Santagata, Rossella

Unterrichtsvideos in der Lehrerinnen- und Lehrerbildung: Zentrale Fragestellungen, Instrumente und Einschätzungen für Forschung und Praxis

Beiträge zur Lehrerinnen- und Lehrerbildung 32 (2014) 2, S. 196-209

Quellenangabe/ Reference:
Santagata, Rossella: Unterrichtsvideos in der Lehrerinnen- und Lehrerbildung: Zentrale Fragestellungen, Instrumente und Einschätzungen für Forschung und Praxis - In: Beiträge zur Lehrerinnen- und Lehrerbildung 32 (2014) 2, S. 196-209 - URN: urn:nbn:de:0111-pedocs-138654 - DOI: 10.25656/01:13865

https://nbn-resolving.org/urn:nbn:de:0111-pedocs-138654
https://doi.org/10.25656/01:13865

in Kooperation mit / in cooperation with:

Zeitschrift zu Theorie und Praxis der Aus- und Weiterbildung von Lehrerinnen und Lehrern

BEITRÄGE ZUR LEHRERINNEN- UND LEHRERBILDUNG

Organ der Schweizerischen Gesellschaft für Lehrerinnen- und Lehrerbildung (SGL)

ISSN 2296-9632

http://www.bzl-online.ch

BEITRÄGE ZUR LEHRERINNEN- UND LEHRERBILDUNG, 32 (2), 2014

Video and Teacher Learning: Key Questions, Tools, and Assessments Guiding Research and Practice

Rossella Santagata

Abstract Recent technological advances have largely increased the availability of and easy access to videos of teaching. It thus becomes increasingly important to design models that guide teacher educators and researchers in the use of video. This article introduces a model comprised of four components represented by the following questions: (1) What is the teacher learning purpose of using video? (2) What types of video will work for that purpose? (3) What viewing modality will best serve that purpose? (4) How can we assess that we have achieved our purpose? Research conducted by the author and by other researchers is referenced and discussed as an illustration of each component of the model. Conclusions highlight the importance of a systematic use of video so that evidence can be collected to inform research on teacher learning and to design improved experiences for teachers.

Keywords teacher professional development – teacher education – mathematics teaching – video

Unterrichtsvideos in der Lehrerinnen- und Lehrerbildung: Zentrale Fragestellungen, Instrumente und Einschätzungen für Forschung und Praxis

Zusammenfassung Die technologischen Fortschritte der vergangenen Jahre haben den Zugang zu Unterrichtsvideos stark vereinfacht und dadurch deren Verfügbarkeit merklich gesteigert. Es wird daher zunehmend wichtig, Modelle bereitzustellen, die sowohl die Lehrerinnen- und Lehrerbildung als auch die Forschung im Umgang mit Videos anleiten. Im vorliegenden Beitrag wird ein entsprechendes Modell vorgestellt, das vier Komponenten aufweist, die in den folgenden Fragestellungen zum Ausdruck kommen: (1) Worin besteht das Ziel, wenn Lehrpersonen mit Videos lernen? (2) Welche Arten von Videos sind für dieses Ziel am besten geeignet? (3) Welche Formen des Videoeinsatzes und der Anleitung vermögen dieses Ziel am effektivsten zu unterstützen? (4) Wie kann festgestellt werden, ob das Ziel auch erreicht wurde? Jede dieser vier Komponenten wird anhand von bereits vorliegenden Forschungserkenntnissen und deren Diskussion illustriert. Das Fazit am Ende des Beitrags unterstreicht die Bedeutung eines systematischen Einsatzes von Unterrichtsvideos. Denn nur auf dieser Basis können Anhaltspunkte zusammengetragen werden, die es erlauben, die Forschung zum Lernen von Lehrerinnen und Lehrern voranzutreiben und verbesserte Lernumgebungen zu entwickeln.

Schlagwörter Aus- und Weiterbildung von Lehrerinnen und Lehrern – Mathematikunterricht – Unterrichtsvideos

1 Introduction

The advantages of using video as a tool for teacher learning in both teacher preparation and in-service professional development have recently been highlighted by many authors (among others, Alsawaie & Alghazo, 2010; Borko et al., 2008; Borko, Koellner, Jacobs, & Seago, 2011; Brophy, 2004; Ghousseini & Sleep, 2011; Hixon & So, 2009; Krammer et al., 2006; Lampert & Ball, 1998; Sherin & van Es, 2009; Seidel et al., 2011; Stockero, 2008; van Es & Sherin, 2008; Wang & Hartley, 2003; Wetzel, Radtke, & Stern, 1994). Teacher educators benefit from the technological advances that have created new affordances since the early use of video originated at Stanford University in the context of microteaching experiences (Santagata, Gallimore, & Stigler, 2005). Video can now be easily and economically collected, stored, edited, annotated, and shared.

