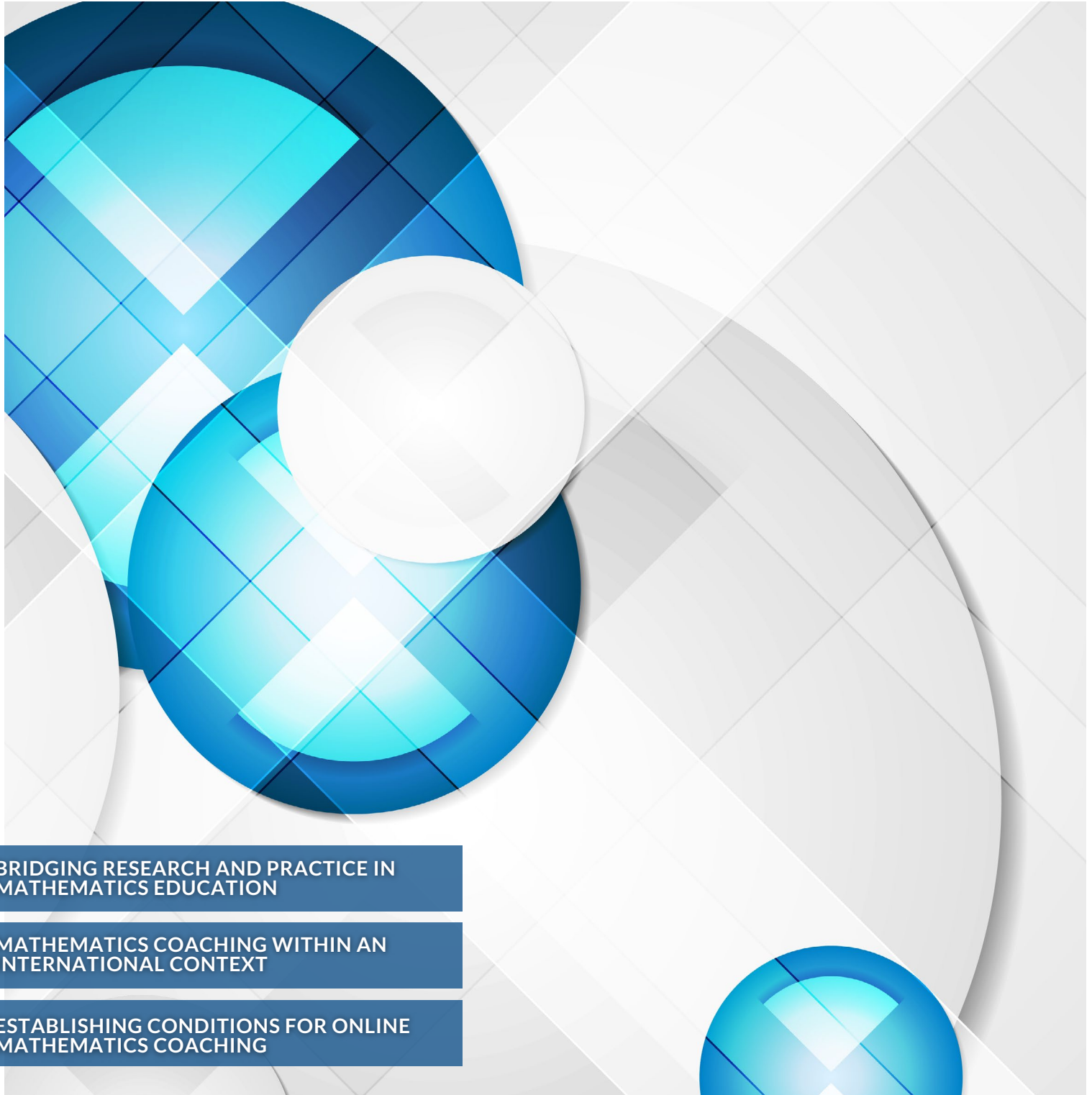


VOLUME 33 | ISSUE 1 | SPRING 2026

# NCSM JOURNAL

OF MATHEMATICS EDUCATION LEADERSHIP



BRIDGING RESEARCH AND PRACTICE IN  
MATHEMATICS EDUCATION

MATHEMATICS COACHING WITHIN AN  
INTERNATIONAL CONTEXT

ESTABLISHING CONDITIONS FOR ONLINE  
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*Across the United States, mathematics teacher leaders often hold similar beliefs and operate under professional norms about the teaching and learning of mathematics. However, teaching in culturally rich and diverse international schools brings unique challenges for mathematics coaches. As such, this qualitative study centered on the 4-year experience of one U.S.-trained educator as they started a new role as a mathematics instructional coach in an international school in the Middle East. Findings highlighted challenges in understanding the interplay between local and school cultures and structural challenges of international schools that impacted the mathematics coach's work. Although the study was situated in an international context, connections to similar challenges in the United States were strong and are briefly discussed. These findings yielded further insight into the considerations leaders of mathematics education should examine when working with and supporting students, teachers, and administrators from culturally rich and diverse backgrounds.*

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*This exploratory study and related analysis investigated the roles, responsibilities, and professional learning needs of school district-based mathematics specialists (DMSs), who play a crucial role in shaping mathematics education. Despite the potential significance of their influence, limited research exists on what DMSs need to know to influence, support, and lead coherent instructional systems. To address this concern, our research team developed a survey to gather data on DMSs' roles and responsibilities related to professional development and curricular implementation. Findings revealed variability in DMSs' roles, involvement in professional development, influences on goal setting, and professional learning needs. Based on these findings, we offered recommendations for DMSs' implementation of district- and state-wide curriculum initiatives. These state-level insights are generalizable to other areas of the United States and highlight the vital role of DMSs in supporting and enhancing mathematics teaching and learning across school districts nationally.*

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by Ryan Gillespie, Evthokia Stephanie Saclarides, Sarah Tegeler, Kathy Prummer, and Amanda Roberts

*This descriptive study examined how 10 experienced mathematics coaches discursively created conditions for one-on-one, online coaching cycles during preliminary discussions with teachers. These coaches were preparing to support teachers in implementing ambitious mathematics teaching practices, challenging work that often requires teachers to make substantial changes to their instruction and coaches to provide customized, responsive support. Using a modified analytic framework from the medical field, we analyzed "getting to know you" conversations between 18 coach-teacher pairs, focusing on how coaches balanced gathering data, sharing information, and building rapport. We illustrated the content of these discursive behaviors and identified key commonalities and differences that shed light on how experienced mathematics coaches initiate responsive coaching partnerships.*

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# ESTABLISHING CONDITIONS FOR ONLINE MATHEMATICS COACHING: HOW COACHES INITIATE PARTNERSHIPS WITH TEACHERS

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## ABSTRACT

*This descriptive study examined how 10 experienced mathematics coaches discursively created conditions for one-on-one, online coaching cycles during preliminary discussions with teachers. These coaches were preparing to support teachers in implementing ambitious mathematics teaching practices, challenging work that often requires teachers to make substantial changes to their instruction and coaches to provide customized, responsive support. Using a modified analytic framework from the medical field, we analyzed “getting to know you” conversations between 18 coach–teacher pairs, focusing on how coaches balanced gathering data, sharing information, and building rapport. We illustrated the content of these discursive behaviors and identified key commonalities and differences that shed light on how experienced mathematics coaches initiate responsive coaching partnerships.*

**Keywords:** *mathematics coaching, online professional development, coaching cycles, discourse analysis*

In ambitious mathematics teaching, teachers engage students in nonroutine, cognitively demanding tasks and use students' thinking as the foundation for instruction (Lampert & Graziani, 2009; Smith & Stein, 2018). The potential benefits of ambitious mathematics teaching are substantial; such practices provide authentic opportunities for all students to develop reasoning and problem-solving skills, deepen their understanding of important mathematical ideas, and cultivate identities as capable mathematical thinkers (Boaler & Staples, 2008; Schoenfeld, 2014). However, realizing these benefits often requires teachers to make significant shifts, or even complete transformations, in their instruction (Horn & Garner, 2022; Walsh et al., 2023). Ambitious teaching can push mathematics teachers to reconsider long-held beliefs about teaching and learning and to deepen their mathematical and pedagogical content knowledge (Ball et al., 2008). Moreover, teachers must develop new pedagogical

skills for making in-the-moment instructional decisions based on students' thinking, including facilitating rich mathematical discussions and supporting students' productive struggles through purposeful questioning (Franke et al., 2009; Jacobs et al., 2010).

