Utilizing Video-based Pedagogical Action Research to Transform Teacher Practice in Elementary, Middle and High School Classrooms

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Abstract

This article introduces a video-based pedagogical action research model for primary and secondary teachers. The video-based pedagogical action research model incorporates video as a self-reflective tool to provide opportunities for teachers to utilize concrete artifacts in each phase of the pedagogical action research process. Sixty-seven practicing teachers participated in this qualitative study. Teacher self-reflections completed during the evaluation phase of the process and school administrator surveys were analyzed to evaluate impact of participation in the process. Results provide preliminary evidence that the implementation of the model can lead to shifts in how teachers think about their practice and ultimately lead to changes in those practices.

Introduction

For the past two decades, the need to increase teacher effectiveness in all teachers has been a prominent theme in the education field (Darling-Hammond, 2010, 2013). Empirical evidence has documented that effective teaching correlates directly to enhanced student learning (Adu & Olatundun 2007; Kane et al., 2011). As a result, in the United States, government officials and local community members have developed and implemented initiatives aimed at promoting greater accountability for teachers. However, these top-down initiatives often fail to bring about the desired outcomes of student learning (Hargreaves & Fullan, 2012). In response, some researchers maintain increasing teacher effectiveness will not be possible until we work to engage teachers in critical inquiry and systematic reflection on their own teaching and learning (Gallimore & Ermeling, 2012; Murphy et al., 2013).

Action research has been considered an opportunity to engage in systematic inquiry and reflection with the goal of empowering teachers to initiate change within their own setting. Stringer (2014) considers action research as a means for stakeholders to construct effective solutions to problems they encounter. However, although traditional action research is rooted in changing practice (McNiff, 2014) it may not be centered on increasing teacher effectiveness within instruction that will ultimately lead to increased student achievement. In the past decades, video analysis has also been found to hold promise as a process in which to improve teacher pedagogical skills (Zhang et. al, 2010). Furthermore, research has found video analysis can shift how teachers think about their own teaching (Sherin & van Es, 2005). This research combines the strengths of both action research and video analysis in one model to examine how using video as a foundation for teachers to reflect upon their pedagogy might provide opportunities for teacher development.

Specifically, this research aimed to better understand how video-based action research impacted teachers' pedagogical practice and professional understandings. The research question

guiding this study was: Does engagement in the video-based action research process lead to change in teacher pedagogical practices and professional understandings?

Literature Review

The video-based action research model presented in this paper is based upon the premise that teachers directly invested in education are the ones in the best position to initiate improvement and one way to do so is through action research (Somekh, 2006). To situate this work, this literature review provides a brief review of both pedagogical action research as a tool for informing teachers' pedagogical content knowledge and the role of video analysis for enhanced reflection within action research.

Pedagogical Action Research

Pedagogical action research is a specific form of educational research that incorporates the ideals of educational action research but is based upon conceptualization of pedagogy (Niemi, 2019). To understand pedagogical action research, it is critical to begin with an understanding of pedagogy. Pedagogy generally refers to teaching approaches and how they help students learn. Leach and Moon's (1999) defines pedagogy as, "the practice that a teacher, together with a particular group of learners creates, enacts and experiences" (p. 267).
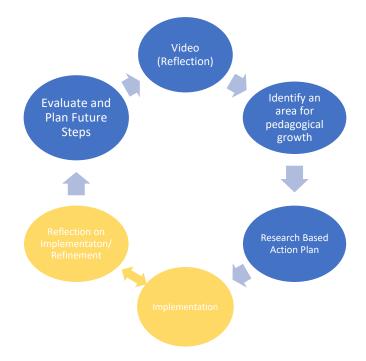
Norton (2019) conceptualizes pedagogical action research as a way to think of teaching as professional practices that provides opportunities to consider both the complexity and contextuality of the work. Pedagogical action research includes both pedagogical research (the adding of new knowledge through formal inquiry) and pedagogical development (the development of practice) and contributes to the development of pedagogical content knowledge (PCK). PCK fills the gap between content knowledge and pedagogical knowledge and covers the what and the how of teaching (Shulman, 1987). Pedagogical content knowledge includes the knowledge of students' understanding, curricular knowledge, and knowledge of instructional strategies (Grossman, 1990). Others have added knowledge of assessment to the conception of pedagogical content knowledge (Magnusson et al., 1999) as necessary for teachers' understandings of their practices. Engagement in action research has been found to improve a teachers' pedagogical content knowledge through the reflection on practice (Menfra, 2019; Zeichner & Noffke, 2001).

