EXAMINING THE USE OF VIDEO ANNOTATIONS IN DEBRIEFING CONVERSATIONS DURING VIDEO-ASSISTED COACHING CYCLES

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This study examined how mathematics coaches leverage written annotations to support professional discourse with teachers about important classroom events during synchronous debriefing conversations. Coaches and teachers created the annotations while asynchronously watching video of an implemented lesson as part of online video-assisted coaching cycles. More specifically, this project examined the extent to which a coach and teacher discussed the annotations during a debrief conversation in a coaching cycle. We present a rationale for needing new knowledge about the relationships between video annotations and professional discourse as well as the potential implications of such knowledge.

Keywords: Inservice Teacher Professional Development, Research Methods, Coaching

Coaching cycles have become a popular professional development activity to support teachers to plan for, implement, and reflect on ambitious instructional practices (Gibbons & Cobb, 2016). A coaching cycle typically consists of three parts including a coach and teacher collaboratively: (a) planning a lesson around specific learning outcomes for students and the use of instructional practices necessary to support student learning, (b) implementing the lesson and instructional strategies, and (c) reflecting on the success of the lesson using evidence of student learning and the teacher's use of new instructional strategies during a debrief conversation (Bengo, 2016; West & Staub, 2003).

Professional developers use video during coaching cycles for two primary reasons. First, video recording the lesson implementation, when paired with synchronous planning and debriefing conversations using distance technologies, allow coaching cycles to occur in a fully online space (Carson, Callard, Gillespie, Choppin, & Amador, 2019; Matsumura, Correnti, Walsh, Bickel, & Zook-Howell, 2019). Second, viewing video of one's own teaching has been shown to effectively support teachers to identify areas of improvement by providing a durable image of what occurred (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Harlin, 2014; Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008). Although using video during online coaching cycles has potential benefits, few researchers have examined how the content of what teachers and coaches notice during the viewing of lesson videos impacts debriefing conversations. Because the decisions made by a coach regarding how to facilitate coaching cycle conversations have been shown to significantly impact the learning opportunities of the teacher (Costa & Garmston, 2016; Heineke, 2013), this study examined the question, how do coaches and teachers discuss the annotations from lesson videos during debrief conversations within coaching cycles?

Theoretical Framing

Teacher noticing has become a common construct within research on mathematics teachers (Sherin, Jacobs, & Philipp, 2011; Star & Strickland, 2008). Teacher noticing describes the ability to sift through the many events taking place simultaneously within a classroom to identify important moments worthy of attention (Walkoe, 2015). The ability to notice what is important during complex classroom situations is a key characteristic of expert teachers (Berliner, 2001). In

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their framework, van Es and Sherin (2002) expanded the idea of professional noticing beyond simply identifying salient moments into three aspects: (a) identifying what is important during a teaching event, (b) reasoning about the event, and (c) making connections between this specific event and larger principles of teaching and learning. Productive teacher noticing also involves the ability to attend to and interpret student thinking so teachers can make decisions to respond in ways that positively impact student learning (Jacobs, Lamb, & Phillip, 2010; Miller, 2011).

A teacher or coach using an annotation to make their thinking public about a moment in a lesson video corresponds to the act of professional noticing (Amador, Carson, Gillespie, & Choppin, 2019). Furthermore, a teacher and coach have many choices throughout the annotation process, both about the events to mark as noteworthy and about how they communicate their thinking about these events of interest (Mason, 2011). Sherin (2007) adopted the term *professional vision* to emphasize the role of *selective attention* as a key subprocess of mathematics teachers' professional vision. Selective attention describes how a teacher focuses their attention given the many things happening within a single moment. In this study, we examined the interaction between the annotations (i.e. the highlighted moments) and what the teacher and coach discussed during the debrief conversation (e.g., their selective attention).

Related Literature

Several researchers have examined different aspects of the use of video within the specific context of online coaching cycles. Matsumura et al. (2019) found the use of video in online coaching cycles supported teachers to use new instructional practices, leading to improved student participation during class discussions. Gregory et al. (2017) argued that teachers involved in video-based online coaching cycles had improved student achievement, peer interactions, and a reduction in racial disparities. Both researchers made claims about the impact of video-based online coaching cycles, but neither articulated the ways in which viewing video supported professional discourse between a coach and teacher within the debrief conversations. Amador et al. (2019) examined the differences in the annotations created by coaches and teachers while watching lesson video within video-assisted online coaching cycles. They found coaches were more likely than teachers to focus on students and make connections within their annotations but did not explore the ways the coach and teachers made use of the annotations during the debrief discussion.