One-on-one coaching has emerged as a promising form of professional development (PD) for supporting teachers in implementing ambitious mathematics instruction (Kraft & Hill, 2020; Walsh et al., 2023; Witherspoon et al., 2021; Yurekli & Stein, 2024). In one-on-one coaching, a coach with full- or part-time release from teaching directly supports a mathematics teacher to improve their instruction (Baker et al., 2022; McGatha & Rigelman, 2017). The strength of one-on-one coaching is its capacity to provide mathematics teachers with responsive and personalized support aligned with their individual goals, needs, and instructional contexts (Kochmanski & Cobb, 2023; Saclarides & Munson, 2021). Although this responsiveness can help teachers navigate the numerous and diverse challenges associated with enacting ambitious teaching practices, it also presents complexities for coaches who must balance intentionality with adaptability to meet teachers' diverse needs. Authors of practitioner-oriented resources in mathematics education have frequently acknowledged this tension and have highlighted conditions that enable productive, responsive coach–teacher interactions (Baker & Knapp, 2023; Smith et al., 2024; West & Cameron, 2013; Wills & Rawding, 2019). Collectively, this body of work emphasized that mathematics coaches striving to help teachers make significant changes to practice should engage in intentional, preliminary actions when initiating their partnerships. Yet, few empirical studies have examined how mathematics coaches establish the foundation for authentic, responsive partnerships during their initial interactions with teachers as they prepare to collaboratively implement ambitious mathematics teaching.

The objective of this descriptive study was to understand how mathematics coaches facilitated preliminary discussions with teachers to establish initial conditions for upcoming one-on-one, online coaching cycles focused on the implementation of ambitious teaching practices. We asked 10 experienced coaches, partnered with 19 middle grades (i.e., Grades 4–10) teachers of mathematics as part of a larger PD project, to facilitate a 20–30 minute “getting to know you” (GTKY) conversation before starting online coaching cycles. Broadly, we aimed to characterize the nuanced ways coaches discursively interacted with teachers as they established the foundation for their new partnership in a relatively short period of time. This process included

analyzing how coaches managed the diverse tasks of sharing information about themselves and upcoming work, gathering information about their teachers, and building rapport. Additionally, we aimed to identify commonalities, along with nuanced differences, in the ways experienced coaches facilitated these initial conversations. Each coach and teacher brought unique personalities, experiences, and contexts to their preliminary interaction, which, perhaps unsurprisingly, resulted in diverse initial conversations. However, identifying commonalities amid this diversity revealed structural themes in how experienced coaches launched their partnerships with teachers. Our study answered the question: In an initial conversation with a teacher, how do experienced mathematics coaches discursively create conditions for future one-on-one coaching interactions? As we discuss in the following section, this study's findings are relevant not only to mathematics coaches working with teachers in online spaces (Carson & Choppin, 2021) but also to coaches working in person with teachers.

## THEORETICAL FRAMING

We considered conditions for learning to be the whole set of factors influencing a learner's ability to grow in a particular experience (Gagne, 1985). Among the many learning conditions present in one-on-one coaching, we considered three conditions to be most salient when a coach establishes a new partnership with a teacher: (a) a coach's knowledge of their teacher, (b) the teacher's knowledge of their coach and upcoming learning interactions, and (c) a sense of rapport between the coach and teacher. These three conditions are critical because of the responsive and relational nature of coaching and because they reside in a coach's sphere of control. We argue that the presence of these conditions exists along a continuum, where coaches likely will not establish these conditions fully in an initial GTKY, and these conditions will evolve during each subsequent interaction. In an initial conversation, a coach should establish a foundation for these three conditions to begin fulfilling their duties as a responsive thought partner.

As the first condition, a coach must possess knowledge of their teacher and their teacher's professional practice. Given a teacher's professional practice is a complex compilation of skills, experiences, beliefs, and knowledge (Grossman et al., 2009), coaches must be selective in gathering pertinent information about a teacher's current professional practice in relation to the ambitious mathematics teaching (Baker & Knapp, 2023; Gibbons & Cobb, 2016; West & Cameron, 2013). For example, to act responsively when supporting a teacher to improve their practice, coaches would benefit from knowing as much as possible about a teacher's current beliefs about effective mathematics teaching, equitable instruction, and all students' capacity to think mathematically (National Council of Teachers of Mathematics [NCTM], 2014). Additionally, a coach likely would benefit from understanding a teacher's goals for their own growth (Kochmanski & Cobb, 2023), mathematical and pedagogical content knowledge (Ball et al., 2008), and contextual features of a teacher's professional role (e.g., available curriculum resources, prior experiences with coaching and PD).

The second condition is the teacher's knowledge of their coach and upcoming learning interactions. One-on-one mathematics coaching assumes a collaborative partnership in which two job-alike educators coconstruct new knowledge about pedagogy and content (Smith et al., 2024; West & Cameron, 2013). Therefore, the teacher also must become knowledgeable about their partner in the learning environment (Mosley Wetzel et al., 2017). Additionally, a coach may have an obligation to share information about upcoming interactions with the teacher, so they have adequate knowledge to use coaching support.

The third condition is a sense of rapport between the coach and teacher, which we consider to be a shared perception of a harmonious relationship between two people. Although both the coach and teacher can feel a sense of rapport with their partner, a teacher's sense of rapport with their coach may be of primary concern, given the teacher is making their professional practice public. Furthermore, because any professional change can be emotionally demanding for teachers (Villegas-Torres & Lengeling, 2021), and ambitious teaching practices frequently entail substantial shifts in beliefs and practices, a central responsibility of the mathematics coach is to foster a sense of emotional safety and support throughout the change process (Yurekli & Stein, 2024). Taken together, a coach has numerous obligations during an initial interaction with a teacher and must make intentional decisions, given teachers have little time away from students for coaching conversations.

To connect coaching discourse moves with the establishment of these three conditions, this study integrated the discourse conceptualizations of Gee (2014) and Borko et al. (2008). Gee proposed that analyzing discourse involves examining relationships among three interrelated elements: (a) the language being used, (b) the activity or context from which the talk emerges, and (c) the identities and roles of those engaged in the interaction. Building on this framework, Borko et al., in their analysis of mathematics teachers' discussions of classroom videos, refined Gee's category of "language being used" into two dimensions: (a) content of the statement and (b) type of conversational move used to engage that content. In other words, Borko et al. differentiated between what was said and how it was said.

Synthesizing these conceptualizations, the present study treated each turn of talk in a coaching conversation as comprising three components: (a) the speaker (i.e., coach or teacher), (b) the content (i.e., what is said), and (c) the discourse move (i.e., how it is said). The GTKY conversation provided a shared contextual activity in which these discursive interactions occur. Given the coach's facilitative role in the GTKY, our analysis centered on the content and discourse moves enacted by coaches to understand how they discursively gather knowledge of their teachers, provide teachers with information about themselves and upcoming learning interactions, and cultivate a sense of rapport.

## LITERATURE REVIEW

### Establishing Conditions for Coaching

Practitioner-facing literature has far outpaced empirical studies involving preliminary interactions of mathematics coaches and teachers. West and Cameron (2013), authors of the content-focused coaching model, suggested a coach's understanding of a teacher's instructional habits, beliefs, and content knowledge is a critical condition for responsive coaching. Both Baker and Knapp (2019) and Wills and Rawding (2019) have emphasized that coaches should coconstruct professional learning goals with teachers ahead of coaching work to ensure responsive interactions stay tethered to a central focus. Similarly, Smith et al. (2024) recommended coaches invite mathematics teachers to identify a small set of instructional challenges to serve as focal points for inquiry and improvement in subsequent coaching interactions. In sum, this thin practitioner literature has begun to delineate the conditions coaches must cultivate during formative phases of one-on-one interactions with teachers and the practices coaches should use when establishing initial conditions for coaching.