Pedagogical Action Research and Video-based Reflection

Dewey (1933) noted that effective reflection of educational practice begins with self-awareness. Yet despite the widespread agreement of the critical nature of reflection for teacher growth, studies on reflection find that it does not necessarily translate into better teaching and improved student achievement, in part because of challenges with being self-aware within one's reflections (Burns, 2017). Clara (2014) notes reflection is an interchange between observation and interpretation, yet it is difficult for teachers to observe themselves and reflect within the action of teaching. Further research has found reflection is neither intuitive nor effective without support mechanisms put in place (Jay, 2003; Valli, 1997). The challenges inherent with reflection can negate the potential of action research to lead to change in a teachers' practice.

Over the past two decades, multiple research studies have focused on the use of video analysis as a reflection tool. Video analysis has been investigated in the Unites States and abroad, and findings suggest video analysis can lead to greater self-evaluation accuracy (Sharpe et al., 1996), improved reflection techniques (Harford & MacRuairc, 2008; Stockero, 2008), and ultimately better practices in the classroom (Fukkink & Tavecchio, 2010). Specifically, studies have demonstrated that video can be used to increase teachers' capacity to notice events in their teaching previously unrecognized (Rich et al., 2007) and to reflect differently on events allowing beginning teachers to slow down the work of teaching and study classroom interactions as they unfold during instruction (Sherin & van Es, 2005).

The video-based action research process in this study expands upon Norton's pedagogical action research model but incorporates video as a mechanism for reflection for teachers to have a concrete artifact on which to reflect. As shown in Figure 1, teachers initially video and then reflect upon their practice. Next, teachers identify an area for pedagogical growth followed by developing a research-based action plan. As teachers implement their action plan they work to engage in on-going cycles of implementation and video-based reflection. In the final steps, teachers evaluate their progress, the progress of their students and plan next steps.

Figure 1

Video-based Action Research Model

Methodology

Participants and Site

This study took place in one graduate education program for practicing teaching in a university located in the Northeastern United States. Forty-five teachers participated in video-

based action research during their final year of graduate study. As noted in Table 1, teachers represented elementary, middle school and high school levels. Elementary teachers were responsible for the teaching of all disciplines, but middle and high school teachers were discipline specific teachers.

Table 1

Participants Organized by Grade Level

School Level	Number of Teachers
Elementary	
K-6th grade – all subjects	18
Middle School	
Math	4
English	4
History	1
Technology	1
Total	10
High School	
Math	4
English	4
History	4
Technology	3
Science	2
Total	17

Data Sources

To understand the impact of the video-based action research process on teacher practice, classroom outcomes, and teacher professional development, teacher self-reflections and final reports were analyzed.

Teachers wrote self-reflections at the conclusion of the project and each reflection was approximately four pages in length. In the reflection, teachers summarized their overall findings and understandings from the project and any future implications for their practice. Teachers' final projects included descriptions of the area of focus, a review of the literature on their area of focus, an implementation plan, and documentation of the data collected and analyzed, which included teacher videos and student artifacts. Teacher self-reflections and projects were analyzed using an emergent coding scheme (Glaser & Strauss, 1967).

The first phase of analysis was conducted to understand the different areas of focus of the projects and how they related to a teachers' pedagogy. Grossman's (1990) and Magnusson et al.'s (1999) models of PCK were used to generate the following codes: (1.) knowledge of students' understanding, (2.) knowledge of curriculum, (3.) knowledge of instructional strategies, and (4.) knowledge of assessment knowledge.

The next phase of analysis focused on understanding teacher reported outcomes from their participation in the action research process. First, a sample of final projects were read and reread by the researcher and a graduate assistant to determine outcomes from the projects. Initially a sample of five projects from each grade band were used to identify possible outcomes reported by the teachers. To code for an outcome, teacher projects needed to provide evidence of change documented by their videos and/or student artifacts. Constant comparison and recursive analysis were used to identify patterns between and among the final projects (Glaser & Strauss, 1967).

