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Using video to analyze one's own teaching

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Abstract

Recently, interest in using video to facilitate teacher reflection has increased. Despite this increase, the frameworks employed to help teachers use video to reflect on their teaching are not based on the results of prior video analysis research. There is a need to better understand how and in what ways video has been used to reflect on one's own teaching. The purpose of this paper is to review past studies in order to help educators make more informed decisions as they establish their own video analysis processes. This review includes 63 studies where participants recorded their own teaching, examined their performance on video and reflected on the performance. Several dimensions of video analysis that varied across past studies are discussed: type of tasks, manner of facilitation, extent to which teachers reflect individually or collaboratively, length of video used, number of reflections and measurement. This paper summarizes reported findings regarding each of these dimensions and raises several questions that need further investigation.

Introduction

The ability of teachers to reflect on their teaching has been touted as important for teacher development (Schön, 1983). One of the first definitions of reflection in teaching is an "active, persistent, and careful consideration of belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it ends" (Dewey, 1933, p. 9). Others have defined reflection as problem solving (Bigge & Shermis, 1992); attempts to make sense of the world (Brubacher, Case & Reagan, 1994); the capacity of a teacher to think creatively, imaginatively and critically about classroom practice (Norton, 1994); thinking rationally about and assuming responsibility for one's educational choices (Ross, 1989); an investigation of the social problems realized in living through them (Ross & Hannay, 1986); and framing, analyzing and acting purposefully on a situation with the end of changing it (Schön, 1983). Reducing these to a single definition, we might encapsulate reflection as a self-critical, investigative process wherein teachers consider the effect of their pedagogical decisions on their situated practice with the aim of improving those practices.

One way of helping teachers to reflect their teaching has been through the use of video (Fuller & Manning, 1973). As it has become more accessible, there has been renewed interest in using video for teacher development (Grossman, 2005). Past studies reported that video reflection can be an effective feedback strategy for helping instructors improve their teaching (Penny & Coe,

Practitioner notes

What is already known about this topic

- Video is a powerful tool for teacher reflection.
- Video enables teachers to more effectively "see" their practice.
- Teachers who engage in video reflection report recalling prior videos of their teaching during future teaching, enabling them to more effectively, "reflect in practice."

What this paper adds

- A unified synthesis of the literature on video used for teacher self-relfection.
- A review of the tools used for facilitating teacher reflection via video and their effect on the reflective process.
- Six different dimensions among which video-aided teacher reflection research varies.

Implications for practice and/or policy

- Teachers prefer to engage in video analysis for reflection in collaboration with colleagues over reflecting alone and feel that the most important recommended changes come from these collaborative groups.
- In support of past research, teachers report that the use of a guiding framework (eg., rubric, checklist, teaching principles) helps to focus their reflection. However, most teachers actually prefer to choose their own focus. Thus, administrators should find a balance between the use of a predetermined reflection framework and teachers' choice of focus within that framework.
- Video-aided teacher reflection has demonstrated posited change through varied measures (self-report, case studies, lesson plans, pre-/posttest scores). However, we do not know which combination of these leads to the greatest or most impactful change. Future research needs to examine the ways in which video-aided teacher reflection can differentially impact teacher practice.

2004). Although studies reported that video was beneficial for teacher reflection, the processes used to reach this conclusion varies widely across studies. For example, in some studies teachers reflected on their videos individually, while in other studies teachers reflected on their videos collaboratively. Studies also used varying video reflection tasks, guiding frameworks and methods for measuring the benefits of video reflection. Understanding the varying dimensions of past studies can help those who are interested in using video analysis make more informed decisions about the process for conducting their own video reflections.

This paper reviews video reflection practices that have been used in teacher education to help teachers reflect on their own teaching. The review was narrowed to studies where participants recorded their own teaching, examined their performance on video and reflected on the performance. This includes studies that were conducted with both preservice and in-service teachers. Because we were interested in determining how examining one's own teaching performance on video influences self-reflection, this review does *not* include studies where teachers examined the performances of other teachers on video. Studies conducted using video cases of other teachers, such as those provided by the Inquiry Learning Forum, Case Technologies to Enhance Literacy Learning, Digital Stories, Making Teaching Public, UnCommon Schools, were excluded not because they are not valuable video resources for learning about teaching but because they are not instances in which teachers reflected on and analyzed specific videos of their own teaching.

Additionally, because we were interested in how teachers use video to alter their authentic classroom teaching experiences, we do not include studies of micro-teaching in this paper.

We searched Education Resources Information Center (ERIC), Social Science Citation Index (SSCI), PsycInfo, Academic Search Premier and digital dissertation databases for papers about video and self-reflection using the following terms: video, self-reflection, reflection, evaluation, teachers and video analysis tools. We located additional studies by identifying references from the resulting set of papers. Additionally, we identified a few key papers (eg., Fuller & Manning, 1973) and performed a highly cited search using the Thomson Reuters Journal Citation Index to discover newer papers that may have been based on early video analysis work. Finally, we contacted researchers at several universities that are currently using video analysis tools to report their current research. This resulted in a final set of 63 studies, including journal papers, conference presentations and dissertations (see Appendix for a summary of all the reviewed papers).

Of note is the relative recency of these studies. Despite that fact that video has been advocated as a means of facilitating teacher reflection for decades, studies reporting teacher experiences in using video to reflect on their own teaching are only recently making headway in the teacher education literature. Fifty of the sixty-three studies included in this review were published after the year 2000. Considering that the only other review of video as a tool for teacher reflection was published in 2002 (Wang & Hartley, 2003), this review ought to contribute considerably to our understanding of how video is currently being used by teachers to reflect on their own teaching. Furthermore, given this rapid increase in reports of video self-reflection, we recognize that there may be many additional studies not included in this review by the time it reaches publication. Nonetheless, we hope to paint a picture of how educators are using video to review and reflect on their own teaching.

Our goal was to describe the field of video-facilitated reflection research in teacher education. We asked the following:

1. In what ways have teachers used video to reflect on their own teaching?
2. What practices were used to facilitate reflection on videos of one's own teaching?
3. How has video-facilitated reflection affected teachers' subsequent teaching?

Dimensions of video analysis

Through our review, we noticed six key dimensions along which studies tended to differ. These include the following: (1) type of reflection tasks, (2) the guiding or facilitation of reflection, (3) individual and collaborative reflection, (4) video length, (5) number of reflections and (6) ways of measuring reflection (see Table 1).

Types of reflection tasks

Reflection tasks involve the different activities teachers used in order to reflect on their teaching through video. These tasks may have occurred either during or after viewing their teaching videos. These tasks included completing codes or checklists, participating in interviews or conferences, writing reflections and video editing. This section explains how these tasks were used in the studies and summarizes the reported effectiveness of the tasks for facilitating reflection.