Although issues of privacy exist and are becoming increasingly important given the multiple venues and the easiness with which video is shared in online environments, teacher educators have now access to thousands of videos of classroom teaching, especially to videos in the English language. It would be nearly impossible to list all the websites available to teachers and teacher educators that include videos of teaching. A few examples provide a sense of the amount and variety of video materials publicly available online. In the United States, a well-known website is YouTube. YouTube now includes a section with educational videos and one with classroom videos (http://www.youtube.com/user/teachers). Hundreds of lessons are available for viewing and are categorized by grade level and subject matter for easy selection. Another noteworthy U.S. website is The Teaching Channel (www.teachingchannel.com). The Teaching Channel is a library of hundreds of classroom videos, ranging from Kindergarten to twelfth grade, launched in 2011 by a former teacher, school administrator, researcher and dean of two colleges of education. Through the Teaching Channel, videos are made available both online and on public TV stations and are supplemented by transcripts, worksheets, lesson plans and commentaries by the videotaped teacher. In addition, a few questions accompany each video and viewers can post brief comments online. Recently the site has also launched a professional development platform that allows teams of teachers to collaborate online and to customize videos for their particular needs. Examples of websites in the German language are http://www.unterrichtsvideos.ch/ and www.uni-münster.de/koviu.

Given the wide availability of video portraying teaching, it becomes increasingly important to design models that guide teacher educators and researchers in the use of video. This article will introduce such a model, share research conducted by others that helps to illustrate its components, and describe how each component was dealt with in a project my collaborators and I are conducting that utilized video as a tool for the preparation of primary teachers. The model originates from years of collaborative work with researchers and practitioners who use video in the context of teacher preparation

and professional development. As such, it is introduced as a practical guide in the hope of gathering feedback from other researchers and teacher educators on its usefulness and on aspects that may be missing and would improve its function. Figure 1 introduces the model's four components.

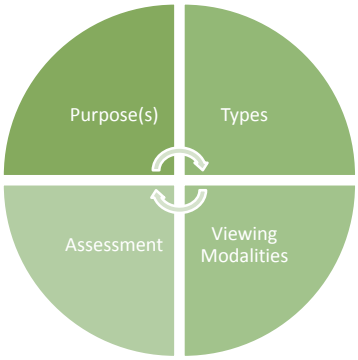

Figure 1: Model for using video for teacher learning.

2 A Model for Using Video for Teacher Learning

When choosing video as a tool for teacher learning, it is important to consider four broad questions:

(1) What is the teacher learning purpose of using video?
(2) What types of video will work for that purpose?
(3) What viewing modality will best serve that purpose?
(4) How can we assess that we have achieved our purpose?

The following sections will consider each question, cite relevant publications, and exemplify how the question was answered in a particular project my collaborators and I are conducting.

2.1 Purpose(s) of Using Video

The answer to the first question drives all subsequent decisions. It refers to the purpose the teacher educator has for the use of video and, more generally, to the perspective on teacher learning he or she embraces. Teacher educators use video for various reasons. Some educators use it to improve teacher pedagogical content knowledge (Borko, Koellner, Jacobs, & Seago, 2011; Santagata, 2009; Seago, Mumme, & Branca, 2004); others to model reform-minded teaching practices (Kellogg & Kersaint, 2004; Santagata & Guarino, 2011); others to develop reflection and noticing skills (Jansen & Spitzer, 2009; Star & Strickland, 2008; Stockero, 2008; Spitzer et al., 2011; van Es, & Sherin,

2002); yet others to discuss equity-based classroom practices (Roth McDuffie et al., 2014). As with the design of any learning experience, it is fundamental to define the purpose and to specify the goals for teacher learning in detail. If, for example, the goal is to improve teacher content knowledge, the teacher educator needs to specify what aspects of content knowledge are of interest, around what topics, and for what instructional context. If the purpose is to teach specific instructional strategies, the teacher educator must identify the key instructional moves that teachers need to learn to apply the new strategies effectively in the classroom.

