this essay, I have presented initial ideas about selecting video clips to promote productive conversations of student mathematical thinking among groups of teachers. While there are clearly a number of factors that contribute to the discussions that take place (the individual participants, the facilitation provided, norms established, etc.) there is reason to believe that the nature of the video clips may also contribute to the discussions that unfolds. In particular, this work suggests that the relationship among the windows, depth, and clarity of student thinking portrayed in a video plays a role in determining whether a particular video clip will support in-depth conversations of student thinking among a group of teachers.

References

Ball, D. L., & Cohen, D.K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional development. In G. Sykes and L. Darling-Hammond (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 3-32). San Francisco: Jossey Bass.

Brophy, J. (2004). *Using video in teacher education.* San Diego, CA: Elsevier, Inc.

Chamberlin, M.T. (2005). Teacher discussions of students' thinking: Meeting the challenge of attending to students' thinking. *Journal of Mathematics Teacher Education, 8*(2), 141-170.

Cohen, S. (2004). *Teacher's professional development and the elementary mathematics classroom: Bringing understandings to light.* Mahwah, NJ.

Hiebert, J., & Stigler, J.W. (2000). A proposal for improving classroom teaching: Lessons from the TIMSS Video Study. *Elementary School Journal, 101*, 3-20.

Horn, I. S. (2005). Learning on the job: A situated account of teacher learning in high school mathematics departments. *Cognition and Instruction, 23(2),* 207-236.

Lave, J. & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge, UK: Cambridge University Press.

Ma, L. (1999). *Knowing and teaching elementary mathematics: Teacher understanding of fundamental mathematics in China and the United States.* Mahwah, NJ: Erlbaum.

Putnam, R.T. & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, Vol.29(1),* 4-15.

Schifter, D. (1998). Learning mathematics for teaching: From the teachers' seminar to the classroom. Journal for Mathematics Teacher Education, 1(1), 55-87.

Seago, N. (2004). Using video as an object of inquiry for mathematics teaching and learning. In Brophy, J. (Ed.) *Using video in teacher education* (pp. 259-286). San Diego, CA: Elsevier, Inc.

Sherin, M. G., & Han, S. (2004). Teacher learning in the context of a video club. *Teaching and Teacher Education, 20,*163-183.

Sherin, M. G., Linsenmeier, K., & van Es., E. A. (in press). Selecting video clips for teacher learning about student thinking. *Journal of Teacher Education*.

Sherin, M. G & van Es., E. A.(2009). Effects of video club participation on teachers' professional vision. *Journal of Teacher Education 60*(1), 20-37.