Code/checklist

In several studies, teachers used codes or checklists to help facilitate their video reflections. Teachers typically tallied the number of times certain behaviors occurred. For example, in Brawdy and Byra (1994) teachers tallied the number of positive and negative feedback statements and questions that they used during their lesson. Studies reported that using checklists to reflect on teaching videos helped teachers to notice specific behaviors and to gain insights into their teaching (Hougham, 1992; Prusak, Dye, Graham, & Graser, 2010; Schmidt & McCutcheon,

Table 1: Dimensions of video analysis

Dimension	*Definition*	*Question*
1. Reflection tasks	Tasks teachers participated in during or after viewing their teaching: (1) completing codes or checklists, (2) participating in interviews or conferences, (3) writing reflections and (4) video editing.	What type of reflection tasks will I ask teachers to engage in during their video reflections?
2. Guiding reflection	How the reflection process was facilitated. For example, in some studies participants chose their own reflection focus, while in other studies researchers or supervisors guided the teachers' reflections.	Will I provide teachers with a framework to guide their reflections?
3. Individual/ collaborative reflection	Individual reflection refers to instances where teachers viewed and reflect on their video individually. Collaborative reflections describe when participants reflected on their videos with supervisors, researchers, peers and/or colleagues.	Will I ask teachers to reflect individually, collaboratively, or both?
4. Video length	In past studies the length of video used for reflection varied from 3 minutes to an entire teaching episode.	What length of video will teachers use for reflection?
5. Number of reflections	In past studies the number of times teachers reflected on their videos varied from one to more than three reflections.	How many times will teachers reflect on their videos?
6. Measuring reflection	This refers to how studies determined the influence of video on teachers' reflections.	What methods will I use to determine if video was beneficial for teacher reflection?

1994; Struyk & McCoy, 1993). Although researchers found codes and checklists to be beneficial for facilitating reflection, one of the challenges researchers encountered was determining the optimal number of categories or items that should be included on the checklists or coding sheets (Prusak *et al*., 2010). When there were too many items, teachers felt overwhelmed and found less utility in video-facilitated reflection. Thus, while there is a well-established precedent for using some sort of guiding framework during analysis, reflection seems to be more effective when focusing on a subset of that framework.

Written reflections

Many studies asked teachers to complete written reflections during or after viewing their teaching videos. Teachers' written reflections included notes, essays, questionnaire responses and journal writings. These studies allowed teachers to perceive classroom interactions at a slower pace and recognize things they did not notice when they reflected from memory (Miller & Carney, 2008; Rich & Hannafin, 2008a, b; Rosaen, Lundeberg, Cooper, Fritzen & Terpstra, 2008; Wright, 2008). As a result, researchers felt that teachers' written reflections tended to be more focused and accurate than teacher reflections without video (Shepherd & Hannafin, 2009; Welsch & Devlin, 2004). Teachers who used video to write their reflections also improved their ability to use evidence to support their reflection comments (Sherin & van Es, 2005, 2009).

Although studies reported that written video reflections were useful for evaluating teaching, some studies reported that teachers valued discussing their videos with others more than writing their own reflections (Halter, 2006; Miyata, 2002; Welsch & Devlin, 2004). This was especially

prominent in preservice teachers who trusted the feedback of others more than their own feelings (Rich & Hannafin, 2008a). It is possible that teachers would value written video reflections more if the reflections were used in conjunction with video conferences.

Video editing

A final reflection task teachers engaged in was video editing. Teachers edited their videos to create a case study of their teaching or selected video clips to serve as evidence to support their reflections. Studies reported mixed results about using video editing to reflect on teaching. Some studies reported that there was not a significant difference in the reflection of teachers who used video editing to support their written reflections and teachers who wrote reflections without video editing (Spurgeon & Bowen, 2002; Warden, 2004). Cunningham and Benedetto (2002) also reported that teachers often spent more time selecting clips than actually reflecting. In contrast, other studies found teachers' reflections to be more detailed, longer and multifaceted when they participated in video editing compared with written reflections. Teachers also preferred the video case construction process to written reflections (Nicol & Crespo, 2004; Rosaen *et al.*, 2008; Yerrick, Ross & Molebash, 2005). It is possible that additional factors, such as reflection training, numbers of opportunities teachers have to edit their videos, or length of time between the lesson and the editing process, may impact the value of using video editing to reflect.

Interviews/conferences

Another common task teachers engaged in to aid reflection were interviews or conferences. Teachers were asked to discuss their teaching videos during an interview with researchers, supervisors or in a discussion group. We discuss the reported value of using video conferences to facilitate video reflections below.

In 17 studies, teachers discussed their video in an interview or conference session with supervisors or researchers. Teachers reported that optimal learning occurred when they watched and discussed their teaching with their supervisor (Grainger, 2004; Miyata, 2002). Teachers felt that video-based feedback was more helpful than supervisor evaluations without video feedback because video served as a common frame of reference on which the discussions were based (Deasey, Heitzenroder, Wienkee & Bloom [as cited in Wang & Hartley, 2003]). As a result, many teachers felt that the suggestions and recommendations made during the video conferences were the most influential contribution to teacher change (Brawdy & Byra, 1994; Dawson, Dawson & Forness, 2001; Rich & Hannafin, 2008a).

In 10 studies, teachers met with their colleagues or peers to view and reflect on their videos. Teachers in these studies also felt that viewing and discussing their videos were the most valuable components of their professional development (Borko, Jacobs, Eiteljorg & Pittman, 2008; Griswold, 2004). Video discussions helped teachers see their teaching from a new perspective, recognize aspects of their teaching that they had not previously noticed (Bryan & Recesso, 2006), and realize that others had similar struggles (Collins, Cook-Cottone, Robinson & Sullivan, 2004; Griswold, 2004; Miller, 2009; Pailliotet, 1995; Schmidt & McCutcheon, 1994).

Overall, teachers not only valued discussing their teaching videos with others but felt that it was one of the most important aspects of their development. Video conferences provided a common frame of reference on which the discussions were based and allowed teachers to gain new insights into their teaching. Although teachers indicated that video conferences were beneficial, they did not specify how many conferences or interviews are necessary for optimal growth, how frequently the conferences should be conducted, or at what point in the teachers' program or career the conferences or interview sessions should be implemented. Consequently, if teacher educators decide to use interviews or conferences, additional research may be needed to effectively arrange the logistics of video conferences.

Teachers were often asked to perform a combination of the aforementioned tasks. While most studies reported that these tasks were useful for facilitating reflection, teachers seemed to value video discussions more than the other reflection tasks. Thus, it would seem that, regardless of one's approach to reflection, or combination thereof, the opportunity to discuss those reflections with others is an essential aspect of the reflection process.

Guiding reflection

Prior research on reflection has established the importance of using some sort of guiding framework to provide a lens whereby teachers see particular aspects of their teaching more clearly (Zeichner & Tabachnick, 1991). The reviewed studies used reflection questions, rubrics, checklists or category codes to serve as a framework to guide teachers' reflections. Most studies concluded that teachers needed a systematic set of procedures to guide their reflections (Collins *et al.*, 2004; Miyata, 2002). Researchers felt that providing teachers with reflection guidance enhanced the quality of their reflections (Fox, Brantley-Dias, & Calandra, 2007) and that without reflection guidance teachers tended to focus on the technical aspects of their teaching (Calandra, Gurvitch & Lund, 2008) instead of on conceptual understanding and student thinking. Although these studies indicated that teachers should be given a framework to guide their reflections, a few studies reported that teachers preferred to select their own reflection focus (Nicol & Crespo, 2004; Rich & Hannafin, 2008a). Consequently, teacher educators might consider allowing teachers to select the focus of their reflection and then helping teachers to narrow their focus to a structured framework for the reflection process.

