Video Annotation for Content-Focused Coaching

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Abstract: We implemented an innovative online mathematics professional learning model designed to create high-impact growth opportunities for teachers in rural school districts. As a part of this model, classroom teachers were partnered with coaches with whom they worked on content-focused coaching cycles. Within a coaching cycle, teachers and coaches met to plan a mathematics lesson, the teacher video recorded the lesson, the coach and teacher both annotated the lesson video, and finally the two met to debrief the lesson verbally. We report on the process of video annotations. Data analysis focused on identifying the type of response within an annotation as well as the extent to which the teacher or coach noticed students' mathematical thinking. We contend that the annotation process afforded opportunities for direct suggestions to teachers that may not have otherwise occurred. Findings indicate annotations were predominantly focused on mathematics content goals and classroom discourse practices.

Conceptual background, context, and significance

Teachers in rural areas face constraints in terms of accessing the expertise and resources required for high-quality professional learning experiences, often because of lack of proximity to such resources as institutions of higher education and critical masses of teachers required to collectively reflect on problems of practice (Howley & Howley, 2005). Rural contexts are thus ideal sites for online professional development, which can be offered at a distance and can engage geographically dispersed participants in collaborative learning experiences (Francis & Jacobsen, 2013). The innovative online professional learning experiences in our project focus on the development of teacher capacity to enact ambitious, responsive instruction espoused in recent US educational policy documents (CCSSI, 2010). Recognizing the critical need to prepare all teachers to implement rigorous instruction, especially teachers who are not geographically proximate to face-to-face trainings or coaching resources, we engaged participants in online courses, online demonstration lessons, and online video coaching over the last two years. In the process, we created experiences that match, if not exceed, what is possible in face-to-face settings. The project is based in two geographically diverse locations in the US to explore the scalability of the model to other under-resourced contexts.

In this paper, we focus on online coaching, particularly the use of video annotations to stimulate the coaching interactions. The use of coaching to foster teacher learning and improve student achievement has become an increasingly popular strategy for schools, districts, and states in the US (Heinke, 2013). Prior studies have shown that coaching can improve both teaching and student learning (Sailors & Price, 2015; Kraft, Blazar, & Hogan, 2018). However, coaching activities vary widely, impacting the effectiveness of coaching and posing problems for researchers and professional developers alike (Gibbons & Cobb, 2016). Content-focused coaching is a specific model for guiding coaching activities that aims to support teacher learning by focusing on the mathematical goals of the lesson, and how students might engage with those goals (West & Staub, 2003). In content-focused coaching, the coach accepts equal accountability for generating effective student learning (West & Staub, 2003).

To facilitate online content-focused coaching, we used video conferencing software (Zoom), and video capturing/annotating software (Swivl). The online video coaching was purposely designed with features analogous to West and Staub's (2003) face-to-face content-focused coaching cycle. First, the teacher and coach met via Zoom to plan the lesson; second, the teacher video recorded the lesson implementation using Swivl; third, the teacher and coach separately viewed and annotated the video of the enacted lesson; and finally, the coach and teacher met via Zoom to reflect on the lesson, using the annotations to anchor their discussion. The purpose of this study was to better understand the content of the annotations and the interactions of the coach and teacher in the online space. Specifically, we were interested in understanding the discursive moves and content of the annotations from both the coach and teacher. We posed the following research questions:

1. What was the focus of the annotations (e.g., non-mathematical aspects of classroom practice, teacher discourse moves, student strategies, mathematical goals of the lesson)?

2. What were the discursive moves coaches and teachers used when annotating video of a mathematics lesson?

Method

Using a cohort model, we engaged 16 teachers in an intensive two-year professional development model focused on supporting teachers to engage in ambitious, responsive instruction. The teachers taught in grades five through eight (ten to 14 years-old), specifically in mathematics, and worked in rural locations that made it difficult to engage in face-to-face coaching.