The following themes emerged from the projects based upon the documentation presented by the teachers:

1. Change in teachers' instructional practices (documented by teachers' documentation through video data)
2. Change in student learning outcomes (teachers' documentation through student artifacts)
3. Change in student engagement (teachers' documentation through video data)
4. No change

The last stage of analysis sought to understand possible professional change as a result of participation in the video-based action research process. Consistent with Creswell's (2008) suggestions, each reflection was read and reread to create an in-depth understanding of how participation in the video-based action research process may have resulted in changes in a teachers' professional understandings. Each reflection was read and reread by the researcher and a graduate assistant to identify and confirm themes. The following themes emerged from the reflections:

1. Change in teachers' understanding of student learning;
2. Change in teachers' understanding of curriculum knowledge;
3. Change in teachers' understanding of their instructional practices;

Results

The Teachers' Areas of Focus

The first level of analysis examined the areas of focus of individual projects and how teachers arrived at those areas of focus. As noted in Table 2, elementary teachers trended towards areas focused upon instructional strategies and assessment knowledge, while high school teachers focused upon areas related to curriculum knowledge. Half of the middle school teachers focused upon curriculum knowledge and the other half focused upon the other areas of PCK. For elementary teachers, over 70% of the projects focused upon knowledge of instruction or assessment strategies. In contrast, only 23.52% of high school teachers' projects focused on instructional strategies and assessment. Over 75.00% of high school teachers focused their projects on areas of curriculum knowledge. Comparisons of the areas of focus of the teachers' discipline area (math, science, etc.) at the middle and high school levels found no discernable patterns. Instead, teachers in these grade levels trended towards areas of focus related directly to curriculum knowledge regardless of discipline.

Table 2

Teachers' Area of Focus

School Level	Student Knowledge	Instructional Strategies	Assessment	Curriculum Knowledge
Elementary (K-6)				
Total & Percentage	1 (0.05)	8 (44.44)	5 (27.78)	4 (22.22)
Middle School				
Math	2	1		1
English		1	1	2
History				1
Technology				1
Total & Percentage	2 (20.00)	2 (20.00)	1 (10.00)	5 (50.00)
High School				
Math		1	1	2
English		1		3
History		1		3
Technology				3
Science				2
Total & Percentage	0 (0.00)	3 (17.66)	1 (.05.88)	13 (76.47)
Grand Totals	3 (0.06)	13 (28.89)	7 (15.55)	22 (48.88)

Note: Number in parentheses indicates a percentage.

Analysis of the final projects revealed differences in how elementary teachers viewed and reflected upon their videos in comparison to middle and high school teachers when determining an area of focus. Although areas overlapped, elementary teachers predominantly viewed their lessons through a lens of specific instructional strategies that could be enhanced within individual lessons. For example, one elementary school teacher noted upon watching her first video,

> Student engagement and participation was high. However, the participation wasn't meaningful. The interactions between students did not include reasoning around the problems, explaining thinking, or asking questions. I knew I need [sic] to implement meaningful discussion techniques in my classroom.

This teacher's focus on discussion techniques as an instructional strategy was similar to other elementary teachers who viewed their videos and determined they needed to focus on developing specific instructional strategies to bolster both engagement and achievement in the classroom. Examples of areas of focus of projects for elementary teachers included: (1.) questioning techniques, (2.) implementing informal formative assessments, and (3.) using instructional conversations.

In contrast to the elementary teachers, high school teachers often viewed their videos through the primary lens of the curriculum they were teaching. For example, after viewing a video on student writing, one Advanced Placement US History high school teacher decided to consult his students' writing scores on document-based questions that align directly to the Advanced Placement United States History curriculum. After recognizing deficiencies in the students' writing of the content, the teacher decided to focus their project on enacting Socratic Seminars as a means for structuring students' discussions on the content of the curriculum prior to writing responses to document-based questions. The viewing of the video and subsequent analysis of the document-based question responses was initially analyzed through a content focused lens which shaped the direction of the project. Examples of high school projects contrasted to the instructional focus of elementary teachers and included areas of curriculum focus such as implementing the flipped classroom in the algebra classroom, implementing the Next Generation Science Standards in the Biology classroom, and using graphic organizers as a history resource.

Like the high school teachers, middle school teachers trended towards projects focused upon curriculum knowledge.

Reported Change in Instruction and Student Outcomes

The next level of analysis examined teachers' reports of changes as a result of participation in the video-based action research process. Coding revealed teachers reported change in teachers' instructional practices, change in student learning outcomes, and change in student engagement.