Individual/collaborative reflection

Teacher educators may want to consider with whom teachers will reflect on their teaching videos. Teachers have reflected on their videos individually, collaboratively, or individually and then collaboratively.

Individual reflection

Participants in several studies reflected individually on their teaching by writing reflective essays, coding their video, or clipping segments and attaching reflection comments. While most of the studies did not indicate whether the participants or researchers felt that reflecting individually was beneficial, the participants in Halter (2006) preferred feedback from their mentors or supervisors to reflecting on their own. Likewise, though the student teachers in Rich and Hannafin (2008a) repeated three cycles of individual video analysis, all participants actively sought out the advice of their mentor teachers or, when the mentor provided insufficient feedback, their university teacher education supervisor. The new English Language Center teachers in Tripp and Rich (in press) also valued their supervisors' feedback over their own. Despite engaging in individual reflection first, novice teachers have repeatedly expressed more confidence in their supervisors' opinions than their own.

Collaborative reflection

Several studies asked participants to reflect collaboratively with supervisors, researchers, colleagues or peers. These studies also indicated that it was beneficial for teachers to discuss their teaching videos with others. Teachers felt that viewing and discussing their videos resulted in optimal learning (Thomson, 1992). Group discussions helped teachers to clarify, examine and challenge their teaching assumptions and practices (Grainger, 2004; Miller, 2009). Additionally, novice teachers reported it was helpful to see other teachers at their same level because they were able to observe in their peers' mistakes they would make themselves but failed to recognize previously. Teachers also reported that the suggestions and recommendations made by others were the most influential element in helping them change (Rich & Hannafin, 2008a). What is

more, peers in Tripp and Rich (in press) were more likely to point out progress their colleagues were making over the course of successive videos.

Both individual and collaborative reflection

Some studies included both collaborative and individual reflections. Brawdy and Byra (1994) reported that teachers who met with a supervisor to discuss their individual reflections had a higher rate of improvement than teachers who reflected alone. Other studies found that allowing teachers to analyze their video before meeting with others helped teachers to think about their reasoning for selecting certain clips and to be more prepared for the discussions (Bryan & Recesso, 2006; Tripp, 2009).

Overall, studies reported that it was beneficial for teachers to discuss their reflection with others, and some preservice teachers indicated that they preferred to reflect with their supervisors because they valued their supervisors' thoughts about their teaching more than their own. The studies did not investigate whether it was more beneficial to use both individual and collaborative reflection, but a couple of studies indicated that teachers were more prepared for their discussions when they spent time individually reviewing their teaching before their discussions (Tripp, 2009).

Perhaps what appears most clearly in who is involved in the video reflection process is that teachers repeatedly appreciated the input of their peers, supervisors and colleagues. This reaffirms Barber's (1990) assertion that the paradox of self-evaluation is that it is best done in collaboration with others.

Video length

The length of the videos used for reflection varied from 3-minute clips of a lesson to an entire teaching episode. It is difficult to determine if the length of the video had a significant impact on reflection because none of the studies compared the differences in the length of the video. However, the majority of the participants in Sharpe *et al*. (2003) thought the length of the video used for reflection should be longer than 3 minutes, while Pailliotet (1995) stated that the process of viewing an entire video was time consuming and claimed that it was impossible to complete a deep viewing session with each student. Additional research is needed to determine if there is an ideal length for teachers to reflect on and if shorter or longer videos affect teachers' ability to reflect on their videos. Such an analysis could then be extended to examine the resulting effect on teachers' subsequent classroom practice.

Number of reflections

The majority of studies asked teachers to view their videos one to three times. While not an intended outcome of the study, teachers in the Tripp and Rich (in press) demonstrated a "saturation effect." That is, after focusing on the same topic in their teaching for three to four videos, teachers felt the changes they made were "good enough," and they moved on to examine another aspect of their teaching. This suggests a limit wherein teachers must make noticeable changes within three to four recordings of their practice. Unfortunately, we did not find other research that reported a minimum threshold to reach wherein teachers were satisfied with their changes. As with the video length, most research did not investigate whether the number of times teachers reflected influenced the value of their video reflection. However, half of the teachers in Sharpe *et al*. (2003) felt that viewing the same video before and after the conference would have been more valuable. The teacher in Storeygard and Fox (1995) reported that she gained new insights every time she viewed her video, and the teacher in Tripp (2009) wished she could reflect with video analysis every day but recognized that it would be logistically too difficult because she did not have enough time.

Teacher reflection research does not state how many times teachers need to reflect before they begin to make changes to their practice. Therefore, additional research is needed to determine if

the number of times teachers reflect on their videos influences their reflection and ultimately the changes they make to their practice. Future research might investigate how many opportunities preservice teachers should be given to reflect during their programs, how many opportunities in-service teachers should be given to reflect, how frequent the reflections should be, the number of reflections that should be individual or collaborative, and whether the focus of the reflection should change or remain the same with each reflection.

Measuring reflection

In most of the studies we reviewed, teachers' purposes in using video to facilitate reflection on their practice were formative. As educators establish a video analysis process, they need to decide how they will evaluate the effect of video on teachers' reflections. This is a valuable step to determine whether the benefits of video reflection are worth both the financial and time commitment. To determine effectiveness, past studies examined teachers' reflection comments, changes in teaching practices, self-assessments of reflection ability, perceptions of the effectiveness of using video to facilitate reflection, scores on pre- and posttests of teaching skills, and accuracy of video coding. This section explains how studies measured reflection and summarizes the conclusions.

Reflection comments

Many studies examined teachers' written and verbal reflection comments to determine the effect of video on reflection. These studies indicated that video influenced what teachers noticed or focused on during their reflection (Byra, 1996; Sherin & van Es, 2005, 2009). For example, teachers often shifted their reflection focus from themselves to student thinking when they used video (Yerrick *et al.*, 2005). Video also facilitated detailed noticing and allowed teachers to analyze aspects of their teaching more specifically (Rosaen *et al.*, 2008; Tripp, 2009). Wright (2008) reported that the number of things teachers noticed about their teaching increased when they used video to reflect rather than reflecting from memory. Detailed analyses helped teachers to identify solutions to the problems they encountered in their lessons, as well as broader applications for future teaching challenges (Miller, 2009).

Changes in teaching practices

Some studies conducted classroom observations or watched teachers' videos to determine if teachers made changes to their practice after participating in video reflections. All the studies reported that teachers made changes or improved their teaching practices after using video to reflect on their teaching (Brawdy & Byra, 1994; Dawson *et al.*, 2001; Hougham, 1992; Koorland *et al.*, 1985; Shepherd & Hannafin, 2008, 2009; Stadler, 2003; Storeygard & Fox, 1995; Wedman, Espinosa & Laffey, 1999). However, Hougham was the only study that compared the changes that were made by teachers who used video to reflect with changes made by teachers who reflected on their teaching without video. Hougham concluded that teachers who used video to evaluate teaching improved their question-asking strategies to a greater degree than teachers who did not use video evaluations. Unfortunately, we did not identify a study where researchers investigated whether the changes made by the teachers were temporary or lasting.