In a project I am directing, the «Learning to Learn from Mathematics Teaching» project (hereafter referred to as the «LLMT project»), the main objective is to prepare future teachers to learn from practice. That is, the project aims to develop pre-service teachers' abilities to reflect on and systematically analyze their teaching. We hope to prepare professionals who will continue to learn new things over time, whether these things involve their students' understanding of mathematics or the instructional strategies that are most effective to move student learning forward. Although the purpose is clear, it is too broad to guide the video-based learning activities we organize for pre-service teachers and certainly too vague to guide our choice of assessments. Through research guided by both theory and empirical data we identified a set of dispositions, knowledge, and skills that together allow future teachers to learn from practice. These were discussed in a previous publication (Santagata & van Es, 2010) and are summarized in Table 1.

Table 1: LLMT project: specific dispositions, knowledge, and skills by areas of development

Areas of Development	Specific Dispositions, Knowledge, and Skills
Awareness	– Awareness of the importance and usefulness of a disciplined analysis of practice – Appreciation for teaching approach that builds on students' ideas – Understanding that student thinking about mathematical ideas is complex and warrants careful consideration
Analysis Knowledge and Skills	– Ability to attend to what students are doing or saying in a lesson and to draw inferences or make hypotheses based on their mathematical understanding – Knowledge of strategies that assist in making students' thinking visible (e.g., effective questioning, design of open-ended mathematical problems, monitoring student work, and establishing a classroom discourse community) – Ability to reason about instructional strategies in terms of the extent to which they make student thinking visible, and the ability to use evidence of student learning to reason about the effectiveness of teaching
Planning and Enactment Skills	– Ability to generate alternative strategies and justify them in terms of their potential impact on student learning – Ability to plan for teaching that makes student thinking visible – Ability to enact instructional practices that make student thinking visible

The knowledge and skills are described in enough detail to be able to design specific learning experiences for pre-service teachers. The project team can thus choose tools that facilitate the teaching/learning process, such as appropriate videos, and identify or design assessments that provide information on activities that worked and challenges that need to be considered in subsequent implementations.

2.2 Types of Video

Once the purpose and the specific goals have been defined, teacher educators must choose the types of video that will be conducive to learning. Here, several questions can assist teacher educators in selecting the appropriate type of video for their purposes:

(1) What should the video capture: A teacher teaching a lesson? A group of students working together? Interactions between the teacher and the class? One student being questioned while solving a mathematics problem? This question relates to the kind of teaching/learning situation one wants teachers to focus on.
(2) How long should the video be? Should it capture an entire classroom lesson or interview? Should it be a shorter clip or series of clips? And should it be edited or unedited?
(3) Who should the video portray and represent? The teachers participating in the learning experience or other teachers? Students from the same population of students of the participating teachers or any students?
(4) What kind of teaching should the video portray? Exemplary teaching or ordinary lessons? And should the teacher portrayed be an expert teacher, an average teacher, or a novice?

It is clear that several considerations need to be made to answer each of the questions above. While in some cases the purpose clearly guides these choices, in others empirical studies can assist in identifying the best type of video for a certain purpose. For example, Seidel and colleagues (2009) investigated whether video of one's own versus others' teaching impacts differently on teacher knowledge activation and professional vision. The study found that while teachers demonstrated higher engagement and motivation with videos of their own teaching, and were somewhat better able to identify key components of teaching and learning, videos of others' teaching were a better stimulus for critical analysis. Other researchers investigated the characteristics that make video clips of classroom teaching good tools for engaging teachers in discussions of student thinking (Sherin, Linsenmeier, & van Es, 2009). These researchers identified three dimensions along which video clips varied: (1) the extent to which a clip provides windows into student thinking, (2) the depth of thinking shown, and (3) the clarity of the thinking. Different combinations of these characteristics resulted in qualitatively different teacher discussions.

Sometimes an arrangement of videos might be the best choice. In my own research for example, the analysis of pre-service teachers' interviews on the advantages and challenges of using video for their preparation highlighted the need for them to be exposed

to both experienced teachers that can model effective practices and to novice teachers who are closer to their zone of proximal development (Santagata & Guarino, 2011). Once the type of video most conducive to teachers' progress towards the learning goals has been identified, other, more practical considerations need to be made as well: Are there publicly available videos that serve the intended purpose? Is it necessary to collect new videos?

In the LLMT project, several types of video are used to achieve the goals summarized in Table 1. Table 2 lists, next to each goal, the type of video that is used, and publicly available video sources from which video segments are drawn. In some cases in-house collected videos are used.