A limited number of researchers have empirically examined such conditions underpinning successful one-on-one mathematics coaching. These studies have coalesced around two themes. First, successful coaching requires trusting relationships in which both partners feel comfortable engaging in open and honest dialogue (Bengo, 2016; Cameron, 2015). A coach and teacher must be able to talk honestly about a teacher's practice to collaboratively identify instructional improvement goals and actions that are relevant to the teacher, will impact student learning, and are developmentally appropriate for teachers (Kochmanski & Cobb, 2023). This relational dialogue also includes open discussion about the role of the coach and teacher in the partnership to dispel potential power dynamics in which the coach is perceived as an authority figure (Cameron, 2015). Second, coaching support must be tailored to teachers' organizational contexts (Baker, 2022; Hannan & Russell, 2020), which includes attending to administrative expectations for teachers (Saclarides & Lubienski, 2020), the particular school culture (Baker, 2022), and standardized testing pressures (Saclarides & Kane, 2023).

In sum, practitioner-facing literature and empirical studies have provided a starting point to understand the necessary conditions for impactful coaching. However, what remains unknown is how coaches establish optimal conditions for professional learning during preliminary interactions with teachers. This study took an important first step in addressing this gap.

### Online Coaching

Despite the increasing popularity of online coaching, scant literature exists on how coaches should interact with teachers in online spaces to create conditions for productive coaching (Carson & Choppin, 2021; Gregory et al., 2017).

The limited empirical literature on online coaching has focused primarily on the affordances of teachers and coaches interacting virtually. As a first example, teleconference software (e.g., Zoom) allows a coach and teacher to collaborate synchronously from different geographical locations, improving the accessibility of coaching, particularly for teachers working in rural areas (Carson et al., 2019). The ability to collaborate synchronously from different physical locations also helps a coach and teacher navigate logistical and scheduling challenges (Callard et al., 2022; Carson et al., 2019), which are inherent challenges of in-person coaching (Gibbons & Cobb, 2017). Improved access and scheduling flexibility have, in turn, made online coaching a less expensive and scalable alternative to in-person coaching (Kraft et al., 2018; Kraft & Hill, 2020). As a second example, online coaching was shown to be an effective alternative to in-person coaching in supporting teacher development (Kraft & Hill, 2020). Teleconferencing software provides a productive modality to replace in-person planning or debriefing conversations (Carson & Choppin, 2021). In place of a teacher and coach collaboratively teaching a lesson, online coaching models have incorporated viewing videos of taught lessons, which can support more thorough reflection and analysis of teaching and student thinking (Callard et al., 2022; Carson & Choppin, 2021).

Professional learning in online spaces can be more impersonal than in in-person settings; thus, PD facilitators, including coaches, must carefully consider social and emotional dimensions of online learning experiences (Stenbom et al., 2016). For mathematics coaches working in online spaces, prior researchers have elevated the importance of coaches building relationships (Kidd, 2020) and have noted it is possible for a coach and teacher to cultivate a productive relationship despite not working together in person (Carson & Choppin, 2021). However, little is known about how mathematics coaches establish the initial conditions for online coaching during a preliminary interaction with a teacher, which was the central focus of this study.

## METHODS

### Participants

Participants were 10 experienced mathematics coaches from across the Pacific Northwest, Midwest, and Northeast regions of the United States. These 10 coaches had diverse, full-time mathematics specialist positions separate from their work in the study's PD program (see Table 1). Coaches were selected to facilitate online coaching cycles with teachers based on the following criteria: (a) multiple years of experience teaching mathematics, (b) multiple years of experience coaching teachers using one-on-one coaching cycles, (c) expertise in the content-focused coaching model that guided all coaching activities (West & Cameron, 2013), (d) expertise in mathematics content in a particular grade range, and (e) expertise in pedagogical concepts central to the PD program (NCTM, 2014; Smith & Stein, 2018).

**Table 1**  
*Coach Demographics*

Coach participant	Teaching experience (years)	Specialist experience (years)	Mathematics specialist positioning (Baker et al., 2022)	Teachers coached	Grade levels coached
Alice	17	7	Mathematics coach: Organization	2	4, 5
Beth	16	5	Mathematics coach: Organization	2	4, 5
Carter	8	2	Mathematics coach: Organization	2	5, 7–12
Eileen	15	15	Mathematics coach: District level	2	5, 5
Jane	6	2	Mathematics coach: School level	1	6
Laura	10	7	Mathematics coach: Organization	1	8
Maya	12	6	Teacher educator: University	2	6, 6
Ruby	7	7	Mathematics coach: Organization	4	4–5, 5, 6, 7
Susan	7	8	Mathematics coach: Organization	1	3–5
Tom	9	3	Mathematics coach: District level	2	9, 9

### Project Context

This study occurred in a state-funded PD program in which 19 middle-grade mathematics teachers, geographically dispersed across the state, participated for 1 year. The program engaged teachers in three professional learning activities, which occurred synchronously in online spaces: (a) course sessions in which teachers learned about ambitious mathematics teaching practices; (b) video clubs in which teachers analyzed video clips of project personnel using new teaching practices in local classrooms; and (c) one-on-one, video-assisted coaching cycles. Project personnel facilitated the course sessions and video clubs, and the 10 participant coaches facilitated the one-on-one, video-assisted coaching cycles. The 19 coach–teacher pairs engaged in three online coaching cycles, which were interspersed across the year of participation, to provide teachers with individualized support to implement ambitious mathematics teaching practices learned in the course sessions and video clubs. The coaching cycles followed a content-focused coaching approach (West & Cameron, 2013), meaning coaches emphasized mathematical content and how students learn that content throughout each phase of the cycle to support teachers’ growth in both mathematical and pedagogical content knowledge (Ball et al., 2008). In the planning conversation, the coach and teacher collaboratively design a lesson articulating explicit mathematical learning goals aligned with cognitively demanding tasks. For the lesson implementation, the teacher taught and video recorded the lesson and shared the video with their coach, allowing both the coach and teacher opportunities to view and annotate the lesson ahead of the debriefing conversation. The debriefing discussion centered on analyzing how effectively the lesson supported learning by examining student thinking, identifying factors that influenced the outcomes, and determining next steps for future instruction (see Callard et al., 2022 for a fuller description of these coaching activities).

As part of introductory activities, each coach–teacher pair was invited to have a 20- to 30-minute GTKY conversation via Zoom (given the coach–teacher pairs were geographically dispersed) that occurred approximately 1 month prior to the start of the first online coaching cycle. To support coaches in

preparing for these initial meetings, coaches were provided with a set of instructions containing the following statement regarding the purpose of the conversation:

*In [this project], a primary learning goal for teachers will be understanding and implementing the NCTM Effective Teaching Framework (comprised of eight teaching practices). Often, these practices are referred to as ambitious mathematics teaching practices. In the course, to help make these ambitious practices more specific and tangible for teachers, we will use the text *5 Practices for Orchestrating Productive Mathematics Discussions* (2nd ed.; Smith & Stein, 2018). Your primary role will be supporting teachers to (a) understand how to implement the practices they learn in the course and video clubs in their own classrooms, and (b) cultivate planning and reflective habits that will support teachers to use the practices after the project is over. The purpose of the “Getting to Know You” meeting is to create a foundation that will support productive interactions towards these goals.*

Coaches were given no instructions about how to facilitate the conversations, leaving ample room for professional discretion.