Data collection

The unit of analysis was coach-teacher pairs, with each coach-teacher pair completing two or three coaching cycles annually. For the purposes of this paper, we focus specifically on data from the annotations the coach and teacher produced as they initially reviewed the lesson video and made comments. To make the annotations in Swivl, the coach and teacher each viewed the lesson video in the Swivl software platform. They then stopped the video at moments they saw as relevant to the coaching cycle, which were automatically time-stamped by the software. The coach or teacher would then annotate the moments with their thoughts and reflections. They were given the following prompt:

> Add your comments, questions, and thoughts to the video segment in Swivl at any points in the video that might be interesting to discuss further. For example, were there any moments that surprised you? (i.e., misconceptions that emerged, strategies that you did not anticipate, struggles/challenges, or any "Ah-ha" moments) Were there particular instances that showed evidence of student thinking? Is there something that you see as you watch the lesson that relates to the goal you set for this coaching cycle?

For each of the nine coaching pairs, we analyzed the written annotations from three coaching cycles. This involved annotations from five different coaches and nine different teachers. Figure 1 shows an example of an annotation, with Bishop as the coach and Cole as teacher (both are pseudonyms), making comments on the video of a lesson Cole taught.

00:22:34	Jun 01, 2017	Cole	---Can we leave the answer in radical form?---
00:25:52	Jun 04, 2017	Bishop	Great introductory discussion about why we might want to leave the result in radical form and why sometimes the rounded form is good enough.
00:26:21	Jun 04, 2017	Bishop	I wonder what the students might have noticed if before you introduced the formula you had focused the students on how they might be able to find the lengths of the two legs of the right triangle without drawing the triangle. "Suppose you did not have a coordinate plane to draw the triangle in questions 1. Could you have found the lengths of 4 and 5 by reasoning with the two ordered pairs only? Can you explain how?" We could even ask students to turn and talk about how they might be able to do this prior to sharing with the entire class.

Figure 1. Sample of annotations.

Data analysis

Data analysis focused on identifying the coaches' and teachers' discursive moves and nature of comments in the annotations. Initially, each annotation was assigned a *Category Code* based the nature of the comment. These codes (i.e. Marking an Event, Question, Suggestion, Interpretation/Explanation, and Evaluation) were intended to capture the essence of the annotation. We then developed a codebook to analyze the discourse moves and content of the annotations. The codebook is based on research on content-focused coaching (West & Staub, 2003) as well as open codes, based on initial constant comparison analysis (Corbin & Strauss, 2003). The codebook contains first level codes and second level codes for four different categories: Coach Discursive Moves, Teacher Discursive Moves, Goals of Lesson, Content/Design of Lesson. Figure 2 provides an excerpt of the Coach Discursive Moves of the codebook.

Features of Coaching Discursive Moves (HOW Coaching)		
First Level	Second Level	Description
Invitational	Elicitation/Pressing	Eliciting a response; broad initial questions;
	Other	Other Comment
Direct Assistance	Suggesting	Offering an alternative point of view or suggesting

	Explaining	Provide and interpretation or rationale of an event, interaction, or mathematical idea
	Other	Other comment
Describing	Account of Practice General	Provides an objective account of a scenario or practice without reference to a specific event

Figure 2. Excerpt of Codebook, Coaching Discursive Moves Section.

From this codebook, each annotation received a *Discursive Code* that was either a Coach Discursive Move or a Teacher Discursive Move and a *Content Code* that related to the Goals of Lesson or Content/Design of Lesson. Two researchers each independently coded each annotation, assigning at least one Category Code, one Discursive Code, and one Content Code for each annotation and then met to compare and reconcile codes.

Findings

Examining the annotations across the various coaches and teachers, coaches wrote approximately 60% of the annotations and teachers 40%. The first focus of the research was to identify the Category Code coaches and teachers used when annotating video of mathematics lessons. Of the five Category Codes (i.e. Mark, Question, Suggestion, Interpretation/Explanation, and Evaluation), *Marking* was the most common for both the coaches and teachers. Marking included comments that pointed to a specific account of practice deemed relevant by the teacher or coach, meaning they highlighted a particular action or verbalization of someone in the video by using a timestamp to draw attention to that action. As an example, one teacher wrote, "Student explained the pictures of the shapes and their angles in Part A." Most annotations coded as *Mark* were also coded with another Category Code, such as *Interpretation/Explanation* or *Evaluation*, as the Category Codes were not mutually exclusive. Although these were the most common category codes, annotations that received this code commonly received another code as well. As an example, one teacher wrote, "I'm handing out the papers and placing them down on the desk in hopes of keeping their focus on the front - hoping they are not distracted by the formula on the top of the back of the paper. I don't usually hand out papers this way. :)" In this example, the teacher *Marked* the moment, stating that she was handing out the papers; however, she then went on to *Interpret/Explain* that she usually does not pass out papers this way and hopes it is not distracting. With these additional comments, this annotation was coded as both *Marking* and *Interpretation/Explanation* (the discursive code was *Describe: Account of Practice Specific*, meaning a detailed review of an event).