Self-assessment of reflection ability

Teachers in Warden (2004) assessed their ability to reflect by completing a teacher profile at the beginning and end of the project. Twelve of the 13 teachers reported an improved perception of their reflective thinking skills and that the process of video editing was helpful. However, there was not a significant difference in the increase of perception of reflection ability among teachers who reflected with video and teachers who reflected without video. Warden suggested that perceptions of reflection ability may be influenced more by having opportunities to reflect than by using video for reflection.

Perceptions of effectiveness

In several studies teachers were asked to report whether video reflections were valuable to their teaching. The majority of the participants in the studies indicated that video reflections were beneficial. Thomson (1992) and Tripp (2009) were the only studies that compared teachers' perceptions of the effectiveness of using video for personal reflection with teachers' perceptions of the effectiveness of reflecting without video. Although the majority of the responses to video reflections were positive, many teachers felt that neither reflections with a supervisor nor individual reflections with video were as effective as participating in both.

Pre- and posttest scores

Some studies compared teachers' scores on pre- and posttests to determine how teachers' scores improved after participating in video reflections. Participants in Halter (2006) and Kapanja (2001) took a test to determine their mastery of teaching skills. Although Kapanja did not describe or report the results of the tests, Halter concluded that reflection was a strong predictor of scores on the Performance Assessment for California Teachers. Martin-Reynolds (1980) compared students' pre- and posttest responses to the Video Self-Report Form. The researcher concluded that the teachers' responses shifted from themselves to their students after participating in the video reflections.

Accuracy of coding

In another study, preservice teachers were given 15 codes to mark and identify in their teaching videos (Prusak *et al*., 2010). Then researchers compared the preservice teachers' codes with the codes of an experienced teacher to determine the accuracy of their coding. Researchers found that novice teachers were only moderately able to code their videos like an expert. Nevertheless, Prusak *et al*. felt that the coding process helped the teachers to gain valuable insights into their teaching.

In addition to coding videos, there are several methods educators may want to consider as they investigate the benefits of video on teacher reflection: teachers' reflection comments, changes in teaching practices, self-assessments of reflection ability, perceptions of the effectiveness of video for reflection, and pre- and post- test scores. Past studies indicated that when teachers used video to reflect, the focus of their comments shifted toward examining student thinking, and they made changes in their teaching practices. Most teachers felt that it was beneficial to reflect on their teaching using video, but teachers' perceptions of their ability to reflect on their teaching was not significantly different for teachers who reflected with or without video.

Conclusions and future research

As interest in the use of video for teacher reflection increases, there are several questions educators may want to consider as they develop their own video analysis processes (see Table 2).

Although some of these questions can be answered from the findings of past studies, there are still questions that need further investigation. The following is a summary of the reported findings for the varying dimensions of video analysis, as well as the aspects of video analysis that need further investigation.

Reflection tasks

There are a variety of reflection tasks that teachers can engage in during the video analysis process. Teachers have completed codes, checklists, written reflections, directly edited their videos, or participated in interviews or conferences. The majority of studies reported that these tasks were valuable for facilitating reflection because they helped teachers to literally see their teaching from a different perspective, noticing that which they had previously either disbelieved

Table 2: Summary of the dimensions of the video analysis process

Dimension	*Conclusion*	*Future research*
1. Reflection tasks	Teachers preferred interviews and conferences over the other reflection tasks (codes, checklists, written reflections and directly editing the video).	How should the logistics of video conferences be carried out? Does combining conferences with other tasks increase the value of those tasks?
2. Guiding reflection	Providing a reflection framework enhanced the quality of teacher reflections. However, teachers reported that they wanted to be able to choose their own reflection focus.	Researchers might consider allowing teachers to select their own reflection focus and then help them to narrow it to a structured framework.
3. Individual/ collaborative reflection	Teachers preferred discussing their reflections with others over reflecting individually on their videos.	What are the benefits of using both individual and collaborative reflection? How many collaborative discussions are optimal?
4. Video length	Past studies did not investigate how the length of video used for reflection impacted the video analysis process.	Is there an optimal length of video teachers should use for reflection?
5. Number of reflections	Past studies did not investigate how the number of reflections influenced the video analysis process.	Are there an ideal number of times teachers should reflect on their videos?
6. Measuring reflection	Studies examined teachers' reflection comments, changes in practices, self-assessment of reflection ability, perceptions of effectiveness, pre- and posttest scores, and coding accuracy.	Future researchers will need to determine which combination of these methods will help them effectively answer their specific questions about the video analysis process.

or ignored altogether. When given the opportunity, teachers preferred conferences over other reflection tasks. This confirms Barber's (1990) paradox that self-assessment is best done in collaboration with others. Furthermore, the use of video provided a common frame of reference on which the discussions were based. As a result, teachers felt like the suggestions and recommendations made during the video conferences were the most important factor in the changes they made.

Although the reflection tasks appeared to be beneficial for helping teachers reflect on their teaching, several aspects of these tasks that warrant further investigation are as follows: (1) the ideal number of items to include on coding sheets and checklists, (2) how the logistics of video conferences should be carried out, (3) the most effective way to use video editing and (4) whether combining conferences with the other tasks increases the perceived value of those tasks.

Guiding reflection

Educators have aided teachers in the video reflection process through questions, rubrics, checklists and category codes as frameworks. Researchers reported that providing a framework enhanced the quality of teachers' reflections by focusing their attention on certain key aspects. Guiding frameworks acted as advance organizers (Ausubel, 1960). As Pichert and Anderson (1977) demonstrated, priming the memory beforehand not only increases attention to certain details but also increases overall retention and ability to notice. Curiously, teachers reported that they wanted to choose their own reflection focus. Therefore, researchers might consider allowing teachers to select the focus of their reflection and then helping teachers to narrow the focus to a structured framework.

Individual/collaborative reflection

Teachers overwhelmingly reported that they preferred discussing their reflections with others over reflecting individually on their videos. This was especially prominent in preservice teachers, who reportedly trusted others' opinions more than their own. A few studies indicated that asking teachers to discuss their video individually and then collectively improved collaborative discussions because teachers were more prepared to discuss specific aspects of their teaching they wished to improve. Additional research is needed to investigate the benefits of using both individual and collaborative reflection as part of the video analysis process. Future research might also investigate the number of conferences necessary for optimal growth and how frequently the conferences should be held.

Length of videos and number of reflections

Although the length of video teachers reflected on and the number of times teachers reflected on their videos varied across studies, studies did not investigate how these characteristics impacted teachers' reflections. Therefore, future research is needed to determine if there is an optimal length of video teachers should use for reflection, as well as the number of times teachers should reflect on their videos.

Measuring reflection

Examining the benefits of video on teachers' reflections can help researchers determine whether the benefits teachers receive from participating in video analysis are worth the investment of time and money required to conduct the process. There are various ways that past studies measured the effect of video on teacher reflection. Studies examined teachers' reflection comments, changes in teaching practices, self-assessment of reflection ability, perceptions of effectiveness, pre- and posttest scores, and coding accuracy. Researchers who are interested in using video for reflection will need to determine which combination of these methods will help them effectively answer their specific questions about the video analysis process.