All eighteen elementary teachers reported changes in their instructional practices. As a result of the change in instructional practices, six of them also reported change in student learning outcomes and two reported changes in student engagement through the process.

Likewise, all ten middle school teachers reported a change in their instructional practices. Five middle school teachers noted that the change in their instructional practices led to change in student learning outcomes and three reported changes in student levels of engagement.

In contrast to elementary and middle school teachers, high school teachers were less likely to report a change in their instruction or student outcomes. Eight high school teachers reported a change in their instructional practices. Only one high school teacher reported a change in student learning outcomes and four of them reported a change in student engagement. Two teachers reported there was no change at all, and three teachers did not address specific outcomes in either their final projects or reflections.

Teacher final reports were then used to understand how participation in the video-based action research process led to their reported changes. Analysis of the reports revealed the change in outcomes occurred when a teacher used initial videos to reflect critically on their practice to identify areas of strength and areas of need and then implemented practices to address an area of need.

As an illustration of this pattern, one second-grade teacher viewed her video and realized her traditional approach of class instruction was not meeting the needs of all her students. However, through the cycles of video and reflection she changed her instructional strategies to include cooperative learning structures, she wrote,

> This research project really helped me as a teacher to make a positive change in my teaching style. I used to feel that I needed to teach the students as a whole group because I was worried about their behaviors. Before this research project, I did not truly understand about all the different components that go into cooperative learning. However, as I viewed my videos, I could observe how in groups students were able to work together to complete their work without me controlling the process.

Although a majority of high school teachers did not report changes in instructional practices or student outcomes, those who did used their reflections on their initial videos to enact change, were found to be similar to the elementary teachers. In one example, a high school History teacher who reported changes in his instructional practices noted the differences in how he approached his lessons, he wrote,

> In the beginning of this research project, I taught with direct teacher instruction, teacher led discussions and teacher led activities only. However, after viewing the bored students' faces on my first video, I change [sic] my lessons to include greater collaboration in my history classroom. As I viewed my final video there was such a change in how I approached my lessons.

Teachers also connected the change in their instructional practices to changes in either engagement or student learning outcomes. The use of video throughout the action research process was found to be instrumental for connecting change in practice to change in other outcomes. The following example illustrates how one middle school teacher used her noticing of student thinking on video through the action research process to adapt her instruction to meet students' individual needs, which supported student learning and led to increased student achievement,

> In the video from February 4, 2020, students were engaged in completing problems on white boards. I took anecdotal notes on student academic performance and then created my leveled base groups. In these groups, I pinpointed where students were struggling and filled in those gaps to reach student achievement. I worked with each individual group to make sure that they were reached understanding [sic] of the material before moving on. I realized understanding what your students need individually increased their achievement because with mathematics it is not a one size fits all. Overall, I feel stronger about my knowledge of understanding what a given student needs and my overall pedagogy skills going forward.

While all elementary and middle school teachers noted at least one change as a result of their participation in the process, five high school teachers did not report changes in either instruction or student outcomes. For all five of the teachers, they rooted their projects in practices they were currently using even if the practices had not previously been successful. As

an example, one high school Algebra teacher used the district curriculum on-line learning platform to gather data that she planned to use to adapt instruction to meet the needs of her Algebra students. However, the majority of her students rarely engaged with the platform leading the Algebra teacher to conclude,

> The need for adaptations cannot be appropriately identified from an online learning platform if students are not actively engaged with the platform. Therefore, obtaining data from one online learning platform is flawed if students refuse to engage. I was unable to appropriately identify the need for lesson adaptations for students since they were not actively engaged with the Delta Math assessment during the allotted class time.

Reported Change in Professional Understandings

Next, reported changes in teacher professional understandings were analyzed. Change in professional understandings were coded when a teacher reported change in their understandings of student learning, change in their understandings of curriculum knowledge, or change in their understandings of instructional practices.

While elementary and middle school teachers were more likely to report evidence-based changes in instruction and student outcomes, high school teachers' reflections were more likely to provide evidence of change in professional understandings. Five elementary teachers reported a change in their understanding of instructional practices and four of them reported a change in their understandings of student learning. Only two elementary teachers reported a change in their understanding of curriculum knowledge. This is in part because elementary teachers trended away from focusing upon curriculum knowledge in their projects.