Table 2: LLMT project: types of video used by areas of development

Development Area	Types of Video	Publicly Available Videos
Awareness	– Videos of student-centered mathematics teaching	*Cognitively Guided Instruction* (Carpenter, Fennema, Franke, Levi, & Empson, 1999)
	– Videos of teachers asking children questions as they solve mathematics problems	*Integrating Mathematics and Pedagogy* (Philipp, Cabral, & Schappelle, 2005)
Analysis Knowledge and Skills	– Videos portraying specific instructional strategies that make student thinking visible	*Cognitively Guided Instruction* (Carpenter, Fennema, Franke, Levi, & Empson, 1999; Carpenter, Franke, & Levi, 2003)
	– Videos accompanied by clearly stated student learning goals, clearly audible student utterances, and sample student work	Collected for project
Planning and Enactment	– Videos of lessons taught by participating pre-service teachers	Collected for project

2.3 Viewing Modalities

Even the most appropriate type of video does not automatically translate into teacher learning (Seidel et al., 2013). Research has found that what makes video an appealing tool for teacher learning – its ability to capture the complex reality of classrooms – makes it also a challenging tool. Without guidance, different teachers will focus on different aspects of the teaching/learning situation portrayed in the video (Erickson, 2007). Pre-service teachers will tend to focus on superficial aspects of the videotaped teachers, such as their clothing and their tone of voice (Santagata, Zannoni, & Stigler, 2007; Star & Stickland, 2008). Depending on the purpose, it is thus important to guide teachers' viewing and help them to focus on specific interactions, subject-matter content, or student thinking represented in the video. A certain kind of reasoning about

the relation between teaching and learning can also be facilitated. This can be done in multiple ways that vary in the extent to which teacher viewing is structured (Borko, Koellner, Jacobs, & Seago, 2011). For example, in the context of teacher video clubs, a form of professional development that involves teachers in collaborative discussions of video clips drawn from their math lessons (van Es & Sherin, 2008), the facilitator focuses teachers' attention on student thinking through a series of questions that begin as open ended (e.g., «What do you notice?») and gradually become more specific (e.g., «Can you tell what that student in the video understood about the meaning of fractions from what she said here?»). Other, more structured video-based material includes a set of specific tasks in which teachers engage as they watch videos of teaching. Examples of these highly structured materials are those developed by Seago and colleagues on the teaching of linear equations (Seago, Mumme, & Branca, 2004) and geometry (Seago, Jacobs, & Driscoll, 2010).

In the LLMT project, a framework including four sets of questions guides pre-service teachers' viewing. These are:

(1) What is the main learning goal of this instructional episode?
(2) Did the students make progress toward the learning goals? What evidence do we have that students made progress? What evidence do we have that students did not make progress? What evidence are we missing?
(3) Which instructional strategies supported students' progress toward the learning goals and which did not?
(4) What alternative strategies could the teacher use? How do you expect these strategies to impact students' progress toward the lesson learning goals? If any evidence of student learning is missing, how could the teacher collect such evidence?

In previous publications my collaborators and I have called this the «Lesson Analysis Framework», and we have proven its effectiveness as a structure for guiding pre-service video-enhanced analyses of lesson videos (Santagata et al., 2007; Santagata & Angelici, 2010; Santagata & Guarino, 2011). In the LLMT project often more detailed questions tailored to specific videos are used to scaffold pre-service teachers' development of the knowledge and skills for analyzing teaching outlined earlier. Careful viewing and analyses of multiple videos guided by these focused questions precede video analyses guided by the «Lesson Analysis Framework».

In addition to thinking about the extent to which viewing should be structured and how this should be accomplished when using video in the context of teacher professional development, it is also important to consider the organization of the interaction among teachers. Video can be used as a tool for individual teachers to learn about certain practices and to reflect on their own practices in isolation, but more commonly it is used as a tool that facilitates discussion among teachers and the use of a shared language to talk about teaching (Borko et al., 2008; Santagata, 2009; Sherin et al., 2009). Teacher

educators need to consider strategies for engaging teachers in discussion, and when choosing to work with videos of participating teachers they need to think carefully about modalities that facilitate sharing and productive discussions that are not considered threatening by the participants. In all cases, a culture of video viewing needs to be created (Hiebert, Gallimore, & Stigler, 2003). Particularly successful have been experiences in which the video analysis is focused on student learning rather than the teacher (van Es, 2012), and lesson-study type of experiences in which teachers plan a lesson together, select a volunteer to teach it, and then watch its video recording focusing on the activities they jointly planned and on their impact on student learning (Lewis, 2000). Because of their role as novices, pre-service teachers might be more open to the discussion of their own videotaped teaching – especially if these discussions have the purpose of jointly discussing ways to solve problems of teaching –, and certainly this kind of teacher preparation activities experienced early on in a teacher's career paves the road for future positive experiences with video.

