LEARNING TO FACILITATE REFLECTIVE CONVERSATIONS: EXPLORING CHANGES IN THE PRACTICES OF MATHEMATICS COACHES

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We examined changes in how mathematics coaches facilitated debriefing conversations after learning about a debrief conversational structure we created based on the principles of our content-focused coaching model. We compared participant coaches' first debriefing conversation, which occurred prior to learning about the debrief conversational structure to their second debriefing conversation, which occurred after learning about the debrief conversational structure. Findings indicate that in the second debriefing conversation, participant coaches participated more, prioritized different discursive moves, developed unique data collection systems to share observations from the co-taught lesson, and more frequently structured the conversation around content ideas related to the guiding principles of our content-focused coaching model.

Keywords: Teacher Educators, Professional Development

Debriefing conversations with a coach after teaching a lesson can support mathematics teacher growth through reflection in at least three ways: (a) identifying practical next steps to improve their practice (Gibbons & Cobb, 2016), (b) practicing using evidence of student thinking to consider responsive instructional decisions (West & Cameron, 2013), and (c) developing productive cognitive habits of reflecting and projective thinking (Costa & Garmston, 2016). However, these benefits depend on a coach's ability to facilitate debriefing conversations with clear goals and intentional decision-making—a process not clearly outlined in existing literature. To fill this gap, we developed a debrief conversational structure for content-focused coaches and designed a coherent set of learning experiences for our project participants to make sense of and implement the conversational structure with mathematics teachers. Participants, henceforth called participant coaches, were mathematics specialists from diverse contexts (Baker et al., 2022) who wanted to learn to facilitate content-focused coaching cycles (Callard et al., 2022) with mathematics teachers. We examined changes in the facilitation practices of participant coaches across two debriefing conversations; conversation one occurred prior to participant coaches learning about the debrief conversational structure and conversation two occurred after. Specifically, we answered two research questions: (1) How did the coaches' participation in debriefing conversations change after learning about a conversational structure? (2) How did the content of the coaches' verbal contributions in the debriefing conversations change after learning about the conversational structure? We strove to understand changes in both *how* the coaches talked to teachers and participated in the conversations and *what* content ideas the coaches prioritized after learning about the conversational structure.

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Theoretical Perspective and Related Literature

We frame our study with the notion that content-focused coaching is complex work (e.g., Carlson et al. 2017; Saclarides & Kane, 2021). We conceptualize this complexity by viewing content-focused coaching as a form of disciplined improvisation, in which coaches' actions must be responsive to the contingent needs of a mathematics teacher but are also bound by the guiding principles and structures of a content-focus coaching model (e.g., Callard et al., 2022). Sawyer (2004) explained that frameworks play a critical role in disciplined improvisation as they support the interplay of structure and agency. Frameworks and structures can serve as productive common artifacts which help organize fluid and responsive interactions. In other words, collaborative discussions involve structure to be productive, but the structure must not be deterministic, allowing space for interlocutors to co-construct knowledge in novel and unpredictable ways.

Mathematics coaches are charged with fostering these types of fluid conversations to effectively support teachers; however, the field lacks knowledge on effective strategies for coach professional learning around how to facilitate productive coaching conversations as part of coaching cycles (Carlson et al., 2017; Kane & Saclarides, 2022; Mangin & Stoelinga, 2010; Stein et al., 2022). Two studies have examined how the inclusion of conversational structures and protocol can support coaches to grow and refine their practice. Baker and Knapp (2019) created the Decision-Making Protocol for Mathematics Coaching (DMPMC) and trained coaches to use the protocol. Baker and Knapp found that the DMPMC effectively supported coaches to grow in their ability to enact research-based coaching practices. Similarly, Russell et al. (2020) created and trained coaches in an inquiry-based coaching model. Russel et al. claimed coaches used the key practices outlined in the model in coaching cycles with teachers, resulting in conversations with greater depth and detail. Russell et al. also noted that coaches adapted their behaviors in unique ways that appeared contradictory to the principles of the model but were deemed productive in supporting teacher learning after more thorough analysis. Both studies highlight the potential of comprehensive models and protocols to support mathematics coaches to effectively act in ways that are both responsive and structured (i.e., disciplined improvisation). However, little is known about how coaches learn to use a comparatively smaller conversational structure within the specific context of facilitating debriefing conversations.