### Data Collected and Analysis

We analyzed the transcripts of 18 GTKY conversations. Although there were 19 coach–teacher dyads in this cohort of participating teachers, two teachers who worked at the same school and were partnered with the same coach decided to attend the same GTKY conversation. Thus, we analyzed 17 transcripts involving coach–teacher dyads and one transcript involving a coach–teacher triad. We included this triad in the analysis because its overall structure and flow of interaction resembled the other coaching conversations, and a single coach facilitated the conversation, which was the focus of our analysis (Schegloff, 2007). These initial conversations were recorded using Zoom and transcribed. There were two steps to the analytic process, detailed in the following sections: (a) creating an analytic framework using the Roter interaction analysis system (RIAS) from the field of medicine, and (b) coding coaches’ talk using the framework.

**Analytic Framework Creation**

To code coach talk turns, we lifted and modified the RIAS, which has been used to analyze doctors’ discursive behaviors when interacting with patients (Roter & Larson, 2002). The coding scheme divides a doctor’s verbal statements in a conversation into three main categories: (a) gathering information from the patient relevant to providing responsive health care; (b) sharing and educating the patient on appropriate next steps in their care; and (c) rapport building, which entails verbal statements related to relationship-

building practices. We argue the three primary behaviors of gathering information, sharing and educating, and rapport building described in the RIAS also broadly characterize a coach’s discourse moves (i.e., how they talked; Borke et al., 2008; Gee, 2014) during initial interactions with a teacher. Within the broad discourse moves of gathering information and sharing and educating, we inductively explored the content focus of the information coaches shared and gathered (i.e., what they talked about; Borke et al., 2008; Gee, 2014), given obvious differences in the content of doctor-patient

**Table 2**  
*Analytic Framework and Coding Scheme for Data Gathering Behaviors*

Data gathering behaviors (Coach asks about _____)		
Content focus	Code	Code description
Learning goals and needs	Ask – learning goals	The coach asks the teacher to share their current professional goals and desired growth and/or their expectations for coaching within the PD project.
	Ask – motivation to join	The coach asks the teacher to share their reasons for participating in the current PD project and/or coaching, including prior relationships that influenced their decision to participate.
Logistics	Ask – conversation logistics	The coach asks the teacher to share details about logistics as well as the plan and/or purpose specific to the GTKY conversation.
	Ask – general logistics	The coach asks the teacher about logistical items related to coaching (e.g., technology, the best times to meet).
Prior experience with PD and coaching	Ask – coaching experience	The coach asks the teacher to share their prior experience working with an instructional coach.
	Ask – experience with PD	The coach asks the teacher to share their prior experience engaging in PD as a learner as well as how the current PD project aligns with other past or current PD in which the teacher has participated.
Professional context	Ask – current role and context	The coach asks the teacher to share their current teaching assignment, conditions, successes, challenges, etc.
	Ask – teaching experience	The coach asks the teacher to share their background as a teacher as well as their pathway into teaching.
Professional practice and beliefs	Ask – educational philosophy, vision, or beliefs	The coach asks the teacher to share their beliefs, values, and/or philosophies about teaching, learning, and/or students.
	Ask – professional practice	The coach asks the teacher to share about their current teaching practice.

and coach-teacher discussions. However, the relational similarities between doctor-patient and coach-teacher interactions were sufficient to retain the rapport-building codes from the RIAS for our research.

To make these modifications to the RIAS, we engaged in multiple rounds of open coding of subsets of the data across several coach-teacher pairs using constant comparative methods (Corbin & Strauss, 2008). We parsed coaches’ talk turns at the sentence level and coded each sentence of coach talk independently. Teacher talk was not analyzed but instead used for context. The intent was to use the three

primary behavioral categories identified in the RIAS (i.e., data gathering, sharing and educating, building rapport) and update the categories and accompanying codes to match the context of an initial coach-teacher conversation as opposed to a doctor talking with a patient. Through the open-coding process, we inductively categorized the questions coaches asked teachers to gather data, the information coaches shared with teachers, and the ways coaches built rapport. Five researchers engaged in the open-coding process, which took several rounds of independent data coding and discussion. This process led to the creation and refinement of an analytic

**Table 3**  
*Analytic Framework and Coding Scheme for Sharing and Educating Behaviors*

Sharing and education behaviors (Coach shares _____)		
Content focus	Code	Code description
Foregrounding teacher learning	Share – coherence to other PD	The coach shares how the PD project aligns with other past and/or current PD in which the teacher may have participated.
	Share – project learning and expectations	The coach shares the nature, focus, and content of the project's learning experience.
Learning goals and professional interests	Share – professional goals	The coach shares their current professional goals and desired growth.
	Share – motivation to join	The coach shares their reasons for participating in the PD project and/or coaching, including prior relationships that influenced their decision to join.
Logistics	Share – conversation logistics	The coach shares details about logistics specific to the GTKY conversation as well as their thinking related to the plan or purpose for the conversation.
	Share – general logistics	The coach shares logistical items related to coaching (e.g., technology, the best times to meet).
Professional context	Share – coaching experience	The coach shares their prior experience working as a coach and/or facilitator of PD as well as their process for becoming a coach. The coach may also share their prior experiences engaging in PD as a learner.
	Share – current role/professional context	The coach shares their current coaching/professional assignment, conditions, classes, successes, and/or challenges.
	Share – teaching experience	The coach shares their teaching background as well as their path into teaching.
Professional practice and beliefs	Share – educational philosophy, vision, or beliefs	The coach shares their beliefs, values, and/or philosophies about coaching, teaching, learning, and/or students.
	Share – professional practice	The coach shares their current coaching and/or teaching practices.

framework containing three parts: data gathering, sharing and educating, and rapport building.

**Data Gathering.** Through the open coding process, we created 10 codes, which were organized into five categories to accurately characterize the nature of the data coaches gathered about their teachers through questioning (see Table 2). These categories were professional context, logistics, prior experience with PD and coaching, professional practice and beliefs, and learning goals and needs. Codes about professional context involved the coach inviting the teacher to share basic information about their current role, school demographic information, or teaching experience. The logistics category comprised codes in which coaches asked teachers to share basic logistical information about either the GTKY conversation (e.g., how much time was available for this discussion) or general logistical information pertaining to future interactions (e.g., what time of day typically works best for meeting). Codes in prior experience with PD and coaching involved the coach asking the teacher

about their prior experiences working with a coach or engaging in professional learning. The professional practice and beliefs category featured codes in which coaches' data gathering moved beyond inviting descriptions of context, logistics, and prior experience, and probed teachers' beliefs or philosophies about teaching, their instructional vision for teaching mathematics (Munter, 2014), or current pedagogical practices. The final category, learning goals and needs, involved codes in which coaches invited teachers to talk about what they wanted to learn from participating in the project or what motivated them to participate in the project.

**Sharing and Educating.** We created five categories in the sharing and educating coaching behavior to organize the various codes describing the nature of the data coaches shared with their teachers (see Table 3). These categories were professional context, logistics, learning goals and professional interests, professional practice and beliefs, and foregrounding teacher learning. Professional context codes involved the coach sharing details about their current

coaching assignment and previous experiences serving as a teacher and/or coach. Parallel to data-gathering codes, the logistics category encompassed codes in which the coach shared logistical items about future coaching and logistics specific to the GTKY conversation. Learning goals and professional interests involved codes in which the coach shared their own professional goals and/or desired growth as well as their reasons for joining the PD project. Professional practice and beliefs contained codes in which the coach shared their beliefs about coaching, teaching, learning, or students, or their current coaching or teaching practices. Last, the foregrounding teacher learning category included codes in which the coach shared what they anticipated teachers would learn from the PD project and how the PD project may align with other professional learning opportunities in which the teacher participated.

**Rapport Building.** Our open-coding process revealed strong similarities between rapport-building discursive practices in both medical and coaching contexts. Thus, we retained the rapport-building codes and categories of the RIAS. These three categories were positive rapport building, social rapport building, and emotional rapport building (see Table 4). The category of positive rapport building contained three codes, which encompassed instances in which the coach engaged in humorous interactions with the teacher, gave the teacher compliments, and/or agreed with the teacher. The category of social rapport building contained two codes, both of which involved the sharing or gathering of personal information not inherently relevant to the coach’s professional relationship

with the teacher. The emotional rapport building category contained six codes, which discursively fostered empathy, concern, and partnership. Furthermore, these codes captured moves in which coaches validated, encouraged, and revoiced teacher-initiated utterances. We note our addition of the code revoice to the RIAS. We found revoice to be a common move coaches used in the initial conversations and placed this code in emotional rapport building based on claims from prior coaching literature that a primary function of paraphrasing is to build rapport (Costa & Garmston, 2016).