2.4 Assessment

The fourth question involves decisions on strategies that can be used to assess teacher learning from video. The assessment of teacher learning needs to be tied to the initial purpose and learning goals for using video, thus various projects may need different assessments. Although surveys of teachers' experiences and satisfaction with video as a learning tool are quite revealing and may inform revision and improvement of professional development experiences, actual learning data needs to be collected to assess whether the learning goals have been achieved. Researchers who have collected such data have used a variety of measures, ranging from transcripts of teacher discussions of video clips analyzed for ways they change over time (Borko et al., 2008; Stockero, 2008; van Es & Sherin, 2008) to interviews structured around video clips of classroom teaching (Sherin & van Es, 2009) or written commentaries typed in online platforms (Santagata et al., 2007; Santagata & Angelici, 2010; Santagata & Guarino, 2011). Qualitative analyses of teachers' discussions, reflections, or written comments are very effective in highlighting teachers' viewing processes and reasoning and how these might change over time as a result of video-based professional development. Van Es (2010) developed a framework that draws from prior research on teacher noticing and analysis abilities to capture different levels of sophistication in *what* teachers notice about student mathematical thinking in video clips and *how* they notice. The framework identifies five levels of noticing, ranging from a baseline to an extended level, that increase in the specificity of what teachers notice about student thinking, and in their ability to elaborate, interpret, and make connections between different elements in the video.

At least two instruments have recently been developed and validated to quantify teachers' ability to analyze classroom teaching portrayed in videos: The Observer, designed and tested by Seidel and colleagues (Seidel et al., 2009), and Classroom Video Analysis (CVA), designed and tested by Kersting and colleagues (Kersting et al., 2010; Kersting et al., 2012).

The Observer, originally designed in the German language, includes a set of standardized rating items linked to video clips of classroom teaching of various types of subject-matter delivered through an online platform. The instrument measures pre-service teachers' psychological-pedagogical competence in observing classroom teaching. Expert ratings are used as criteria to assess pre-service teachers' knowledge. The CVA, designed in the English language, includes a database of video clips of math lessons targeting various key topics and concepts in the U.S. elementary school mathematics curriculum. Teachers write comments on the clips in an online platform in response to an open ended prompt (e.g., «Please comment on the interaction between the teacher and the student(s) around the mathematical content»). A set of scoring rubrics (also available for automated, computerized scoring) are then applied to measure teachers' knowledge of math teaching as indicated by their ability to analyze instruction.

The CVA is one of the measures we used to assess pre-service teacher learning in the context of the LLMT project. The scoring rubrics included in the instrument well match some of the project's learning goals listed in Table 1, namely to develop pre-service teachers' abilities to (1) attend to what students are doing or saying in a lesson and to draw inferences or make hypotheses based on their mathematical understanding, (2) use evidence of student learning to reason about the effectiveness of teaching, and (3) generate alternative strategies and justify them in terms of their potential impact on student learning.

In one of the LLMT project studies, pre-service teachers' written comments on video clips of classroom lessons were scored according to the following four CVA rubrics: (1) depth of interpretation; (2) attention to math content; (3) attention to student thinking; and (4) suggestions for improvement. This study included a control group of pre-service teachers who were not taught to reflect on and analyze teaching systematically, but rather had only occasional opportunities to learn these skills in their math methods course or in their fieldwork. Thus, the performance of pre-service teachers who received explicit and systematic instruction on learning from mathematics teaching was compared to the performance of this control group. A total of 60 pre-service elementary teachers, attending a one-year post-bachelor teacher preparation program at a large public university on the west coast of the United States, participated in the study during its first year of implementation. They were randomly assigned to the two groups at enrollment in the program. All pre-service teachers completed the CVA both at the beginning of the program and after two quarters (i.e., approximately six months) once they had attended their methods courses. Each time, participating pre-service teachers commented on ten video clips of math lessons. Their comments were then scored according to the four rubrics listed above. A total score computed as the sum of the scores obtained on each rubric provided an overall index of their analysis ability.