The Debrief Conversational Structure

We constructed our debrief conversational structure for mathematics coaches by considering existing debrief conversational structures from other coaching models (e.g., Costa & Garmston, 2016; Knight, 2007) and our primary content-focused coaching goals: (a) increase the teacher's content knowledge in a specific subject area and (b) build the teacher's knowledge of effective instructional practices related to that subject area, referred to as pedagogical content knowledge (Ball et al., 2008). Additionally, we considered recommendations from existing practitioner resources for content-focused coaches (e.g., West & Cameron, 2013) about the importance of examining evidence of student learning in relation to established mathematical and instructional goals. Thus, our debrief conversational structure contained four phases to guide coaches: (1) Reviewing goals established in the planning session; (2) Examining evidence of student learning related to the mathematical and instructional goals; (3) Considering contributing factors that may have supported or limited success toward the mathematical and instructional goals of the lesson; and (4) Reflecting on implications for the teacher's future practice (see Callard et al., 2022 for a fuller explanation of the debrief conversational structure).

Methods

Participants

Participant coaches for the study included four mathematics specialists who held various roles in their contexts (Baker et al., 2022). Table 1 shows years of experience (prior to beginning the project) and the positioning of each participant coach in their context outside of our project.

Table 1. Participant Coach Demographics

Participant Coach	Teaching Experience	Specialist Experience	Mathematics Specialist (MS) Positioning (Baker et al., 2022)
Briggs	4	0	MS as coach, Organization
Delgado	27	0	MS as coach, Mathematics Coach: District Level
Kennedy	6	0	MS as teacher, Teacher Leader
Lee	11	1	MS as coach, Mathematics Coach: District Level

Project Context

This study was situated within a larger professional development project in which we designed, implemented, and researched a fully online learning model for practicing or aspiring mathematics coaches. We engaged participants in three professional development components that included (a) five course sessions on content-focused coaching, (b) four video coaching clubs, and (c) two supported coaching cycles (Amador et al., 2020).

This study focused on the two supported coaching cycles within the project. For each coaching cycle, a participant coach facilitated a planning conversation, lesson implementation, and debriefing conversation with a teacher in their context. A mentor coach supported a participant coach to prepare for each coaching cycle. The first coaching cycle occurred immediately after participant coaches learned about facilitating planning conversations, through the course and video clubs, and their preparation with their mentor coach focused only on preparing for their upcoming planning conversation. Thus, participant coaches facilitated their first debriefing conversation without guidance or project support. The second cycle occurred after participant coaches learned about our debrief conversational structure and their preparation with their mentor coach focused on preparing for all three parts of the coaching cycle.

Data Collected

For this study, we analyzed the debriefing conversations for the first and second coaching cycles of the four participant coaches. This resulted in the analysis of four, cycle-one debriefing conversations (occurring prior to participants learning about the debrief conversational structure) and four, cycle-two debriefing conversations (occurring after participants learned about our debrief conversational structure). All eight coaching conversations were transcribed verbatim.

Data Analysis

To analyze conversation transcripts, individual talk turns for the coach and teacher were copied into separate rows in a spreadsheet. The teacher talk-turns were not analyzed but used for context when coding the coach talk-turns. Longer coach talk-turns (i.e., those containing substantially different ideas) were separated into different rows and considered distinct talk-turns. A single coach-talk turn was the unit of analysis.

Our research questions focused on understanding changes in *how* the coaches participated in the conversations and *what* content ideas the coaches prioritized. Given these two foci, we

developed two codebooks. The first codebook detected content ideas in the coaches' talk-turns related to our debrief conversational structure. This codebook contained four dimensions, each connected to one part of our debrief conversational structure, with specific codes nested within each dimension. Figure 1 shows the details of this codebook.