**Coding Coaches’ Talk**

Once the framework was finalized, we recoded all 2,849 sentences of coach talk across the 18 GTKY conversations in teams of three. Each team member independently coded each sentence of coach talk in a single transcript using the framework. Each sentence was assigned a single code with the broad dimensions of data gathering, sharing and educating, or rapport building. After the three researchers independently assigned codes, two researchers met and reconciled any discrepancies. Table 5 provides an example of the final codes assigned for three coach sentences through this coding process. For reliability, 83% of coded sentences featured agreement between at least 2 of the 3 coders. Once the pairwise teams reconciled their coding, we compiled codes into a single spreadsheet and identified structural similarities and nuanced differences in the 10 coaches’ discursive actions.

**Table 4**  
*Analytic Framework and Coding Scheme for Rapport Building Behaviors*

Rapport-building behaviors (Coach communicates _____)		
Content focus	Code	Code description
Emotional rapport building	Concern	The coach discursively looks after the well-being of the teacher.
	Empathy	The coach communicates that they understand the perspective or idea shared by the teacher.
	Encouragement	The coach provides encouragement to the teacher.
	Partnership	The coach communicates togetherness with the teacher in upcoming coaching work.
	Revoice/paraphrase	The coach revoices and/or paraphrases utterances made by the teacher to further establish a connection.
	Validation/legitimation	The coach communicates that the idea shared by the teacher is important or worthy.
Positive rapport building	Agreement	The coach agrees with something shared by the teacher.
	Compliments/approval	The coach compliments the teacher or something shared by the teacher, or they approve of something shared by the teacher.
	Humor	The coach makes a humorous utterance.
Social rapport building	Ask – personal life	The coach asks the teacher to share about their family, home life, outside interests, and/or anything not related to professional activities.
	Share – personal life	The coach shares about their family, home life, outside interests, and/or anything not related to professional activities.

**Table 5**  
*Example of Our Coding Process*

Speaker	Transcript	Dimension	Categories	Code
Teacher	I would love to see, to be able to implement more conversation and discussion with the concepts group.			
Teacher	But I don't know how that would fit with the new curriculum.			
Teacher	So I think it'd be kind of difficult to be learning that and trying to implement it when . . .			
Coach	Right, that makes sense to have a lot of new things all at once, for kids already, that you're just really trying to focus on and feed into as much as possible.	Rapport building	Emotional rapport building	Validation/legitimation
Coach	And you said, you've been teaching for 3 years.	Rapport building	Emotional rapport building	Revoice/paraphrase
Coach	So why did you become a teacher?	Data gathering	Teaching context	Ask – teaching experience

## FINDINGS

Throughout the GTKY conversations, the coaches engaged in three kinds of talk: data gathering, sharing and educating, and rapport building. We present findings around these three kinds of talk in two ways. First, we provide excerpts to illustrate coaches' differing content foci when enacting these three behaviors. Second, we use percentages to highlight commonalities and differences in how the experienced coaches facilitated these conversations.

Overall, the most prevalent category of coach talk was rapport building because this topic surfaced in an average of

44% of the coach-spoken sentences. Sharing and educating was the second most prevalent category (38%) followed by data gathering (18%). Although this overall trend was evident across coaches, there were instances in which individual coaches deviated from this overall pattern. For example, Tom frequently enacted rapport building (52%) and data gathering (36%) but seldom deployed sharing and educating (12%) talk. Furthermore, Eileen evidenced a near-even split between the three types of talk, spending approximately one third of her time engaged in each category of talk. Table 6 contains percentages and counts for each coach for each category of talk and an average across coaches.

**Table 6**  
*Overall Percentage Distribution of Sentences Coded as Data Gathering, Sharing and Educating, and Rapport Building*

Code	Alice	Beth	Carter	Eileen	Jane	Laura	Maya	Ruby	Susan	Tom	Avg.
Data gathering (%)	7	14	13	32	14	14	22	21	12	36	18
Sharing and educating (%)	56	43	42	35	33	26	41	43	47	12	38
Rapport building (%)	37	43	45	34	54	60	38	36	41	52	44

### Data Gathering: Illustrations

When gathering data about teachers, coaches' questions coalesced around five topics (see Table 7), and we illustrate each content foci of coaches' data gathering in the following sections.

**Table 7***Percentage Distribution of Content Related to Coaches Data Gathering, Sharing and Educating, and Rapport Building*

Code/content	Alice	Beth	Carter	Eileen	Jane	Laura	Maya	Ruby	Susan	Tom
<b>Data gathering</b>										
Professional context (%)	18	52	53	54	40	42	27	36	41	34
Logistics (%)	0	0	3	0	0	0	4.2	0	0	5
Prior experience with PD and coaching (%)	41	2	19	0	27	5	0	25	14	0
Professional practice and beliefs (%)	29	31	13	29	33	32	54	13	23	29
Learning goals & needs (%)	12	14	13	17	0	21	15	26	23	32
<b>Sharing and educating</b>										
Professional context (%)	59	31	29	53	28	44	66	36	17	0
Logistics (%)	19	14	19	40	11	12	11	17	21	57
Learning goals and interests (%)	7	7	5	5	6	6	9	11	11	0
Professional practice and beliefs (%)	10	37	26	3	8	9	5	23	14	29
Foreground teacher learning (%)	6	12	22	0	47	29	9	13	37	14
<b>Rapport building</b>										
Positive rapport building (%)	14	20	36	30	17	13	18	16	25	19
Social rapport building (%)	14	33	11	5	15	24	24	5	35	0
Emotional rapport building (%)	72	47	53	65	68	64	58	79	39	81

**Professional Context**

To illustrate how coaches gathered data from teachers around the two codes in this category, we highlight Carter's questions. In his two conversations with teachers, Carter asked basic contextual questions (coded as ask – teaching experience) such as, “What grades have you taught?” Carter also asked more open-ended questions about his teachers' prior teaching experience, including, “What is your favorite thing about your teaching experience?” Furthermore, Carter gathered contextual data about his teachers' current roles and work environments, including teachers' access to math tasks (coded as ask – current role and context). These questions included, “How much access do you have to rich tasks, and do you know where to find them?” Professional context questions seemed to enable coaches to better understand their teachers' contexts, supporting the coaches in customizing their coaching efforts to specific teachers' needs.

**Logistics**

Coaches spent little energy gathering data about logistics, with only three coaches asking any questions related to conversational logistics (e.g., “Are you still at school now?”) and general logistics (e.g., “What works best for when you and I meet?”). Coaches spent more time sharing and educating when discussing logistics, and we return to this point in later sections.

**Prior Experience With PD and Coaching**

We characterized questions focused on prior experience with PD and coaching using two codes (i.e., ask – coaching experience and ask – experience with PD) and illustrate their use through Alice. In her two conversations, Alice asked her teachers questions about their prior experiences working one on one with a coach (e.g., “Have you done one-on-one coaching before with a coach?”). Alice also gathered data

about her teachers' background knowledge of the pedagogical content in the upcoming professional learning session (e.g., “Since this project will use the book, *Five Practices for Orchestrating Mathematics Discussions*, I was wondering what background you have with that book?”). Through these questions, Alice gathered data both about teachers' experiences engaging in the activity of one-on-one coaching and their prior familiarity with the content of upcoming professional learning sessions.