Detailed findings were presented in a separate publication (see Santagata & Yeh, under review). Here we summarize the main results to provide an example of ways teacher

learning from video-enhanced activities can be assessed. At pre-test, there were no statistically significant differences between the groups in the total CVA score, nor in any of the separate rubrics' scores. At post-test, the LLMT group significantly outperformed the control group. This overall index of analysis abilities provided evidence for the effectiveness of the video-based activities as opportunities to develop the knowledge and skills we identified at the beginning of the project. The breakdown of scores by each sub-scale defined by the four rubrics listed above provided further information about pre-service teachers' abilities. Although the difference was not statistically significant, pre-service teachers in the LLMT group on average tended to elaborate on what they saw in the video clips and to go beyond mere descriptions more often than the control group. The ability to attend to the math content in the video clip did not differ in the two groups. Significant differences were instead observed between the two groups in the abilities to attend to student mathematical thinking and to propose suggestions for instructional improvements. These findings show that pre-service teachers may be able to develop the ability to make sense of classroom teaching and to take the math content into account when reasoning about instruction through typical coursework and fieldwork they complete as part of teacher preparation. But in order to develop the ability to pay close attention to ways students respond to instruction and infer their mathematical thinking, pre-service teachers benefit from systematic and video-enhanced learning opportunities such as those designed for them in the context of the LLMT project. Systematic learning experiences are also necessary for pre-service teachers to begin to learn to propose instructional improvements.

These findings confirm those found by other researchers who used video as a tool for facilitating pre-service teachers' systematic reflection on practice. Among others, van Es and Sherin (2002) structured pre-service teachers' viewing of videos of their own practices by asking them to attend to the details and to interpret instructional episodes by focusing on three separate aspects: students' thinking, the teacher's role and classroom discourse. Compared to a control group who did not participate in the video-enhanced experience, pre-service teachers in the treatment group produced more elaborated written analyses of their teaching, namely by attending more closely to the students, by reasoning about the impact of their decisions on student learning and by considering future steps. Stockero (2008) used a video-based curriculum in the context of a mathematics methods course for secondary pre-service teachers and documented their written reflections over time. Pre-service teachers learnt to propose multiple interpretations of student thinking and to reflect on the effects of teaching on student thinking.

In sum, the CVA instrument provided useful information on the effectiveness of the video-based activities the LLMT project team designed to develop pre-service teachers' abilities to learn from mathematics teaching. In addition to evidence in support of the video-based activities, the CVA instrument also highlighted the aspects of this teacher learning process that are most challenging for pre-service teachers. The open-ended character of the CVA task allowed for further analyses of pre-service teachers' com-

ments to identify particular difficulties they encountered when making sense of teaching. Once the quantitative scores were available, we were able to apply additional coding categories to the written comments to better characterize pre-service teachers' challenges. For example, we reviewed pre-service teachers' comments to assess the extent to which they were able to reason about the impact of teaching on student learning. We were able to identify a few challenges in utilizing evidence of student thinking and learning from the video. Pre-service teachers preferred to make claims about the potential impact of a teaching move on students' future learning by drawing on principles of effective teaching they had learnt in the course instead of evaluating evidence of student learning or difficulties present in the video clips. When they did consider evidence of student learning, they sometimes mistook evidence of procedural fluency for evidence of conceptual understanding, arguing that a child had understood a certain math idea, when evidence in the video was limited to a correct procedure. Findings of this additional coding were summarized in a separate publication (Yeh & Santagata, under review).

Both quantitative and qualitative findings from all above reported analyses will be used in the future to improve the design of the video-based learning activities. For example, we are designing activities that ask explicitly to distinguish among different types of evidence of student learning, so pre-service teachers can engage in discussions about what counts as evidence of progress towards specific learning goals.

3 Conclusions

Without doubt, video is a powerful tool for engaging future and practicing teachers in the analysis and discussion of their classroom practices. Video allows making public a profession that has evolved over time behind closed doors. Through video we can celebrate the knowledge and expertise of teachers, we can learn to appreciate the complexity of their work, and we can create opportunities for them to dialogue and learn from each other. But alongside these strengths there are also many risks, now exacerbated by the easiness with which video can be accessed. Careful considerations of goals and means, attention to the sensibility of teachers, development of trust and of a culture of support and dialogue are essential elements for making video a positive and effective tool. The model presented in this article is intended to provide guidance for the many decisions that need to be made when choosing video as a tool for teacher learning. The model is also an invitation to document all decisions and to collect evidence of their impact. Only by doing so, teacher educators will be able to evaluate their experiences and thus complete the cycle. It is essential that teacher educators take an inquiry stance and learn from their work with teachers as much as their teachers have learnt from video.