Although video is used increasingly for teacher reflection, there has not been a framework based on results of video analysis research available to those who are interested in designing their own video analysis studies. This review synthesized several dimensions of the video analysis process. These suggestions offer a practical framework based in empirical evidence from past studies wherein video was employed to help teachers reflect on their own teaching. Careful consideration of each of these dimensions does not guarantee that a successful process will be developed. However, these can serve as a framework for those who are interested in using video to facilitate teacher self-reflection.

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Appendix: Synthesis of video analysis studies

Video analysis studies reviewed

Authors, date	*Participants*	*Video Procedures*	*Reflection Method*	*Data Collection*	*Results*
Athanases (1993)	Twenty-four teachers from 1 year to 15 years of experience	Recorded three-class groupings (large group, small group and one to one)	Selected two 3-to 5-minute episodes from their lessons demonstrating successful events and problems; met with an examiner to review clips; used the clips in portfolio	Collected interviews and written statements during the 9 months of the study; conducted exit interviews	Teachers reported growth in their teaching and in their thinking about their teaching.
Borko, Jacobs, Eiteljorg and Pittman (2008)	Sixteen middle school math teachers; half attended monthly professional development workshop	Recorded at least one lesson; some teachers shared their video with the group; group discussions were recorded and analyzed	Coded their videos and shared with group	Coded teacher discourse during group discussions; established categories from topics consistently discussed	Teachers talked in a more focused, in-depth and analytical manner about specific issues. They focused more on content and student thinking and the teacher's role in probing thinking.
Brantley-Dias *et al.* (2008)	Eight preservice science teachers	Recorded a single lesson; analyzed for two to three critical incidents	Used the Critical Incident Reflection (CIR) protocol (Tripp, 1999) to guide reflection	Analyzed edited video, post-teaching interviews	The depth of reflection was mostly technical.
Brawdy and Byra (1994)	Physical Education (PE) teacher majors	Recorded 10 minutes of teaching fundamental motor skills	Group 1: analyzed videos on their own and set an objective. Group 2: met with the supervisor and jointly coded types and frequency of verbal feedback, and made a plan to improve.	Tallied number of positive and negative feedback statements and questions; compared number of positive and negative feedback statements and questions	Teachers increased the frequency of positive specific statements and modified the frequency of their positive general statements.
Bryan and Recesso (2006)	Science student teachers	Recorded at least once with a max of three; video streamed across the local school system	Identified instances that supported or contradicted their personal teaching statement; presented clips to peers; discussed outcomes and reasoning; identified a concrete solution	Recorded weekly cohort mtgs.; analyzed student teachers' own written Video Analysis Tool (VAT) comments; Analyzed student teachers' video(s).	Better prepared to think through and tackle demanding issues in their teaching; more engaged in thoughtful, structured dialog in supervisory conferences; aware of the complex nature of teaching and learning

Byra (1996)	Fourteen preservice PE teachers	Recorded a 30-minute lesson	Watched video; answered questions regarding feelings about performance, strengths of the lesson and aspects for improvement	Researchers coded the reflections as technical, situational and sensitizing.	Video reflections focused on the technical aspects of teaching.
Calandra, Brantley-Dias and Dias (2006)	One preservice teacher (Science Education)	Recorded self during two different teaching cycles	Edited videos for meaningful teaching incidents; discussed edited video with cooperating teacher	Used Grounded Theory to analyze data: audiotaped teacher conferences, full videos of teaching episodes, edited videos, debriefing session (post-conference), final interview	Final video-stimulated interview demonstrated high reflection on the Sparks-Langer *et al.* reflective scale. This contrasted with low reflection when not guided or video enhanced.
Calandra, Brantley-Dias, Lee and Fox (2009)	Group A used guided and collaborative reflection Group B created video vignettes.	Captured one episode of teaching; looked for two critical incidents	Group A debriefed with mentors and used Critical Incident Analysis. Group B edited videos for two critical incidents and used same reflection form as Group A.	Not described	Students who developed video vignettes produced longer and more multifaceted reflections.
Calandra, Gurvitch and Lund (2008)	Ten preservice PR teachers	Three 45-minute lessons were recorded during semester	Reported if they felt the lesson was successful and why; created 3-minute video clips for each 45-minute video to support their claim(s).	Used pattern matching and cross case analysis to analyze videos, edited vignettes and written reflections	Congruence between vignette(s) and written reflection(s); clips were teacher-centered; focus on management and verbal instruction decreased across cycles; reflection became more explanatory across cycles.
Collins *et al.* (2004)	Students enrolled in a course on teaching writing for in-service and preservice teachers	Teachers videoed themselves teaching a writing strategy.	Edited video to a 3- to 6-minute presentation; videos were viewed by a group of peers who offered suggestions.	Teachers reported on whether they felt there was educational value added to the course through the video assignment.	Teachers thought that the video reflection was highly valuable.
Cunningham and Benedetto (2002)	Preservice teachers	Not described	Participants edited their videos to create a meaningful, reflective video.	Not described	Teachers felt that the editing process required them to be critical of the clips they selected to communicate their growth. Teachers spent more time selecting the clips than reflecting on the video segments.

Appendix: *Continued*

Authors, date	*Participants*	*Video Procedures*	*Reflection Method*	*Data Collection*	*Results*
Cuper, Gong, Farina and Manning-Osborn (2007)	Preservice teachers at Keen State College	One preservice teacher videotaped another preservice teacher teaching.	Gradual Replay Lens: watched their video on their own; met with their supervisor; replayed frames related to a particular lens	Not described	Identified specific teaching behaviors that they wanted to change or keep; felt that supervisory feedback was more convincing.
Dawson *et al.* (2001)	Two college students enrolled in a teaching practicum	Teachers were videotaped through a one-way mirror.	Videos were edited to contain equal amounts of effective and ineffective teaching behaviors. Teachers were asked questions such as, "What do you think was going on here?"	Trained observers compared the number of effective and ineffective behaviors exhibited by the teachers before and after viewing their videos.	Teachers increased effective and decreased ineffective teaching behaviors after seeing the videotaped sequence. Teachers felt that the video feedback was primarily responsible for the change in their behavior.
Deasy *et al.* (1991) as cited in Wang and Hartley (2003)	Nineteen preservice teachers	Participants videotaped their teaching.	Viewed video and were given feedback about their teaching as it related to eight teaching behaviors that were relevant to working with behaviorally disordered students.	A participant survey was administered at the end of the study.	Teachers perceived the video method as more helpful than the traditional observation and feedback method for identifying gaps between their beliefs about best practices and their actions.
Fox, Brantley-Dias and Calandra (2007)	Twenty-four English Education preservice teachers	Created two vignettes to demonstrate their teaching	Used the CIR guide, which was modified from Tripp's (1999) and Griffin's (2003) recommendations	Researchers analyzed edited digital videos, written reflections, follow-up and open-ended questionnaires.	CIR enhanced the quality of reflections. Writing focus changed from teacher centered to student centered and from means based to ends based.
Grainger (2004)	Not discussed	Teachers were videotaped.	Video Stimulated Recall (VSR): immediately after the lesson, played back the video and teachers stopped and commented on decisions	Not described	Viewing and talking about one's own teaching is the best way to access knowledge of one's own purpose.