We explored the ways teachers and coaches took up the recorded noticing (i.e. the annotations) during a debrief conversation. Specifically, the study focused on how teachers and coaches used the annotations to conduct a debriefing conversation.

Methods

This study occurred within the coaching activity of a larger, fully online, professional development project created for middle school mathematics teachers working in rural areas (Choppin, Amador, & Callard, 2015; Choppin, Amador, Callard, Carson, & Gillespie, 2020). The project consisted of three parts: an online course, online teaching labs, and video-assisted online coaching cycles designed to improve teacher practices for implementing high cognitive demand tasks and facilitating mathematical discourse (Smith & Stein, 2011). Using a cohort model, 21 teachers from grades 5-8 participated in the project as part of two cohorts, each lasting two years. In the coaching cycle portion of the project, teachers were partnered with coaches using a content-focused coaching model (West & Staub, 2003).

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Participants

This study focused on seven coaches and their assigned teachers who engaged in video-assisted coaching cycles in the professional development project. Each coach was assigned one or two cohort teachers, resulting in nine coach/teacher pairings. Data were collected from the debriefing conversations of the coach/teacher pairs in addition to the annotations created by the coach and teacher when watching the lesson video prior to the discussion.

Context: Video-assisted Coaching Cycles

The goal of each video-assisted coaching cycle was to support participating teachers to successfully implement productive discourse practices (e.g., Smith & Stein, 2011) discussed during the online course and teaching labs. Each coaching cycle followed the same structure and utilized both synchronous and asynchronous activities (see Figure 1). First, the coach and teacher participated in a planning discussion using video conferencing technology, Zoom, focused on a lesson proposed by the teacher. Guided by the content-focused coaching model, participants collaboratively analyzed the mathematical lesson goals, the tasks used in the lesson, the anticipated student strategies, and the instructional practice goals for the teacher (West & Staub, 2003). Following the planning meeting, the teacher video- and audio- recorded the teaching lesson using Swivl Technology (automated video camera and recording). After the lesson was taught, the coach and teacher asynchronously watched and annotated the lesson video. Annotations were written comments about the contents of the lesson video. The coaching cycle concluded with the coach and teacher engaging in a forty to sixty minute debrief discussion that utilized the annotations to reflect on the lesson.

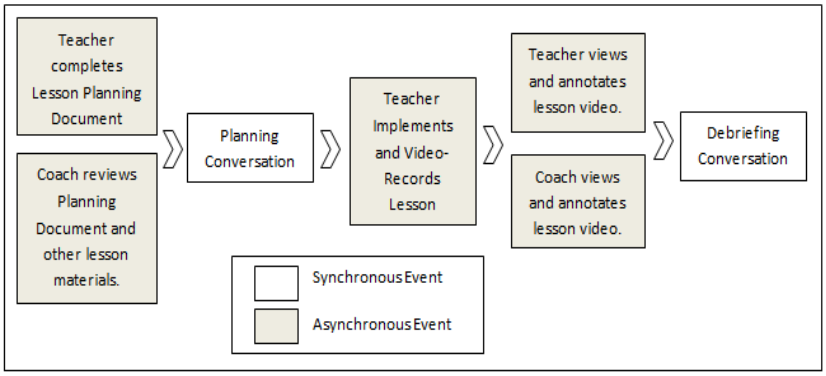

Figure 1*:* Video-assisted coaching cycle process

Data Collected

We analyzed the video annotations created by the coaches and teachers and the corresponding debriefing conversations from the third coaching cycle for nine coach-teacher pairs. The third coaching cycle was selected because it allowed the teachers and coaches time to become accustomed to each other and the video-assisted coaching process (Matsumura, Bickel, Zook-Howell, Correnti, & Walsh, 2016). Using the third coaching cycle data resulted in the analysis of video annotations from nine video-recorded lessons and the nine corresponding debrief conversations. All nine debrief conversations were video-recorded using Panopto screen-capture and then transcribed. Transcripts were parsed into stanzas which including the coach's discursive move and/or the teacher's discursive move about a particular topic (Sa , 2013). A single video annotation served as the unit of analysis.

Data Analysis

The data analysis process began with the researcher entering annotation data into a spreadsheet. This data included: the annotation text, the author of the annotation, the number of the annotation in the full set, and the timestamp connecting the annotation to a specific moment in the lesson video. The researcher then watched the video of the debrief conversations from the third coaching cycles and read the transcriptions of the conversations.