Eight middle school teachers reported a change in their professional understandings. Five teachers reported changes in their understanding of student learning while two teachers reported change in their understanding of curriculum knowledge. Only one teacher reported changes in their understanding of instructional practices.

As noted above, high school teachers were the most likely grade level to report a change in their professional understandings. Six high school teachers reported a change in their understanding of student learning and two teachers reported change in their understanding of instructional practices. Over half of the high school teachers reported changes in their understanding of curriculum knowledge.

Analysis of self-reflections revealed increased professional understandings were associated with increased self-awareness of one's own practices. For one high school teacher, his first video became a catalyst for change that resulted in greater understandings of his practice. After watching his first video he reflected,

> The majority of this lesson was direct instruction – guided notes. I do not believe this lesson was cognitively challenging, which can be seen in student engagement. Students seemed to be compliant, not necessarily engaged.

His subsequent reflections and videos focused upon the implementation of more meaningful interactions in his class. At the end, the teacher notes how his pedagogical changes were a result of a fundamental shift in how he understood his role as a teacher.

> My teaching has changed from directly giving information to my students to providing them with opportunities to learn through inquiry. Prior to this project, I thought I was a good science teacher, because I embedded demonstrations, science experiments, and projects into my teaching. My perception was that students in my classroom enjoyed science and for the most part understood what they were learning. However, through this process, coupled with external assessment results, I realized that I was failing my students in the area of science. However, I also knew there was a solution to the problem and that I could find that solution. It wasn't easy as I had to go against the traditional instruction emphasis of my department. However, at the end of this process I realize I can examine the data and make changes in my instruction to positively impact student learning.

The process also disrupted some teachers' complacency that had developed over years of teaching. For one elementary teacher, the video-based action research process forced her to become aware that her teaching had remained stagnant for years. She wrote in her final reflection,

> As I implemented the various strategies, I realized that my students are not the only ones who were not prepared for changes. It made me realize that every year that passes by, your teaching style becomes stagnant and what works for one group of students may not work for another. I had become routine and stopped thinking outside of the box. I was stagnant and focusing on the curriculum and what I needed to accomplish, as opposed to reaching into their interests, allowing them to take the wheel instead of me dictating the lessons and allowing us to have fun, not just while learning, but also while teaching.

For another middle school teacher, the process led her to recognize that even as a "great teacher" there were areas that could be improved.

> This action research plan has definitely changed my teaching. Prior to this study, I had never used self-assessment and I rarely focused on the writing process and did not provide effective feedback. At times I had lower expectations, especially with writing, and chose to not push them too much within my classroom because of the stresses they face in their other classes. This research study changed everything. The self-assessments held students accountable and for the first time I was really seeing solid improvement from all students, instead of just from the students that were more academic. Prior to this study, I viewed myself as a great teacher. I pride myself on my ability to connect with students and my ability to provide engaging and meaningful instruction. After implementing self-assessments to students, I found that my weak points in my teaching have always been in feedback, data collection, and reflection.

Additionally, analysis of the reflections revealed that increased self-awareness of practices led to some teachers questioning their own existing belief systems. One high school

English teacher reported no change in instructional or student outcomes but arrived at a greater understanding of curriculum through the process. This teacher had long held beliefs regarding how to best teach conventions to his high school students. Despite conflicting literature that called for a more integrated approach to teaching conventions and adoption by his school of a curriculum that favored an integrated approach, the teacher was convinced a teacher directed approach to teaching conventions in isolation of writing was necessary.

He, therefore, began the project with a goal of proving the effectiveness of teaching conventions through direct instruction in isolation of reading or writing. As the teacher watched his first video of a direct instruction lesson on punctuation, he was surprised at how bored his students were. In response, he decided to include more partner activities around teaching conventions in his next videos. He also collected other writing assessments to examine how his teaching of conventions was transferring to students' writing. However, as the weeks continued, the teacher noted minimal change in student engagement during conventional lessons, even with the partner activities, and no transfer to student writing.

At the end of the project, the teacher questioned his long-held beliefs on how students learn writing skills,

> After completing my research, although I believe it to be valuable learning, I'll have to consider the argument, addressed at various points in the published literature, that maybe conventions-based instruction in isolation does not carry the value of the time and effort required, especially with the other imperatives that an English class is required to address. This process revealed that although I spent a tremendous amount of time and effort on teaching conventions it never transferred to student writing.