Griswold (2004)	Thirteen K-8 in-service teachers from four different schools within a district	Teachers videotaped three 30- to 60-minute segments of instruction and chose a 10- to 15-minute clip to share with peers.	Teachers reflected with their peers after viewing the video and reflected in a journal throughout the process.	Used Teacher Video Self-Assessment/Reflective Writing questionnaire, teaching competency form, journals, professional development form and concluding response survey.	Sharing videos of classroom performances can be an effective means for guiding professional development. Viewing videotapes altered the teachers' self perceptions.
Halter (2006)	Sixty-seven intern teachers	Preservice teachers were videotaped teaching a lesson.	Preservice teachers wrote reflective essays.	Compared reflective essays. Questionnaires and follow-up interviews were used to capture the thoughts and beliefs about reflection.	The type of reflective writing remained consistent, but the focus of the reflective writing was affected. Teachers saw value in using video, but viewed feedback from supervisors as more valuable than reflecting on their own.
Hougham (1992)	Senior student teachers placed in local elementary schools	Videoed during their student teaching; viewed and evaluated their question-asking strategies using a form	Recorded tallies for level of questions, types (focusing, probing, prompting and closure) of questions and techniques (redirecting and wait time)	Trained observers tallied the number of specific questions asked and the techniques used and compared results over time. Teachers rated the value of the video reflections.	Teachers who received video evaluations improved their question-asking strategies to a greater degree than students who did not receive video evaluations. Teachers agreed that videotaping was a beneficial tool.
Jensen, Shepston, Connor and Killmer (1994)	Student teachers majoring in elementary education, early childhood education or special education	Recorded three different teaching samples; reflected on three different skill areas	Open-ended instruments focused observations in interpersonal skills, instructional, management, and organizational skills, and question skills.	Teachers identified both the assets and limitations of their experiences. Teachers assessed their overall teaching competencies through use of the "Preservice Teacher Reflection and Self Analysis."	Difficult to consistently identify strengths and growth areas; focused observations produced more helpful information than self-assessments; need more instruction and experience with recording and reflection
Koorland *et al.* (1985)	Three preservice teachers	Preservice teachers videotaped themselves and mailed it to their supervisors.	Results on the Florida Measurement System (FLPMS) of effective and ineffective teaching behaviors was discussed during a conference call.	Researchers looked at changes in frequency counts on pre and post scores on the FLPMS.	The video group performed comparable to—if not superior to—the control group.

Appendix: *Continued*

Authors, date	*Participants*	*Video Procedures*	*Reflection Method*	*Data Collection*	*Results*
Kapanja (2001)	Forty curriculum Studies and Educational Technology students at the University of Ilorin in Nigeria.	The practicing teacher's micro-teaching lesson was recorded.	The participants met with their supervisor to watch and discuss faults that they noticed in their teaching.	Pre- and posttests were administered to the participants. No description of the tests was given.	The video reflection group had significant improvement over the control group. The video group was more confident and positive about the micro-teaching lesson.
Krammer *et al.* (2006)	Twenty preservice teachers from Germany and Switzerland	Recorded mathematics teaching project	Preservice teachers' videos were available online to discuss the "implemented project and its effects on the students."	Used online "Mood Barometer;" administered two surveys to examine the change in instruction-related teacher cognitions; surveyed teachers about the use of instructional practices	Reflection on and discussion of personal teaching videos was deemed valuable by the teachers, but the process was very time consuming.
Lokey-Vega and Brantley-Dias (2006)	One mentor; first-year Ed-Tech teacher	A mentor and a first-year teacher selected 1 videotaped lesson to edit and reflect on.	Used the CIR protocol (Tripp, 1999) to guide reflection	Collected and analyzed written reflections, video and discussions	Assisted meaning feedback conversations
Martin-Reynolds (1980)	Thirty student teachers were recorded (18 experimental, 12 control)	Split Screen Analysis with one camera on the teacher and the other on the students	Reviewed tape one on their own; filled out Video Self-Report Form (VSRF); reviewed same tape with their mentor; second recording was viewed just by the student teacher and another VSRF was filled out	Used Flanders Interaction Analysis to analyze verbal communication and Love Roderick Scale for non-verbal communication; pre- and posttests were compared	Focus from pretest to posttest was dramatically shifted away from self to students in both groups, so treatment was not effective; however, this shows that something happened during video analysis that caused the shift.
Meade and McMeniman (1992)	One chemistry teacher	Videotaped using two cameras and a vision mixer which allowed the researchers to track the teacher and students in any area of the classroom	Four VSR sessions	Analyzed the sessions by coding the comments using Shulman's six categories of knowledge; pre- and post-interviews	The process helped make the teachers' implicit theories about teaching explicit.

Miller (2009)	Five Preservice Social Science Teachers	Each participant videotaped at least one of their lessons and viewed the videotape on their own.	Two- to 3-hour seminar with five to six peers; used the Critical Friends Group protocol to guide problem-based conversations: shared a 10- to 15-minute segment of teaching video.	Analyzed interviews, observations, videotapes, discussion transcripts, lesson plans, reflective papers and student work; looked for codes and patterns; used constant comparison.	Teachers learned how to adapt lesson models to meet student needs, generalize beyond particular problems for future teaching, and clarify and challenge their teaching practices and assumptions about learning.
Miller and Carney (2008)	Not described	Not described	Teachers used Video Traces to record in-the-moment responses to their teaching videos.	Not described	Allowed access to real artifacts of practice; slow downed the teaching event; filtered the complexity of teacher interactions; allowed mentors to correct misinterpretations and extend interpretations
Miyata (2002)	Elementary education preservice teachers at Shiga University in Japan	Recorded at least three lessons (first video during the first 2 weeks in the schools, second video by week 4 and third video by week 6)	Participants used a reflection instrument that focused on classroom environment, communication skills and teaching procedures.	Not described	Teachers felt the process helped them improve their ability to monitor and adjust their practices. Optimum learning occurred when the student and college supervisor viewed and discussed the video together.
Nicol and Crespo (2004)	Ten students from a problem-based cohort	Not described	Students created a digital case in the form of a web page that stemmed from the student's particular inquiry question and consisted of edited video data linked with analysis.	Analyzed a case study of one student in the cohort	The participant was able to sensitize herself to what she wanted to attend to. The participants' inquiries seemed to be prompted by the opportunity to ask her own question about her teaching.
Pailliotet (1995)	Preservice teachers	Preservice teachers were videotaped teaching a lesson.	Teachers analyzed their videos according to three levels: literal observation, interpretations, and evaluation and application. They shared their observations with the whole group.	Data were analyzed for common themes.	Deep viewing helped preservice teachers to examine their personal beliefs about teaching.