Dimension	Code	Definition *Coach shares or invites the teacher to share a/an:*
Goals	Instructional Practice	instructional practice goals established by the teacher in the planning conversation.
	Math Learning Goal	mathematical concepts the teacher/coach wanted the students to learn.
Evidence of Student Learning	Student Thinking	observation about students' mathematical thinking during the lesson.
	Student Action	observation about students' actions or behaviors during the lesson.
Contributing Factors	Teacher Actions	observation about the teachers' actions/behaviors during the lesson.
	Lesson Design	observations about the design of the lesson/task.
Implications for Future Practice	Content	new idea involving the teachers understanding of mathematics that can be drawn from the lesson or prior discussion.
	Content-specific pedagogy	new idea about how students learn mathematics or how to teach mathematics that can be drawn from the lesson or prior discussion.
	Pedagogy	new idea about instruction (not specific to teaching and learning mathematics) that can be drawn from the lesson or prior discussion.

Figure 1. Codebook Focused on Content of Coaches' Talk

The second codebook characterized the coaches' discursive moves in each talk-turn and contained three dimensions: *directive*, *reflective*, and *facilitative*. Each of these dimensions contained three codes, created from existing literature on coach and facilitator discourse, to depict specific coach discourse moves (see Figure 2). *Directive* moves involved the coach sharing their thinking and opinions with the teacher which in turn positions the coach as the thinking authority within that instance of conversation (Ippolito, 2010; Sailors & Price, 2015). *Reflective* moves involved the coach inviting the teacher to share thinking and opinions which in turn positions the teacher as the thinking authority within that instance of conversation (Ippolito, 2010; Sailors & Price, 2015). *Facilitative* moves involved the coach establishing the (van Es et al., 2014). Facilitative moves did not contain the coach's thinking, nor did they invite substantial thinking from the teacher.

To analyze the data, three researchers independently coded the coach talk-turns in all eight transcripts and met to reconcile disagreements. Then, for each coach, the three researchers drafted analytic memos describing specific coach actions indicative of change between the coaches' cycle one and cycle two facilitation. The three researchers again met to reconcile individual memos into a single memo for each coach. Descriptive statistics related to the coaches' participation and facilitation were also recorded, including length of conversations, number of coded coach talk-turns, average words in a coded coach talk-turn, and the percentage of conversation words spoken by the coach.

First-Level Code	Definition	Second-Level Code	Definition
Directive	moves in which the coach shares their thinking and opinions with the teacher	Explaining	provide an interpretation of an event, interaction, or mathematical idea
		Suggesting	recommends an action
		Validating	Confirm and support teacher's contributions or actions
Reflective	moves in which the coach invites the teacher to share their thinking and opinions	Launching	pose general prompts to elicit teacher ideas
		Pressing	prompt teacher to explain their reasoning and/or elaborate on their ideas
		Paraphrasing	restating the teacher ideas in a manner that prompts the teacher to elaborate on their ideas
Facilitative	Moves in which the coach establishing the focus, direction, and/or clarity of the conversation	Describing	Direct attention to noteworthy ideas or events by describing the idea or event without inference, evaluation, and interpretation
		Clarifying	Prompts teacher to verify an idea to ensure common understanding
		Framing	Directing attention to the larger purpose or goal that was previously discussed

Figure 2. Codebook Focused on Coaches' Discursive Moves

Changes in Coach Participation

We found three patterns with respect to changes in how coaches participated in the conversations. First, all four coaches showed increased participation in the second debriefing conversation based on conversation lengths and how much and how often coaches spoke (see Table 2). For example, Briggs had roughly double the number of talk-turns in the second conversation (55) when compared to the first conversation (27) and conversation two (33:37) was approximately 13 minutes longer than conversation one (20:01). We found more dramatic changes in Lee's participation. In conversation one, Lee had 20 talk-turns that contained, on average, 6.5 words. In conversation two, Lee had 73 talk-turns containing an average of 36 words. This suggests that Lee spoke nearly 3.5 times more often in conversation two and each of these talk-turns was approximately 6 times longer than talk-turns in conversation one. We highlight that this increase in participation did not mean coaches dominated the second conversation (e.g., Heineke, 2013) as coaches contributed approximately 50% or less of the conversation words in conversation two. Instead, this pattern suggests that coaches became more equal contributors in their second conversation.