Finally, for other high school teachers, although the process did not lead to any changes in their practice, it did lead to deeper understandings about their practices. One English teacher wrote,

> This research project reinforced why I utilize vocabulary instruction within novel study. I found the explicit instruction on vocabulary aided in students' comprehension and provided opportunities for transfer. I will continue the practices that I have utilized for years.

Discussion

A purpose for action research is to improve teachers' professional understandings (Noffke, 1997). Furthermore, engagement in action research has been found to improve a teachers' pedagogical content knowledge through reflection on practice (Zeichner & Noffke, 2001). However, although reflection is critical to successfully engaging in the action research process that leads to greater professional understandings and improved pedagogical content knowledge, research has found accurate reflection can be a challenge for teachers (Burns, 2017). Therefore, this study examined a video-based action research process in which video was used to enhance reflection within action research to provide opportunities for teachers to improve pedagogical practices.

First, video-based action research projects were analyzed to determine if there were differences in the areas of focus of PCK based upon grade levels and if the differences in areas of focus influenced instructional outcomes or change in professional understandings. This research found that teachers at different grade levels did indeed trend towards different areas of focus. While elementary teachers focused heavily on instructional and assessment practices, high school teachers focused more on curricular areas. Wiggins and McTighe (2005) assert that elementary teachers tend to focus their pedagogical decisions around an activity orientation to instruction while high school teachers tend to focus their instruction on the coverage of content. As such, elementary teachers tend to focus on instructional activity and high school teachers tend to focus on content within the curriculum. This research indicates that predisposed ideas around areas of focus for pedagogical decisions provided a lens for viewing videos and ultimately led teachers to determine an area of focus based upon that lens.

This research found that engagement in the video-based action research process did lead to change in both instructional and student outcomes for some teachers. Findings revealed changes in instructional and student outcomes occurred when a teacher changed a specific instructional strategy based upon their critical reflections of their videos. For these teachers, video provided a tool for identifying areas for development that was rooted in a teachers' practice. Although video has not necessarily been paired with action research in the past, video has been used as a tool for the purposes of reflection. Past studies have demonstrated that video can be used to increase teachers' capacity to notice events in their teaching previously unrecognized (Rich et al., 2007). For many of the teachers, the opportunity to view the classroom events from a different vantage point afforded by video allowed them to identify areas of strength and areas for improvement. In this study, elementary and middle school teachers were more inclined to use the reflections of their videos to change an instructional practice within the action research process that led to change in student outcomes. In contrast, high school teachers were less likely to utilize the videos to critically reflect upon practice. Instead, most high school teachers chose to study a practice that was already part of their curriculum.

Finally, this study found that although the majority of high school teachers did not report changes in instructional or student outcomes, they did report development of their own professional understandings due to their participation in the video-based action research process. For some of the high school teachers, the examination of existing practices led to cognitive dissonance as they were confronted with the realization that existing practices might not have the outcomes desired. Baecher et al. (2013) noted that the ability of a teacher to seek consonance between their actions and beliefs will lead an individual to either change their beliefs or behaviors to maintain consistencies between action and beliefs. It is important to note that it is unclear if future changes were made by the high school teachers to better align their practices to their professional understandings. For other high school teachers, the video-based action research process reinforced their existing practices leading to greater understanding of their practices.

Conclusions and Implications

This study sought to understand how participation in video-based action research impacted teachers' development. This research found that engaging in the video-based action

research process provided opportunities for pedagogical and professional development. Furthermore, this research found the use of video within the action research process enhanced opportunities to identify areas of pedagogical strength and areas of pedagogical need for some participants. However, the results were not universal. For some teachers, development occurred through the change of their pedagogical practices while for others, development occurred through greater professional understandings of practice.

In this research, patterns in types of development emerged between grade levels of teachers in how video was used within the action research process for reflection purposes. This research provided preliminary evidence that different grade levels of teachers viewed videos differently which led to different purposes behind the action research projects. Furthermore, elementary and middle school teachers were more likely to use their reflections on their videos to change an instructional practice while high school teachers chose to study a practice that was already part of their practice. More research is needed to determine if this was unique to this sample of teachers or if teachers of different grade bands use both video and action research differently in their own development.

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