Appendix: *Continued*

Authors, date	*Participants*	*Video Procedures*	*Reflection Method*	*Data Collection*	*Results*
Powell (2005)	Six experienced teachers working on an in-service Masters of Arts degree (MA)	Teachers were videoed for 30 minutes while they were teaching with active learning strategies.	Teachers used a reflective framework that focused on intentions, self-awareness, practical and technical reflection, perceptual awareness and critical reflection.	The reflective dialogues were audiotaped and transcribed. Transcriptions were coded using NVivo.	Teachers' tacit assumptions about active learning were made explicit. Video sequences provided teachers with a context for investigating dimensions of their professional practice.
Preston (2004)	Thirty-nine students from various departments	Recorded lesson and embedded clips directly in the body of an essay	Wrote multimedia essays for each of the first nine weeks (connected video content with the readings, identified implications for classroom practice, and asked questions that could be addressed in class)	Fourteen out of thirty-nine students felt writing the essay was helpful and appreciated the ability to view, excerpt and annotate the videos.	Students were universally positive about having the ability to watch the videos wherever and whenever they chose. Students were better prepared for lectures each week.
Preston, Campbell, Ginsburg, Sommer and Moretti (2005)	Graduate students in a development of mathematical thinking course	Designed a mathematical activity; recorded themselves carrying it out with a child and interviewing the child afterward	Used Video Interactions for Teaching and Learning to analyze their video; wrote multimedia essays	Students completed a self-evaluation.	Student should be more accustomed to obtaining evidence and using critical thinking skills to support decision making.
Prusak *et al*. (2010).	Preservice teachers enrolled in PE teaching courses	While one student teacher was teaching, another student teacher videoed the lesson.	Used Studio Code to code their own teaching videos with 15 codes that were previously introduced when they analyzed expert teaching videos	Researchers randomly selected 15 coded instances. For each instance, the researcher determined whether or not the code label was an accurate representation of the video segment.	Students could only moderately code their video like an expert, but they still obtained valuable insights into their own teaching practice.
Rich & Hannafin (2008b)	Four elementary education student teachers	Used VAT three times throughout their student teaching to analyze their instructional decisions	Used the VAT to upload video and reflect on their teaching; looked at instructional decisions and changes, but determined their own focus	VAT comments and participant Interviews	Instructional Decisions were student centered when they focused on pedagogical strategies and were teacher centered when focusing on administrative issues.

Rich and Hannafin (2008a)	Four elementary education student teachers	Used VAT three times throughout their student teaching to analyze their instructional decisions	Reflected using the VAT; consulted with their mentor teacher; recorded another video where they were to make changes; coded their video; reflected on the video with their mentor	VAT comments; participant interviews w/ preservice and mentor teachers; archival documents (eg., lesson plans, student work)	Teachers preferred to choose their own focus for reflection. Participants chose to defer judgment until they could view their videos. Suggestions/ recommendations made by mentors were most influential.
Rich and Hannafin (2009)	Three elementary education preservice teachers	Recorded themselves; reflected on their video; identified specific changes; recorded themselves again; analyzed it; presented their findings	Teachers used the VATand their own self-created lens as a guide to reflect on their teaching.	VATcomments; interviews; class presentation; teaching documents	Video analysis allowed teachers to ″step back and see″ their teaching in a non-cognitively threatening way.
Romano and Schwartz (2005)	Ten first-year teachers	Videotaped three times during their first year	Used different technologies (electronic portfolios, online discussion board and video) to reflect on their own teaching	Three open-ended interviews (following video-taping), electronic portfolios, surveys, online discussion board transcripts	Teachers indicated that videotaping was the most important means for facilitating reflection because it helped them to ″see mannerisms″ and make changes in their teaching.
Rosaen *et al.* (2008)	Three elementary interns (two first grade and one third grade)	Taped twice in 8 weeks	Wrote reflections on lessons without watching the video; watched videos and chose excerpts to analyze (No prompt was given to focus reflection)	Teacher interviews; reflection (reflections were chunked into ideas or topics, then segmented and divided into two categories, management and instruction, and then into two subcategories)	Video-based reflection was more specific. It discussed instructional elements rather than behavioral and paid more attention to students rather than self.
Rosaen, Lundeberg, Terpstra, Cooper, Fu and Nui (2008)	Four interns earning a baccalaureate degree	Created a video case of their discussion-based science teaching	Created a video case of teaching; reflected on it	Baseline interview (allowed interns to share ideas on reflection and their perceptions of the tasks); design interview (allowed for open-ended questions); final interview	Teachers benefited both in terms of what they noticed and in how they reasoned about their teaching. There were changes in their frame of mind towards using video as a tool to facilitate change.

Appendix: *Continued*

Authors, date	*Participants*	*Video Procedures*	*Reflection Method*	*Data Collection*	*Results*
Saxena and Stevens (2007)	Preservice (student teachers) and in-service teachers	Student teachers were videotaped.	Video Traces were used to review the videos and make comments and ask questions. In-service teachers and faculty responded to the video and comments with their own ideas.	Looked at and analyzed the conversation that came about from the videos	Video Traces supported novice teachers in their actual classrooms. Video Traces creates a "third space" to bring preservice and in-service teachers together.
Schmidt and McCutcheon (1994) as cited in Wang & Hartley, (2003)	Pne hundred eighty preservice teachers	Eight preservice teachers were videotaped, and 180 preservice teachers helped evaluate their performance.	Preservice teachers assessed the videos using the Classroom Procedures Evaluation Form and Adjective Checklist.	Not described	The self-videotaped assessments were effective in helping preservice teachers capture and assess the teaching behaviors.
Senger (1998)	Two elementary school teachers	The researcher observed and recorded 10 mathematics lessons.	Previewed their lesson and made note of segments they wanted to discuss; met with the researcher to reflect on their video lessons	Video and Theory reflection methods were compared. Reflection sessions were videotaped, and follow-up interviews were conducted. The data were analyzed for common themes.	Both methods were useful in understanding teachers' tacit beliefs and the relationship of belief to practice and for encouraging teacher change.
Sharpe *et al.* (2003)	Preservice teachers	Teachers recorded themselves and selected a 3-minute clip to share.	Teachers had a live video conference with peers and university supervisors.	Preservice teachers filled out a questionnaire about the technical and pedagogical advantages and disadvantages of Multipoint Desktop Video Conferencing.	Felt that the video clips should have been longer; watching themselves and their peers was beneficial; it was necessary to scaffold the teachers' reflections
Shepherd and Hannafin (2008)	Three preservice social studies teachers (two female and one male)	Recorded an entire class session of themselves teaching; analyzed active engagement; repeated the process three times	Reflective questions helped participants to review how their instruction was supposed to influence active engagement, whether or not it did, and what they would do differently next time to promote it.	Video recordings; answers to reflection questions; teacher interviews	Considered diverse classroom perspectives that had not been considered previously; developed improvement plans; change their opinions of teaching outcomes based on examination of video evidence