**Professional Practice and Beliefs**

To illustrate how coaches gathered data about teachers' typical instructional habits (coded as ask – teaching practice) and teaching beliefs (coded as ask – educational philosophy, vision, or beliefs), we highlight questions from Beth and Maya. Beth asked her teacher, “What kind of tasks do you usually do in your classroom? Do you do tasks like [the prior course session], or is that something new to you?” To understand teachers' instructional beliefs, philosophies, and visions, coaches used a variety of open prompts. For example, Beth invited teacher discussion with prompts, such as, “Tell me about your own math story.” Maya used different prompts, such as, “Who was one of your favorite teachers and what made them memorable?” Through these questions, Beth and Maya gathered data about teachers' current states of teaching as well as their beliefs and visions about their idealized classrooms.

**Learning Goals and Needs**

The final category in data gathering (i.e., learning goals and needs) involved coaches asking about teachers' professional growth goals (coded as ask – learning goals) and their rationale for joining the project (coded as ask – motivation to join). In contrast to the diverse ways coaches explored teachers' instructional practice and beliefs, questions

involving these codes tended to be more direct and explicit. To illustrate this pattern involving data gathering about teachers' professional growth goals, Tom asked both his teachers, "What goals do you have for yourself this year?" To understand teachers' hopes for their growth, coaches also asked direct questions about why teachers enrolled in the project. For example, Alice asked both her teachers, "What brought you into this project?" Coaches honored teachers as professionals who had the autonomy to select their own PD by explicitly tapping into teachers' perspectives about their own learning goals.

### **Data Gathering: Noteworthy Consistencies and Variability**

We identified two consistencies across the 10 coaches and their 18 conversations, along with two noteworthy differences. For the similarities, all 18 conversations featured data-gathering moves focused on both teachers' professional contexts and professional practices and beliefs. This finding suggested all 10 coaches valued gaining knowledge about the contextual features of teachers' current roles, along with their typical instructional habits and beliefs. Conversely, all coaches infrequently asked questions related to logistics; we identified only four logistical questions across all 18 conversations. Regarding variability, two categories in data gathering (i.e., prior experience with PD and coaching, learning goals and needs) had a large range across the coaches. For prior experience with PD and coaching, Beth, Tom, Eileen, and Maya spent little-to-no time gathering data on this topic, whereas at least 25% of questions from Alice, Ruby, and Jane invited teachers to discuss prior professional learning experiences. Similarly, the percentage of questions coded as learning goals and needs ranged from 0% (Jane) to 32% (Tom), highlighting different coaches' actions in terms of wanting to learn about teachers' learning interests.

Additionally, we found substantial diversity in the questions coaches asked to learn more about teachers' professional practice and beliefs. As previously shared, Beth prompted teachers to talk about their "math story" and a recent lesson that was successful. Maya asked her teachers about their favorite mathematics teacher and how this teacher influenced their current teaching. Alice and Eileen invited their teachers to talk about their perfect or ideal mathematics classrooms. Jane asked her teacher to describe their "mindset" for teaching mathematics and was more direct, asking her teachers to talk about specific instructional habits (e.g., how they typically launch and close lessons). In sum, the diversity in coaches' questions suggested gathering information about all facets of teachers' professional practice and beliefs is a large task requiring multiple approaches.

### **Sharing and Educating: Illustrations**

When sharing with and educating teachers, coaches' verbal statements centered around five topics (see Table 7), and we illustrate the different content foci in the following sections.

#### **Professional Context**

When making statements about their own professional contexts, the coaches shared information about their current coaching positions and contexts (coded as share – current role and context) and their previous experiences teaching and coaching (coded as share – teaching experience and

share – coaching experience, respectively). To illustrate, we highlight Maya's statements. Across her two conversations with teachers, Maya not only shared information about her prior teaching experience (e.g., "I started teaching in 2007. I started in a smaller school district, in the math department for a middle school for seventh and eighth grade."), but she also shared information about her previous coaching experience ("My last 4 years in K–12 public education, I was an instructional coach. I was outside of the classroom. I had students, but my students were teachers."). Additionally, Maya provided her teachers with information about her current professional context ("I am now working for [a midwestern university] with preservice teachers."). In sum, professional context statements established the coaches' current professional identities, authority, and contexts while drawing upon their prior coaching and teaching experiences.

#### **Logistics**

Logistical sharing statements provided teachers with information about the upcoming coaching sessions (coded as share – general logistics) and logistics regarding the GTKY conversations (coded as share – conversation logistics). To illustrate, Eileen started her conversation by sharing her discursive plan with her teachers, saying, "I have some questions to know you a little bit better, about your teaching experience and your classroom. Just to get a sense for who you are and what your experiences have been." These sentences were coded as share – conversation logistics because Eileen spoke directly about her plan for the GTKY conversation. Throughout the coaching conversation, Eileen touched on logistics as it related to the technology they would use in online coaching cycles (e.g., "The Swivl is just a robot. It's a pod that holds an iPad, and it's going to follow you."), which was coded as share – general logistics because Eileen shared details about technological logistics pertaining to future experiences. Overall, the sharing of such logistical statements provided teachers with important information about the timing and execution of the GTKY conversation and future coaching interactions and technology upon which they would be dependent in upcoming interactions.

#### **Learning Goals and Interests**

The learning goals and interests sharing category encompassed statements in which the coaches either discussed: (a) their current professional goals and desired growth (coded as share – professional goals) or (b) their reasons for participating in the current PD project (coded as share – motivation to join). To illustrate, across her four conversations, Ruby made clear her motivation for joining the project, saying, "My heart is working with teachers and working at rural schools." Furthermore, Ruby articulated her own professional learning goals, noting, "I'm going to come to these course sessions when I'm able. I can always learn from a different speaker. I feel like I will have my learner hat on." Although this category was not a prevalent talk category (see Table 7), 9 of 10 coaches briefly discussed their learning goals and professional interests. In doing so, the coaches positioned themselves as learners alongside their teachers, which appeared to be important for most of the project coaches. Professional Practice and Beliefs

When discussing their professional practice and beliefs, the coaches shared details regarding their current coaching

and/or teaching practices with teachers (coded as share – professional practice) and information about their overarching philosophy, vision, or beliefs regarding education (coded as share – educational philosophy, vision, or beliefs). To illustrate a statement coded as share – educational philosophy, vision, or beliefs, Beth shared her belief that students can persevere when problem solving if teachers can work to develop students’ agency and self-efficacy. She said, “If you can help [students] develop that agency and that self-efficacy that ‘I can do this!’—that is where you can get kids to persevere in problem solving.” The coaches’ statements functioned to establish themselves as professionals by sharing their teaching and coaching practices and beliefs with teachers.

### ***Foregrounding Teacher Learning***

Last, when coaches foregrounded teacher learning, they made sharing statements with teachers about what teachers might learn through their engagement in the project (coded as share – project learning and expectations) and how what teachers learned in the project might connect to other PD they had experienced (coded as share – coherence to other PD). To illustrate, Jane shared, “I think [your instructional goal] resonates heavily because *5 Practices*, it’s all about the quality of instruction and the quality of student thinking and the quality of teacher facilitation of using student thinking to drive lessons.” We coded this sentence as share – project learning and expectations because Jane discussed how her teacher’s learning goals would be addressed through the upcoming PD project. To depict a statement coded as share – coherence to other PD, Laura shared, “So it sounds like this project is in alignment with this current initiative.” In this statement, Laura established connections between the PD teachers would experience in the current project and other ongoing PD initiatives. In sum, foregrounding teacher learning statements centered teachers’ identities as learners in the context of the coaching partnership, which was essential given that the purpose of coaching is to support teacher learning in service of enhanced outcomes for students.