Second, we found changes in coaches' discursive patterns with respect to four discourse moves. All four coaches increased their use of *reflective: press* moves. In their first debriefing conversation, the four coaches collectively used 3 press moves. In conversation two, the coaches collectively used 28 press moves with each coach increasing their use of this move from conversation one to conversation two. This suggests that in the second conversation, coaches more frequently asked teachers to explain their reasoning and/or elaborate on or make connections between ideas currently being discussed. All four coaches also increased their use of *facilitative*: *describe* moves collectively increasing from 13 to 37 from conversation one to

conversation two. To illustrate both these discourse moves, we share the following example from Lee in conversation two:

> When you think of the learning goal—so "understanding inverse operations and property equality and using them, applying that understanding to solve one-step equations", what evidence do you have then for the students in terms of what you saw that day or what you've seen today, the day after, that it worked?

In this example, Lee first described the learning goal established in the planning conversation and then asked the teacher to elaborate on their prior claim that the lesson had felt successful using specific evidence of student thinking. Thus, we coded the discursive moves in the talk-turn as *facilitative: describe* and *reflective: press*. We consider this noteworthy as Lee used zero *press* moves and only three *describe* moves in her first conversation, and this distinctive combination of describing and pressing connects directly to our debrief conversational structure. All four coaches also increased their use of *directive: validate* and *directive: explain* moves, further highlighting shifts in the ways coaches participated in the second debriefing conversation.

Table 2. Data Related to Coach Participation in Debriefing Conversations

Participant Coach	Conversation	Total Conversation Time	Coded Talk Turns	Words Per Talk Turn	Percent of Conversation Words Spoken by Coach
Briggs	Cycle 1	20:01	27	28.8	30.7%
	Cycle 2	33:37	55	29.4	29.4%
Delgado	Cycle 1	16:43	36	20.5	40.6%
	Cycle 2	20:16	53	31.7	49.8%
Kennedy	Cycle 1	5:42	19	9.6	52.1%
	Cycle 2	39:19	55	45.3	49.5%
Lee	Cycle 1	7:14	20	6.5	25.2%
	Cycle 2	25:34	73	36.0	45.5%

Third, from our thematic analysis of analytic memos, all four coaches created and used unique data collection systems to record teacher actions and student thinking in conversation two that were not found in conversation one. Furthermore, in conversation two, three of the four coaches structured the conversations in ways that allowed both the coach and teacher to collaboratively examine collected data. For example, coach Kennedy recorded student quotes throughout the lesson. During the debriefing conversation, Kennedy recommended taking 10 minutes of private think time for the coach and teacher to individually examine the quotes, select quotes that felt important to discuss further, and determine rationale for why the quotes felt salient. We find this noteworthy as the learning experiences we provided for coaches about using the debrief conversational structure never recommended or shared ways of creating data collection systems nor ways to publicly share data with teachers.

Changes in the Content of the Coaches' Verbal Contributions

We identified two patterns with respect to changes in the content of coaches' verbal contributions from debriefing conversation one to two. First, all four coaches talked more about *evidence of student learning, contributing factors*, and *implications* in their second conversation (see Table 3).

Table 3. Content of Coach Contributions

Participant Coach	Conversation	Goals	Evidence of Student Learning	Contributing Factors	Implications
Briggs	Cycle 1	3	2	0	8
	Cycle 2	7	6	11	13
Delgado	Cycle 1	4	5	8	3
	Cycle 2	3	13	20	5
Kennedy	Cycle 1	3	0	2	4
	Cycle 2	0	10	5	12
Lee	Cycle 1	2	3	2	2
	Cycle 2	7	6	18	18

This finding highlights that coaches more frequently incorporated three of the focal topics articulated in the debrief conversational structure into their second debriefing conversation. As a second finding, we found each coach shifted the content of their verbal contributions from conversation one to two in unique ways. For example, in debriefing conversation one, Briggs never shared or elicited thinking from the teacher about *contributing factors* such as teacher moves or the lesson design. In the second debriefing conversation, eleven of Brigg's talk-turns focused on the *contributing factors*. As a second example, Delgado's talk-turns in conversation two referenced *evidence of student learning* (13) and *contributing factors* (20) more frequently than talk-turns in conversation one (five and eight respectively). This change in the content of Delgado's talk-turns connects to changes in her participation and discourse patterns. In conversation one, six of Delgado's talk-turns were coded as *facilitative: describe*. In conversation two, the number of Delgado talk-turns coded as *facilitative: describe* increased to 18. This suggests that Delgado more frequently directed attention to student thinking and actions as well as teacher moves and lesson design in conversation two when compared to conversation one. To illustrate this claim, we share the following Delgado talk-turn from her second debriefing conversation:

> One group that you were with, the question was, "What fraction card should you use to make eight sixths?" You said, "you have wholes, thirds, fifths—which should you use?" Then they answered. Then you said, a whole—you questioned a whole. And you said, "how are you going to split that into sixths?" So what's you're thought on that? Listening to what you said?