References

Alsawaie, O.N., & Alghazo, I.M. (2010). The effect of video-based approach on prospective teachers' ability to analyze mathematics teaching. *Journal of Mathematics Teacher Education, 13* (3), 223–241.
Borko, H., Jacobs, J., Eiteljorg, E., & Pittman, M.E. (2008). Video as a tool for fostering productive discussions in mathematics professional development. *Teaching and Teacher Education, 24* (2), 417–436.
Borko, H., Koellner, K., Jacobs, J., & Seago, N. (2011). Using video representations of teaching in practice-based professional development programs. *ZDM, 43* (1), 175–187.
Brophy, J. (2004). *Using Video in Teacher Education*. Amsterdam: Elsevier.
Carpenter, T.P., Fennema, E., Franke, M.L., Levi, L., & Empson, S.B. (1999). *Children's Mathematics: Cognitively Guided Instruction*. Portsmouth, NH: Heinemann.
Carpenter, T.P., Franke, M.L., & Levi, L. (2003). *Thinking mathematically*. Portsmouth, NH: Heinemann.
Erickson F. (2007). Ways of Seeing Video: Toward a Phenomenology of Viewing Minimally Edited Footage. In R. Goldman, R. Pea, B. Barron, & S. Derry (Eds.), *Video research in the learning sciences* (pp. 145–155). Mahwah, NJ: Erlbaum.
Ghousseini, H., & Sleep, L. (2011). Making practice studyable. *ZDM, 43* (1), 147–160.
Hiebert, J., Gallimore, R., & Stigler, J.W. (2003). The new heroes of teaching. *Education Week, 23* (10), 42–56.
Hixon, E., & So, H.J. (2009). Technology's Role in Field Experiences for Preservice Teacher Training. *Educational Technology & Society, 12* (4), 294–304.
Jansen, A., & Spitzer, S.M. (2009). Prospective middle school mathematics teachers' reflective thinking skills: descriptions of their students' thinking and interpretations of their teaching. *Journal of Mathematics Teacher Education, 12* (2), 133–151.
Kellogg, M., & Kersaint, G. (2004). Creating a vision for the standards using online videos in an elementary mathematics methods course. *Contemporary Issues in Technology and Teacher Education, 4* (1), 23–34.
Kersting, N.B., Givvin, K.B., Sotelo, F.L., & Stigler, J.W. (2010). Teachers' analyses of classroom video predict student learning of mathematics: Further explorations of a novel measure of teacher knowledge. *Journal of Teacher Education, 61* (1–2), 172–181.
Kersting, N.B., Givvin, K.B., Thompson, B.J., Santagata, R., & Stigler, J.W. (2012). Measuring Usable Knowledge: Teachers' Analyses of Mathematics Classroom Videos Predict Teaching Quality and Student Learning. *American Educational Research Journal, 4* (3), 568–589.
Krammer, K., Ratzka, N., Klieme, E., Lipowsky, F., Pauli, C., & Reusser, K. (2006). Learning with classroom videos: Conception and first results of an online teacher-training program. *ZDM, 38* (5), 422–432.
Lampert, M., & Ball, D.L. (1998). *Teaching, Multimedia, and Mathematics.* New York: Teachers College Press.
Lewis, C. (2000). *Lesson study: The core of Japanese professional development*. Invited Address to the Special Interest Group on Research in Mathematics Education, American Educational Research Association Meetings, New Orleans, April 28, 2000. Retrieved from: www.csudh.edu/math/syoshinobu/107web/aera2000.pdf (24.05.2014).
Philipp, R.A., Cabral, C., & Schappelle, B.P. (2005). *IMAP CD-ROM: Integrating mathematics and pedagogy to illustrate children's reasoning* (computer software). Upper Saddle River, NJ: Pearson Education.
Roth McDuffie, A., Foote, M.Q., Bolson, C., Turner, E.E., Aguirre, J.M., Bartell, T.G., Drake, C., & Land, T. (2014). Using video analysis to support prospective K-8 teachers' noticing of students' multiple mathematical knowledge bases. *Journal of Mathematics Teacher Education, 17* (3), 245–270.
Santagata, R. (2009). Designing video-based professional development for mathematics teachers in low-performing schools. *Journal of Teacher Education, 60* (1), 38–51.
Santagata, R., & Angelici, G. (2010). Studying the impact of the *Lesson Analysis Framework* on preservice teachers' ability to reflect on videos of classroom teaching. *Journal of Teacher Education, 61* (4), 339–349.