### ***Sharing and Educating: Noteworthy Consistencies and Variability***

Of the three behaviors, sharing and educating had the largest variability in all conversations, ranging from 12% (Tom) to 56% (Alice). In sharing and educating, noteworthy variability existed in the category of foregrounding teacher learning. Eileen did not align any of her talk moves with this category, whereas both Jane and Susan spent considerable time talking to their teachers about upcoming learning experiences and how these related to prior PD experiences. Additionally, substantial variability existed in the extent to which coaches shared their own professional practice and beliefs. For Beth and Carter, over one quarter of their sharing and educating moves focused on their own educational beliefs and/or coaching practices, whereas Eileen, Jane, Laura, and Maya rarely shared such content. For similarities, we noted two patterns. First, coaches seldom talked about their own learning goals and interests, with such moves ranging from 0%–11% of coaches’ sharing and educating moves. Conversely, all coaches, other than Tom, discussed their own professional context. Although the frequency of professional context talk ranged from 17%–66%

of all sharing and educating moves, the trend suggested a coach sharing about their own professional context may be an important part of introductory meetings in which the coach and teacher are not located in the same school or district.

### ***Rapport Building: Illustration***

Rapport-building statements were prevalent in all conversations, ranging from 34% (Eileen) to 60% (Laura) of all coded coach sentences (see Table 6). Although all coaches used rapport-building moves, we found notable distinctions in how coaches attempted to build rapport with teachers across the three categories from the RIAS (Roter & Larson, 2002; see Table 7).

### ***Positive Rapport Building***

Positive rapport building encompassed instances in which the coach used humor, compliments, and/or agreement when communicating with their teacher. Such positive rapport building moves typically were dispersed throughout the conversations and often were part of coaches’ responses after teachers shared information. To illustrate, we highlight the actions of Carter, who frequently used combinations of humor and compliments throughout his conversations when responding to his teachers. In one conversation, Carter invited his teacher to discuss her project learning goals. After the teacher shared their desire to grow students’ confidence in learning mathematics, Carter stated, “I really like that. That’s probably the best version of that I have ever heard. ‘Hey, you want to come do my job sometime?’” In this statement, the first two sentences were coded as compliment because Carter praised the teacher’s statements. The third sentence was coded as humor because Carter playfully suggested the teacher’s thoughtful statements qualified her to be a coach.

### ***Social Rapport Building***

Social rapport building involved the coach asking or sharing information related to one’s personal life. For Ruby, Eileen, and Carter, social rapport-building moves were limited to brief questions or singular statements about a teacher’s family in response to a shared personal statement (e.g., “How old are your kids?”). In contrast, Alice and Maya dedicated portions of the conversation for personal discussion that was catalyzed using social rapport-building moves. For example, both coaches provided teachers with open-ended prompts (e.g., “Tell me about yourself.”) at the start of conversations, allowing teachers the opportunity to talk about their personal lives. After teachers shared, the coaches reciprocated, sharing similar personal information through short monologues. In Alice and Maya’s conversations, after these short monologues from both the coach and the teacher, no additional social rapport-building moves were used. For Beth, Susan, and Laura, social rapport-building moves were salient across the entire conversation. For example, Laura routinely interjected personal anecdotes about family, typical daily routines, idiosyncratic behaviors, and pets throughout the conversation. In sum, coaches’ varied use of social rapport-building moves made personal discussion notable features of some conversations, but not all.

### ***Emotional Rapport Building***

Emotional rapport-building moves encompassed instances in which the coach expressed empathy, validation, concern,

partnership, or encouragement or paraphrased teachers' statements. Like positive rapport-building moves, different emotional rapport-building moves were used in tandem and typically were part of coaches' responses after teachers shared information. For example, Eileen tended to use validation and paraphrase moves after teachers shared about what "students would know and be able to do" in their "perfect classroom." As one example, after the teachers shared, Eileen said:

*So this connection to the real world seems very important, plus student agency and discourse and then rich tasks. And I love, Ella, how you said that there's still a need for the management piece, because the engagement has to be high to be able to do that.*

Eileen's first sentence was coded as paraphrase because she summarized the teachers' statements. Eileen then used a validation move, communicating that the teachers' ideas were important.

A second trend in coaches' use of emotional rapport building was communicating concern for and a desire to be respectful of teachers' limited time (coded as concern) during their conversations. For example, in five instances across a single conversation, Jane shared statements such as, "I really want to respect your time." In this statement, the coach attended to the teacher's well-being by respecting the limited amount of time the teacher had to meet.

A third trend in the coaches' use of emotional rapport-building moves was coaches delivering short monologues involving explicit statements about partnership. For example, Alice shared the following in one of her conversations:

*I think we have a lot of the same beliefs towards teaching and learning. So, this is going to be a super fun partnership. And from my perspective, as a coach, I always enter into it as a true partnership. Like, I want to take just as much shared ownership of the lesson. And even though I won't ever be in your classroom, what happens is on both of us. It's a learning opportunity for both of us.*

All sentences in Alice's statements were coded as partnership, as she spoke about her excitement to begin a new partnership and her role in the partnership in forthcoming interactions.

### **Rapport Building: Noteworthy Consistencies and Variability**

Perhaps the most noteworthy finding in this study is the prevalence of emotional rapport-building moves found across all 10 coaches. Such moves were prominent for all coaches, ranging from 47% (Beth) to 81% (Tom) of all moves coded as rapport building. In this broad prevalence, coaches used emotional rapport-building moves in unique ways. For example, Beth tended to use statements of empathy and partnership, whereas Eileen used numerous paraphrase and validation moves. Despite these subtle differences, coaches also exhibited similarities with all coaches using emotional rapport-building moves in tandem with data-gathering moves (e.g., sharing statements of validation, empathy, or encouragement after teachers shared ideas). Furthermore, 9 of 10 coaches delivered monologues about partnership and

repeatedly shared statements of concern regarding teachers' limited time.

In contrast, there was substantial variability in the coaches' use of social rapport-building moves, which ranged from 0% (Tom) to over 30% (Beth and Susan) of all rapport-building moves. This trend was noteworthy because we anticipated these meetings would feature social discussion, which was a chance for a coach and teacher to get to know each other on a personal level prior to academic-focused interactions. Social rapport-building moves also played different roles in the conversations for coaches who used them. For example, for Alice and Maya, personal discussion was confined to alternating monologues, whereas Beth, Susan, and Laura infused personal discussion across the entire conversation. In sum, the findings suggested emotional rapport-building moves were critical for all coaches, though each coach varied slightly in the moves they favored. In contrast, social rapport-building moves were not a common feature of all conversations and appeared to be more individualistic.

## **DISCUSSION**

Prior research has shown one-on-one coaching can be an effective way to support mathematics teachers to enact ambitious teaching practices (Kraft & Hill, 2020; Stein et al., 2022; Witherspoon et al., 2021). Yet, research on mathematics coaching has tended to emphasize outcomes of coaching with less focus on unpacking the moment-to-moment interactions through which such support unfolds. Responding to recent calls for descriptive analyses that illuminate how mathematics coaches navigate the complex task of providing support that is both responsive and intentional (Yurekli & Stein, 2024), this study offered new insights into the interactional practices mathematics coaches use when initiating coaching partnerships. Our analysis of experienced coaches' GTKY meetings revealed how coaches begin establishing relationships and pedagogical focus in preparation for online coaching cycles aimed at helping teachers adopt ambitious instructional practices. Our findings extended existing coaching knowledge in at least three ways.

First, the analysis revealed both consistencies and differences in how mathematics coaches facilitated their initial conversations with teachers. Because each coach and teacher brought distinct goals, contexts, experiences, and personalities to these interactions, some variation was expected. However, consistencies across the 10 experienced coaches pointed to practices that may represent salient features of early coach-teacher interactions preceding the intensive, intellectually demanding work of supporting the use of ambitious teaching practices. For example, all 18 conversations included data-gathering moves focused on teachers' professional contexts as well as their professional practices and beliefs, indicating coaches prioritized understanding both the contextual features of teachers' roles and their typical instructional approaches and beliefs. Given that effective mathematics coaching must be responsive to teachers' unique contexts and needs, these early conversations may serve as critical opportunities for coaches to learn about teachers' current practice to tailor support accordingly (Kochmanski & Cobb, 2023). Moreover,

the frequent use of emotional rapport-building moves by all 10 coaches may reflect the relational groundwork required for coaching aimed at ambitious mathematics teaching, work that often asks teachers to take professional risks, make their teaching public, and engage in deep reflection about practice. The consistencies identified in this study may illuminate how experienced mathematics coaches commonly prioritize certain discourse moves before engaging in more instructionally focused collaboration.