Shepherd and Hannafin (2009)	Six preservice social studies teachers during their final semester of the program	Recorded their teaching when they implemented an active learning technique; repeated the process minimum of three times	Reflective questions helped teachers to identify an area of active engagement to focus on. A rubric regarding techniques was completed. Teachers indicated what they would do differently next time.	Video recordings; portfolio answers; self-completed rubrics; teacher interviews	Examined classroom events from a different vantage point; considered alternative causes of classroom phenomena; identified missed actions from students; reconsidered strategies to increase student engagement
Sherin and van Es (2005)	Two studies—a: four middle school math teachers b: 12 preservice high school math and science teachers.	a: Year-long series of video club meetings (10 meetings) b: used Video Analysis Support System (VAST) to analyze student thinking, teacher roles and classroom discourse	a: Open-ended questions with all teachers involved during meetings b: narrative essay discussing video from own classroom 1 month prior to and 1 month after VAST exposure	Coded transcribed videos and narrative essays	Focus shifted from pedagogy to student thinking and identified specific features instead of the overall chronology of the clips. Analysis became more interpretive instead of evaluative and more evidence based.
Sherin and van Es (2009)	Group 1: four middle school math teachers; Group 2: seven fourth and fifth grade math teachers	Math lessons were recorded and then watched and discussed at monthly meetings.	Video clubs: teachers met monthly to watch and discuss video clips from their classes.	Observed changes in conversations; examined the influence of the video club in regards to thinking outside of the meetings; coded discussions	Increased focus on interpreting student mathematical thinking over time; looked at a wider range of factors rather than just pedagogy; knowledge based reasoning was developed
Spurgeon and Bowen (2002)	Twenty-two student teachers	Student teachers were recorded.	Student teachers used video editing (iMovie) to critique their teaching performance.	Student teachers identified one competency they wished to have evaluated. The teachers' written reflections were examined and compared with the control group.	Although the difference between the groups was not significant, researchers still believe that using multimedia portfolios will increase teachers' critical reflections.
Stadler (2003)	Preservice teachers	Not described	Not described	Interviews with teachers, reflective papers, video analysis of group work, feedback from students, classroom observations, student–teacher discussions during video feedback sessions	The quality of reflective papers improved. Teachers felt that the experience was a valuable part of their professional development.

Appendix: *Continued*

Authors, date	*Participants*	*Video Procedures*	*Reflection Method*	*Data Collection*	*Results*
Storeygard and Fox (1995)	Fifth grade teacher	Videotaped her math lessons for three years	Reflected on her lessons with her colleagues during their seminars; specifically looked for ways to increase student talk during her lessons	Interviews with the teacher, journal writings, classroom and seminar observations	The teacher felt that she made progress toward her goals. Word count of teacher talk compared to student talk revealed that after three years the teacher dominated the students' discussions less.
Struyk and McCoy (1993)	Preservice teachers	Classroom teachers videotaped the preservice teacher's lesson by panning the camera across the classroom in 20 second time sweeps.	Teachers watched the video and recorded behaviors that appeared during each 20 second interval and tallied the total number of occurrences.	Not described	Allowed teachers to focus on strengths and weaknesses; evaluate teaching as often and as many times as desired; did not need a supervisor to receive feedback; less threatening than evaluation by a supervisor
Thomson (1992) Reported on two studies (study a)	Student teachers	Teachers videotaped themselves and mailed the tapes to a faculty supervisory team	The tapes were evaluated by the team using the Florida Performance Measurement System. After the conference the supervisor called the student teacher to provide feedback.	Not described	Student teachers who used video feedback performed in a comparable and in some cases a superior manner to those who received the conventional treatment.
Thomson (1992) Reported on two studies. (study b)	Twenty-six preservice teachers	The students were observed by a content specialist from their field and recorded while teaching.	Teachers evaluated their video using behaviors defined in North Carolina's Teacher Performance Appraisal Instrument.	Compared and contrasted the effectiveness of supervisor feedback and self-criticism using videotapes	There were more positive reactions than negative reactions to the process. Participants felt that optimal learning occurred when they were able to view and discuss their video with their supervisor.

Tripp (2009)	One student teacher and her supervisor	Recorded three lessons and analyzed them with Media Notes	Used several Interstate Teacher Assessment and Support Consortium (InTASC) standards to guide her reflection. After analyzing her video, she met with her instructor to discuss her analysis.	Observations of video and traditional conferences and interviews were used to compare the video conferences with traditional post lesson conferences.	Video helped the teacher notice things in her teaching that she had not remembered, focused the analysis on specific teaching areas and provided evidence to support discussions
van Es and Sherin (2002)	Four middle school mathematics teachers	Teachers met monthly for a year to watch and discuss video clips	The researcher facilitated the meetings using open-ended questions.	Video clubs were videotaped and discussion was analyzed.	There was a shift in what the teachers noticed. There was a shift in how the teachers discussed what they noticed.
Viiri and Saari (2006)	Four student teachers, two experienced teachers, one tutor	Recorded a 45-minute lesson	Watched lesson with researchers; explained reasons for changes in talk type	Categorized the type of teacher talk	New teachers used monotonous talk type and did not plan for teacher talk type during lessons. They needed more time to practice and discuss teacher talk.
Warden (2004)	Fifteen preservice teachers	Teachers were videotaped teaching a lesson.	Teachers identified each indicator of the Oklahoma Criteria for Effective Teaching and Administrative Performance.	Researchers looked at the level of significance between the pre- and posttests.	There was a significant difference between the video group's pre- and posttests, but there was not a significant difference between the groups that used video reflections and those that did not use video.
Wedman, Espinosa and Laffey (1999)	Two undergraduate students, eight elementary teachers, one secondary teacher	Recorded two teaching episodes that were 15 minutes in length	Reviewed videos for the influence class setting and the lesson had on students; met with the researcher to discuss video; responded to questions	Teaching beliefs questionnaire, videotapes of two teaching events, videos of the reflective conference, two post-teaching reflective conferences and a portfolio presentation	Teachers grew in their abilities to learn from experience and begin new practices. Videos helped teachers focus on behaviors that needed to change.

Appendix: *Continued*

Authors, date	*Participants*	*Video Procedures*	*Reflection Method*	*Data Collection*	*Results*
Welsch and Devlin (2004)	Preservice teachers in a special education course (26 Undergraduates and six graduates)	The experimental group was videotaped teaching, and then they reviewed the video after they taught.	Teachers answered six reflective questions. The control group did memory based reflection, whereas the experimental group used the video in conjunction with their reflection.	Responses to each question were reviewed and given a score using a common scoring sheet by multiple reviewers.	There was a slightly higher mean score on reflective practices when doing video-based reflection than those doing memory based reflections. Teachers reported that the videos were useful in their reflective practices.
Wright (2008)	Pilot study = seven in-service teachers; main study = six in-service teachers (one principal in both)	Recorded five teaching evidences and then analyzed their performance using media notes.	Used the Utah Professional Teaching Standards and the Alpine School District (SD) Scales for Effective Teaching Standards	Compared paper reflections with video-based reflections: analyzed teacher surveys and observations	Teachers believed the video enhanced process increased the amount of things they noticed about their teaching, increased the ability to reflect by focusing their reflections and consequently helped them set goals.
Yerrick, Ross and Molebash (2005)	Preservice teachers	Teachers made the videos from their own teaching (5-minute digital video products were made from 90-minute clips of teaching).	Reflected on their teaching through the videos they created; picked out important aspects they wanted to point out or discuss	Collected personal video reflections that showed individual learning outcomes; performed a final exit interview with each preservice teacher	Digital video projects shifted preservice teachers' thinking from themselves to children's thinking. Teachers adjusted their planning and instruction based upon lessons learned.