To identify instances when coaches and teachers discussed the annotations during debrief conversations, two binary variables were created to code the presence of a written annotation within an instance of verbal discussion. Both variables were assigned a code of yes or no for each annotation. The first variable, *indicated connection to annotation*, described instances when the coach or teacher clearly indicated that their verbal statement connected to a written annotation. The second variable, *verbatim use of annotation,* described instances when the verbal statement of the coach or teacher matched the written language in the annotation verbatim. If the coach or teacher explicitly indicated their verbal statement connected to an annotation or if a verbal statement matched a written annotation verbatim, there was reliable evidence that an annotation had been taken up in conversation. In instances when indication was coded no and it was debatable if a significant portion of an annotation matched a spoken statement verbatim, the researcher used the video of conversation to consider the context. In these ambiguous instances, if the annotation was present on the coach's screen at the time of the spoken statement, such instances were coded as verbatim. If the annotation was not on the coach's screen at the time of the spoken statement, such instances were coded as not verbatim.

An annotation was considered to have been discussed in the conversation if either variable was coded yes, since the presence of either variable provided a reliable indication that the written annotation influenced the discussion. If both indication and verbatim were coded no, the annotation was considered not to have been discussed in the conversation (see Figure 2). A single annotation could have been discussed multiple times throughout a conversation. Therefore, each time an annotation was brought into the conversation, the annotation was coded using the two variables and labeled as a new instance of annotation discussion.

Annotation considered present in the debriefing conversation.

Annotation considered not present in the debriefing conversation.

		Verbatim Does the spoken statement of the coach/teacher match language from the annotation verbatim?	
		Yes (Verbatim)	**No (Not Verbatim)**
Indication Does the coach/teacher clearly indicate (via spoken language or through technology features such as sharing a screen) that their verbal statement connects to an annotation?	**Yes (Indication)**	*Verbatim with Clear Indication*	*Not Verbatim with Clear Indication*
	No (No Indication)	*Verbatim with No Indication*	*Not Verbatim and No Indication*

Figure 2: Coding scheme for determining the presence of an annotation during debriefing conversations.

To illustrate the coding process with these two variables, an example is provided. Coach Alvarez created an annotation, "And what did you learn about students' understanding? How did this inform your lesson?" During the debriefing conversation, Alvarez said,

> I wondered then, again at 7:35, just what you thought about what you learned about students understanding, from the warmup, and then how that informed your lesson. Were there takeaways that you had from the warmup that made you think differently about your lesson?

Because Alvarez explicitly mentioned the timestamp of the annotation, she provided a clear indication her question was connected to the annotation. Therefore, indication was coded as yes. Alvarez also included the phrases "learned about student understanding" and "how that informed your lesson" in her verbal questions. Therefore, verbatim was also coded as yes.

If an annotation was considered to be discussed within an instance of the conversation, four additional codes were applied to each instance of annotation discussion to gain further insight into the research question. First, we coded for who initiated the conversation about the annotation, the coach or teacher. Second, we coded for who created the annotation. Third, we recorded the stanza number from the transcript in which the instance of annotation discussion began. Fourth, we recorded the stanza number from the transcript in which the discussion of the annotation ended. Coding the starting and ending stanzas for an instance of annotation discussion allowed us to analyze the length of discussion about an annotation and to determine if a single annotation was discussed multiple times throughout the conversation.

As an example of this coding process, coach Lowery created the annotation, "What do other people think about what he just said about using the difference of 5? His point highlights the relationship and bears repeating by another voice (preferably a peer before the teacher)." In stanza 12 of the debrief transcript, coach Lowery initiated conversation about this annotation. The discussion about the annotation continued until the end of stanza 13 when the conversation moved to a topic not contained in the annotation. In stanza 16, teacher Fernandez initiated additional conversation about this annotation which continued until the end of stanza 17. Therefore, the researcher recorded two instances of annotation discussion for this coach-created annotation; one initiated by the coach with a starting stanza of 12 and an ending stanza of 13 and the second initiated by the teacher with a starting stanza of 16 and an ending stanza of 17.