To illustrate these distinctions further, consider the coaching actions of Tom and Beth. Across two conversations, Tom never used social rapport-building moves and used relatively few sharing and educating moves. Beth, in contrast, averaged 22 social rapport-building moves across her conversations and frequently shared her own professional context and professional practice and beliefs. Despite these differences, both Tom and Beth—along with all other coaches—consistently used numerous emotional rapport-building moves and favored questions targeting teachers' professional practices and beliefs and learning goals and needs. These patterns suggested that although some moves (e.g., social rapport building) may reflect an individual coach's personal style, others (e.g., emotional rapport building, data gathering) appear to be characteristic features of initial coaching conversations that set the stage for the deeper, instructionally focused work of supporting ambitious mathematics teaching.

Second, virtual mathematics coaching has become increasingly prevalent, and prior studies have shown it (a) is an effective way to support teacher development (Kraft & Hill, 2020) and (b) can make coaching accessible to all teachers regardless of their geographical location (Carson & Choppin, 2021; Gregory et al., 2017). Despite the promise of virtual mathematics coaching, researchers have noted a potential challenge of online learning interactions: the lack of in-person connections can lead to impersonal experiences (Kidd, 2020). As coaching assumes a strong, authentic coach–teacher partnership, understanding how mathematics coaches establish the foundation for teacher partnerships in online spaces is critical. This study's findings are applicable to mathematics coaches working one on one with teachers in either in-person or online modalities. Prior studies (Russell et al., 2020; Stein et al., 2022; Witherspoon et al., 2021) and practitioner texts (Baker & Knapp, 2023; Smith et al., 2024; West & Cameron, 2013) have suggested all mathematics coaches, regardless of coaching modality, are tasked with acting responsively to an individual teacher's unique needs, goals, and contexts. Furthermore, all coaches face the challenge of limited time to interact with teachers (Kane & Rosenquist, 2019; Saclarides & Lubienski, 2020). Thus, our study filled a critical gap in mathematics coaching literature, presenting detailed descriptions of the discursive decisions experienced coaches made when using a short amount of time to establish conditions for future coaching.

Finally, the adaptation and use of the RIAS as an analytic lens for coaching conversations provided methodological contributions for studies examining mathematics coaches' and small group facilitators' discursive behaviors. Prior studies on how mathematics coaches distribute intellectual authority during coaching cycle conversations have focused

on coaches' use of directive and reflective coaching moves (Gillespie et al., 2025; Saclarides et al., 2024; Witherspoon et al., 2021). Directive moves (e.g., suggesting, explaining) involve a coach positioning themselves as the knowledgeable authority in a conversational moment, and reflective moves (e.g., questioning) position the teacher as the primary authority. The primary behaviors of data gathering and sharing and educating in the RIAS parallel reflective and directive coaching moves, respectively. However, data gathering and sharing and educating do not necessarily connect to the larger construct of intellectual authority and instead describe basic and observable facilitative behaviors, making this framework applicable in diverse professional learning contexts. For example, directive coaching moves lack applicability in a GTKY conversation because a coach telling a teacher about their professional background does not position the coach as a knowledgeable authority in the same way as a coach explaining mathematical content to a teacher during a planning discussion (Gillespie et al., 2025; Saclarides et al., 2024). However, the broader behavior of sharing and educating would be applicable to preliminary discussions as well as planning and reflective discussions in coaching cycles because it characterizes a fundamental facilitative behavior. Furthermore, the rapport-building codes provide practical ways to capture coaching moves that may foster relationships and emotional connection in discussions focused on content and pedagogy, a useful contribution given that coaching assumes an authentic and trusting partnership between two educators (Baker & Knapp, 2023; Smith et al., 2024; West & Cameron, 2013). The broad applicability of our coding scheme also could be used to understand the discursive behaviors of facilitators working with small groups of mathematics teachers. Prior studies have shown that developing a shared sense of community is a key condition of collaborative small-group learning experiences (Lefstein et al., 2020; van Es, 2012), and the framework in this study could support the field in understanding how facilitators establish community. Thus, our study presents a framework that can be adapted and used to analyze the ways coaches, and other facilitators, engage teachers in both intellectual discussion about mathematics teaching and learning while building rapport.

## IMPLICATIONS

This study has implications for researchers who wish to build upon its findings and for practitioners (e.g., coaches and other school leaders in school districts).

### Implications for Research

Our sample was relatively small and consisted of 10 experienced mathematics coaches who engaged teachers in online coaching cycles in the context of a grant-funded PD project. Partnering with 10 experienced mathematics coaches was an intentional sampling decision to draw upon our coaches' extensive expertise and showcase the kinds of discourse possible in GTKY conversations. However, results should be interpreted in this particular context because they do not necessarily generalize to all coach–teacher interactions. Future researchers can build upon this study's findings and partner with a larger, more diverse group of mathematics coaches, including novice coaches who are in

their first few years serving as coaches and coaches who coach primarily in person as opposed to in virtual settings.

As previously discussed, the primary purpose of this exploration was to better understand the types of discourse possible during initial coach–teacher conversations, with the goal of establishing conditions for upcoming coaching cycles. As such, this study was descriptive in nature because we sought to unpack the black box of what those conversations look like. However, a limitation of the study was our focus on coaches’ actions without attention to teachers’ responses or the subsequent coaching cycle conversations. Thus, our study was unable to make any empirical claims regarding the extent to which these coaching actions and conversations were productive. Although the common practices displayed by experienced coaches may signal features associated with productive coaching (Gibbons & Cobb, 2016; Witherspoon et al., 2021), future research is needed to examine how coaches’ facilitative actions in initial conversations relate to teachers’ responses and outcomes from subsequent coaching cycles before drawing such conclusions.

Last, our team unearthed methodological complexities during the analytic process. As previously shared, we assigned codes at the sentence level and aggregated counts for categories of talk, so we could make claims about the prevalence of talk categories for individual coaches and for the coaches as a whole group. We noticed that when gathering data about a teacher’s beliefs regarding teaching and learning, a coach may have posed just one question that generated a thoughtful and thorough response from the teacher. We also noticed that when sharing information about their own beliefs regarding teaching and learning, the same coach may have needed to share many sentences to articulate their beliefs fully. The inherent differences between asking questions and providing information may have created an imbalance in the counts, making some talk categories more prevalent than others. We invite researchers to continue to grapple with us about how to best code and count such data to provide descriptive analyses.

### **Implications for Practice**

Mathematics coaches may understand the importance of establishing conditions with teachers ahead of future coaching work centered on ambitious mathematics teaching, but they may not know how to establish those connections. The framework in our study, along with our illustrative examples, can serve as professional learning tools to introduce mathematics coaches to the three major categories of talk (i.e., data gathering, sharing and educating, rapport building) and the associated subcodes, definitions, and examples. From this starting place, coaches can then be supported to use the framework as a planning and reflection tool for initial interactions with teachers. We encourage those tasked with providing mathematics coaches with ongoing, job-embedded professional learning opportunities to use our framework and findings to support coaches in considering diverse ways to discursively establish conditions for future coaching work with teachers.

For facilitators of professional learning experiences for mathematics coaches (e.g., district-level administrators, principals), we emphasize that the framework is not prescriptive, and the categories do not represent a checklist of topics to be covered in preliminary discussions. Instead, the framework offers a broad menu of discursive behaviors and content that may enable coaches to responsively engage individual teachers based on their unique needs and varied contexts. For example, if a mathematics teacher is unfamiliar with ambitious mathematics teaching practices or has never had professional or personal interactions with their coach before, it may be important for the coach to discursively spend more time deploying rapport-building moves to establish a trusting coach–teacher relationship. Conversely, if a coach is working with an experienced teacher with whom they already have a strong personal relationship, the coach may spend more time deploying data gathering and sharing and educating moves.

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