In this example, Delgado references her data collection system to recall specific teacher questions and language. This low-inference observation then became the basis of a question to elicit thinking from the teacher. Thus, we coded the content of this talk-turn *contributing factor: teacher actions* and the discourse moves *facilitative: describe* and *reflective: launch*.

Discussion and Implications

The findings from both research questions provide new insight into how a conversational structure may have supported coaches in the act of disciplined improvisation (Sawyer, 2004) when facilitating a debriefing conversation with a mathematics teacher. From research question one, we found three patterns in changes to coaches' participation in the debriefing conversations after learning about our debrief conversational structure. First, coaches participated more fully in the debriefing conversations by speaking more often and at greater length, without dominating

the conversation. Second, in conversation two, coaches more frequently pressed teachers to explain or elaborate on their thinking, shared low-inference descriptions of classroom events for public consideration, and provided explanations involving their own interpretations. Third, coaches created and used unique data collection systems in the second conversation to record and publicly share observed classroom events. From research question two, we found that the content of coaches' verbal contributions related to *evidence of student thinking*, *contributing factors*, and *implications* for future practice, increased after learning about our debrief conversational structure.

Similar to Baker and Knapp (2019) and Russell et al. (2020), we consider the changes documented in our findings to be productive in relation to the guiding principles and goals of our content-focused coaching model. Furthermore, we argue that providing a debrief conversational structure played a role in supporting participant coaches to act with enhanced disciplined improvisation. For example, in the first debriefing conversation, Lee made or invited only five total references to *evidence of student learning* or *contributing factors* and only two references to *implications*. In the second debriefing conversation, Lee made or invited 24 total references to *evidence of student learning* or *contributing factors* and 18 references to *implications*. The change in the content of Lee's verbal contributions suggests she increased the structure of her second conversation to focus more on topics central to the guiding principles of content-focused coaching (Callard et al., 2022; West & Cameron, 2013). Lee also used more press moves in the second conversation (13) than in the first conversation (0). This suggests Lee also acted more responsively, or with greater improvisation since press moves involved the coach asking a teacher to elaborate on or further explain shared thinking. We argue that Lee, and the other three participant coaches, were relatively inexperienced in coaching mathematics teachers and facilitating debriefing conversations. Thus, they lacked any disciplinary structure to support productive improvisational decisions that are a natural part of facilitating coaching conversations. Once equipped with a basic debrief conversational structure and a modest set of learning experiences, participant coaches made substantial changes to the structure and responsiveness of their coaching in ways that aligned with the guiding principles of our content-focused coaching model.

Coaches or mathematics specialists are often promoted into these new roles based on their expertise as classroom teachers, yet being an effective teacher is not a sufficient condition to becoming a successful coach (Carlson et al., 2017; Chval et al., 2010). Based on our findings and these claims from prior researchers, we offer implications for those supporting the development of coaches and conducting future research on coaching. Given the changes our four participant coaches demonstrated, we urge those working with coaches to consider adopting, adapting, or creating structures and protocols that operationalize guiding principles and goals of a coaching model in a particular context. Such structures should explicitly name desired coaching behaviors while also providing coaches space to operate responsively based on the needs of teachers. We also encourage future researchers to more carefully examine how changes in coach actions, driven by protocols and structures, influence teachers' opportunities to learn. Similar to Baker and Knapp (2019) and Russell et al. (2020), we argue that the changes in our participants' coaching behaviors were productive given the theories of teacher learning underpinning our coach model. However, future research should directly examine the relationship between changes in coaching behaviors and teacher learning opportunities to validate these inferences.

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