Santagata, R., Gallimore, R., & Stigler, J.W. (2005). The use of video for teacher education and professional development: past experiences and future directions. In C. Vrasidas, & G.V. Glass (Eds.), *Current Perspectives on Applied Information Technologies (Volume 2): Preparing Teachers to Teach with Technology* (pp. 151–167). Greenwich, CT: Information Age Publishing.
Santagata, R., & Guarino, J. (2011). Using Video to Teach Future Teachers to Learn from Teaching. *ZDM, 43* (1), 133–145.
Santagata, R., & van Es, E.A. (2010). Disciplined Analysis of Mathematics Teaching as a Routine of Practice. In J.W. Lott, & J. Luebeck (Eds.), *Mathematics teaching: Putting research into practice at all levels* (pp.109–123). San Diego, CA: Association of Mathematics Teacher Educators.
Santagata, R., & Yeh, C. (under review). Preparing teachers for career-long learning: Findings from the «Learning to Learn from Mathematics Teaching» project.
Santagata, R., Zannoni, C., & Stigler, J.W. (2007). The Role of Lesson Analysis in Pre-Service Teacher Education: An Empirical Investigation of Teacher Learning from a Virtual Video-Based Field Experience. *Journal of Mathematics Teacher Education, 10* (2), 123–140.
Seago, N., Jacobs, J., & Driscoll, M. (2010). Transforming Middle School Geometry: Designing Professional Development Materials that Support the Teaching and Learning of Similarity. *Middle Grades Research Journal*, *5* (4), 199–211.
Seago, N., Mumme, J., & Branca, N. (2004). *Learning and teaching linear functions: Video cases for mathematics professional development*. Portsmouth, NH: Heinemann.
Seidel, T., Blomberg, G., & Renkl, A. (2013). Instructional strategies for using video in teacher education. *Teaching and Teacher Education*, *34*, 56–65.
Seidel, T., Prenzel, M., Schwindt, K., Stürmer, K., Blomberg, G., & Kobarg, M. (2009). LUV and Observe: Two Projects Using Video to Diagnose Teacher Competence. In T. Janik, & T. Seidel (Eds.), *The power of video studies in investigating teaching and learning in the classroom* (pp. 161–180). Münster: Waxmann.
Seidel, T., Stürmer, K., Blomberg, G., Kobarg, M., & Schwindt, K. (2011). Teacher learning from analysis of videotaped classroom situations: Does it make a difference whether teachers observe their own teaching or that of others? *Teaching and Teacher Education, 27* (2), 259–267.
Sherin, M.G., Linsenmeier, K.A., & van Es, E.A. (2009). Selecting video clips to promote mathematics teachers' discussion of student thinking. *Journal of Teacher Education, 60* (3), 213–230.
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.
Spitzer, S.M., Phelps, C.M., Beyers, J.E., Johnson, D.Y., & Siemenski, E.M. (2011). Developing prospective elementary teachers' abilities to identify evidence of student mathematical achievement. *Journal of Mathematics Teacher Education, 14* (1), 67–87.
Star, J.R., & Strickland, S.K. (2008). Learning to observe: Using video to improve preservice mathematics teachers' ability to notice. *Journal of Mathematics Teacher Education, 11* (2), 107–125.
Stockero, S.L. (2008). Using a video-based curriculum to develop a reflective stance in prospective mathematics teachers. *Journal of Mathematics Teacher Education, 11* (5), 373–394.
van Es, E.A. (2010). A framework for learning to notice student thinking. In M. Sherin, V. Jacobs, & R. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (Chapter 9, pp. 136–151). New York: Taylor & Francis.
van Es, E.A. (2012). Examining the development of a teacher learning community: The case of a video club. *Teaching and Teacher Education, 28* (2), 182–192.
van Es, E.A., & Sherin, M.G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education, 10* (4), 571–596.
van Es, E.A., & Sherin, M.G. (2008). Mathematics teachers' «learning to notice» in the context of a video club. *Teaching and Teacher Education, 24* (2), 244–276.
Wang, J., & Hartley, K. (2003). Video technology as a support for teacher education reform. *Journal of Technology and Teacher Education, 11* (1), 105–138.
Wetzel, C.D., Radtke, P.H., & Stern, H.W. (1994). *Instructional effectiveness of video media*. Mahwah, NJ: Erlbaum.

Yeh, C., & Santagata, R. (under review). Pre-service teachers learning to generate evidence-based hypotheses about the impact of mathematics teaching on learning.

Author

Rossella Santagata, Ph.D., Assistant Professor, School of Education, University of California, r.santagata@uci.edu