With respect to the other Category Codes interestingly, *Evaluative* comments were distributed almost equally between coaches and teachers. As an example of an *Evaluative* comment, one coach wrote, "Great introductory discussion about why we might want to leave the result in radical form and why sometimes the rounded form is good enough." The *Evaluative* codes were used when there some type of positive or negative judgement about something in the lesson. The code for *Questions* was used when either the coach or teacher wrote a direct question to the other person or wrote a question to his or herself as something to consider at a later point, and this code was the least frequently applied.

The Discursive Moves that were most common (those coming from the codebook, Figure 2, and relating to the type of speech from the coach and teacher) included Direct Assistance from the coaches and Describing Accounts of Practice from the teachers. The coach commonly included phrases that provided suggestions to the teacher on how they may rethink their instructional moves or on how they may consider pedagogy in the future. Many of these suggestions began with "I wonder…" and included language about what could or should be done in a similar situation in the future or in the next lesson. In contrast, the teachers most commonly described what they were doing in the video as they wrote out their annotations.

With respect to the Content Codes, Math Content Goals and Discourse were the most common topics for discussion. As an example, one teacher was working on a goal of supporting students to understand formulas. For the annotation, the coach wrote, "Perhaps rewriting the distance formula as the square root of delta x squared plus delta y squared, might have helped some students makes more sense of the formula at this point." In this example, the coach focuses on the mathematics content goals of the lesson and provides a specific suggestion related to the mathematics. Discourse was another common topic of focus in the annotations. Discourse refers to verbal interactions among the teacher and students. As an example, one coach annotated the following, "George states that *every angle can make a straight line*. This statement is quite ambiguous but is a start to the conversation. I wonder what would have happened if you followed this up with *George says that every angle can make a straight line. What does he mean by this? Do you agree or disagree*?" In this example, the coach comments on how the teacher started a conversation and then provides a specific question the teacher could have asked. It was common that the coach and teacher wrote comments that were aimed at improving classroom discourse, which was a focus of the professional development project.

Implications and conclusion

The coaches and teachers focused most of their annotations on the mathematical content and discourse moves, reflecting the content-focused coaching model and the focus of the professional development project. The annotations provided an opportunity for the coaches and teachers to indicate how they were interpreting the enactment of the mathematical goals and how teachers were facilitating those goals. This is typical of face-to-face coaching interactions, when the coach and teacher can explore artifacts together in person. In the absence of that opportunity, the annotations provided a means for the coach and teacher to independently mark crucial moments, which could then be used to anchor the post-lesson Zoom discussion. Though classroom management was sometimes a focus of the annotations, most of the annotations were more in line with content-focused coaching. Importantly, the annotations also focused on classroom discourse moves, and many of these annotations were non-evaluative, instead describing objective accounts of the episode.

These findings draw attention to the possible affordances of the annotation process for supporting teachers to pay attention to students' mathematical thinking, an important aspect of effective mathematics instruction (Jacobs, Lamb, & Philipp, 2010). We contend that the process of watching a video and typing specific comments about the video through a content-focused coaching model (West & Staub, 2003) may support teachers in thinking more about the specifics of mathematics as compared to having a general conversation about a lesson, as may occur with an interview or other type of interaction. Therefore, we consider the Swivl online annotation platform as a possible medium to elicit math-specific comments that may support teachers' development and understanding about pedagogy and content. The data show that the online annotation platform allows for new types of interactions between the teacher, coach, and their learning environment, which may afford new knowledge of collaborative online technologies for supporting teacher learning. We recognize additional analysis would be necessary to support claims about the benefits of annotation, but this study gives rise to the possibility of these types of affordances of annotation technology.

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