Findings

In total, we analyzed 308 annotations the nine coach/teacher pairs created during nine debriefing conversations. Of this total, coaches created 158 annotations and teachers created 150 annotations. In analyzing the extent coaches and teachers talked about the annotations, the process revealed 96 of the 308 annotations were taken up, resulting in an average of 10.7 annotations discussed per conversation. Because some annotations were discussed more than once during a conversation, 110 instances of annotation discussion were identified resulting in an average of 12.2 instances of annotation discussion per conversation (see Table 1). However there existed variability between the coach/teacher pairs with respect to their verbal uptake of written annotations. For example, coach Braithewhite and teacher Summers had only three instances of annotation discussion about three separate annotations despite collectively creating 50 annotations prior to the conversation. Conversely, coach Bishop and teacher Parsons had 23 instances of annotation discussion about 21 separate annotations after creating 23 total annotations prior to the discussion. This suggests differences in how these coach/teacher pairs interpreted the role of the annotations during video-assisted coaching cycles. This finding also highlights a range for the number of annotations that can be discussed within a single debrief conversation.

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Table 1: Annotation Discussion Counts by Coach/Teacher Pair

Coach/Teacher	Annotations Created	Annotations Discussed	Instances of Annotation Discussion
Alvarez/Graham Marks	59	11	13
Bishop/Parsons	23	21	23
Bishop/Wise	14	9	12
Braithewhite/Summers	50	3	3
Hale/Swanson	47	9	11
Lowery/Fernandez	25	11	15
Riess/Larson Waters	27	10	10
Riess/Sandoval	23	5	7
Whilton/Morrison	40	15	16
Average	34.2	10.7	12.2

To further examine the extent coaches and teachers talked about the annotations during debriefing conversations, the percentage of transcript stanzas containing instances of annotation discussion were calculated. The number of stanzas containing an instance of annotation discussion was divided by the total number of stanzas in the conversation. For example, the Bishop/Wise conversation transcript contained 40 stanzas. Instances of annotation discussion occurred during stanzas eight and nine and in stanzas 18 through 29. Therefore, 14 of the 40 total stanzas (35.0%) contained instances of annotation discussion. When this analysis was done for all 364 stanzas within the nine debrief conversations, 41.4% of stanzas contained an instance of annotation discussion. This finding indicated annotations were taken up in debrief conversations but were not the sole focus on conversation since less than half of the stanzas contained instances of annotation discussion. Similar variability also existed when comparing the percentage of stanzas containing instances of annotation discussion between different coach/teacher pairs. For example, in the debrief conversation transcript between coach Whilton and teacher Morrison, 62.5% of the stanzas contained instances of annotation discussion. However, for coach Hale and teacher Swanson, only 20% of the conversation stanzas were found to have instances of annotation discussion.

Table 2: Instances of Annotation Discussion within Conversational Stanzas

Coach/Teacher	Total Number of Stanzas in Conversation	Number of Stanzas Containing an Instance of Annotation Discussion	Percentage of Stanzas Containing an Instance of Annotation Discussion
Alvarez/Graham Marks	37	23	62.2%
Bishop/Parsons	67	30	44.8%
Bishop/Wise	40	14	35.0%
Braithewhite/Summers	25	4	16.0%
Hale/Swanson	40	8	20.0%
Lowery/Fernandez	41	20	48.8%
Riess/Larson Waters	43	14	32.6%
Riess/Sandoval	31	12	38.7%

Whilton/Morrison	40	25	62.5%
Average	40.6	16.7	41.1%

Analyses also explored whether coaches or teachers were more likely to initiate conversation about the annotations. Coaches initiated conversation about the annotation more frequently than teachers. Of the 110 instances of annotation discussion, 91 (82.7%) were initiated by the coach and only 19 of the instances (17.3%) were initiated by the teacher. This finding was consistent across coach/teacher pairs as the coach initiated more than 70% of instances of annotation discussion for seven of the nine pairs.

Annotations coaches created were discussed more frequently than those teachers created despite the fact that roughly half of the annotations for the nine coach/teacher pairs were teacher created. Of the 110 instances of annotation discussion, 74 (67.3%) focused on coach-created annotations compared to only 36 of the instances (32.7%) focused on teacher-created annotations. This trend was found within instances of annotation discussion initiated by both teachers and coaches. Of the 19 instances in which teachers initiated discussion about annotations, 13 of these instances (68.4%) focused on coach-created annotations. Of the 91 instances when coaches initiated discussion about annotations, 61 of these instances (67.0%) focused on coach-created annotations. When combining the findings about initiating annotation discussion and the creator of the annotations, coaches initiating conversation about coach-created annotations was the most common occurrence with 61 of the 110 (55.5%) instances of annotation discussion meeting these criteria. The least common occurrence was teachers initiating conversation about a teacher-created annotation. This occurred in only six of the 110 (5.5%) instances of annotation discussion (see Table 3 for additional information).

Table 3: Comparison of Annotation Discussion Initiation and Annotation Authorship

	Instances of Discussion about Coach-Created Annotations	Instances of Discussion about Teacher-Created Annotations	Total
Instances of Coach-Initiated Annotation Discussion	61 (55.5%)	30 (27.3%)	91 (82.7%)
Instances of Teacher-Initiated Annotation Discussion	13 (11.8%)	6 (5.5%)	19 (17.3%)
Total	74 (67.3%)	36 (32.7%)	110 (100%)

These findings suggest coaches were more likely to initiate conversation about the annotations and tended to discuss annotations they created. These findings highlight that coaches exerted significant influence regarding the selection of annotations to discuss and focused on annotations containing their own ideas about the lesson.

Discussion

Findings from this study contribute to existing literature on coaching in three ways. First, prior studies have claimed that the use of video within coaching cycles held the potential to improve teaching practices (e.g., Gregory et al., 2017; Matsumura et al., 2019). However, prior studies did not provide any description about how the coaches and teachers took up the lesson

video and annotations during conversations, leaving the actions of both coaches and teachers within the activities unknown. For professional development providers wishing to successfully implement video-assisted coaching, the findings from this study partially fill this crucial gap by highlighting a range for the number of annotations discussed within a single debrief conversation. This knowledge may support both teachers and coaches in selecting a limited number of focal annotations from a larger set when preparing for a debrief discussion. Additionally, findings about the percentage of stanzas containing annotation discussion also may support coaches and teachers to prepare for reflective discussions, which often are constrained by a limited amount of time. For example, this study revealed that even in extreme cases, less than two-thirds of the stanzas contained annotations discussion and eight of the nine coach/teacher pairs discussed 15 or fewer annotations within a single conversation. Thus, when given a fixed amount of time for a debrief conversation (commonly constrained by school logistics such as the length of a preparation period), these findings may support a coach and teacher to set realistic goals regarding how much of their conversation could be dedicated to annotation discussion.

Second, these findings contribute the existing literature about variability of coaching actions within coaching cycles. Prior studies have shown the actions of coaches when engaging teachers in conversation can vary significantly (e.g., Heineke, 2013; Sailors & Price, 2015). This study extends these claims about variability of coaching actions to the ways in which coaches take up annotations during debriefing conversations. The large range found in both the *number of annotations* discussed in the debriefing conversations and the *number of transcript stanzas* containing instances of annotation discussion suggest significant variability in the ways the coach leveraged the annotations to catalyze discussion. This variability may be due to different interpretations about the role of the annotations to support teacher learning. For example coach Braithewhite and teacher Summers created 50 annotations prior to the debriefing conversation. Yet, only three of these annotations were discussed with 16% of the transcript stanzas containing instances of annotations discussion. Conversely, coach Bishop and teacher Parsons created 23 annotations prior to the debrief discussion and discussed 21 of these annotations. In this case, 44.8% of the stanzas contained instances of annotations discussion. These differences suggest coach Bishop and coach Braithewhite may have held different views about how to use the annotations to initiate productive reflective opportunities for teachers. Such differences may have significant impact on teachers because diversity in the actions of coaches has been shown to influence learning opportunities of teachers (Heineke, 2013; Sailors & Price, 2015). Although these findings cannot be directly used to make claims about teacher learning, they do suggest teachers such as Parsons and Summers had different learning experiences when engaging in reflective discussion about video annotations.

Third, the finding that coaches initiated more annotation discussions than teachers and the tendency of coaches to initiate conversation about their own annotations connects to claims made by Mosley Wetzel and colleagues (2017) regarding implications of power within coaching conversations. They argued a coach holding a formal position of power is often perceived as being more accomplished and knowledgeable than the teacher. Therefore, the actions of the coach and their position of power may have implications for a teacher's learning experience. Akin to coaches positioning themselves as the authority through the use of *directive* discourse moves versus positioning the teacher as the authority through the use of a *reflective* discourse moves (e.g. Ippolito, 2010), coaches tendency to initiate conversation about their own annotations and the infrequency of teachers initiating conversations about their own annotations raises new questions about the power dynamics within video-assisted coaching cycles.

Specifically, if the goal of written annotations is to support teachers to verbally reflect on their practice, should coaches strive to position teachers to more frequently initiate conversation about their own annotations? Or, is it more beneficial for teachers to have coaches initiating conversation about coach-created annotations? Future research should examine these questions regarding how the differences in the ways coaches use annotations during debrief conversations impact teachers' learning experiences.

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