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Two Beginning Teachers' Epistemic Discursive Moves and Goals in Small Groups in Mathematics Instruction

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Students' participation in epistemic practices, which are related to knowledge construction on the part of students, is becoming a crucial part of learning (Goizueta, 2019). Research on epistemic practices in science education draws attention to teachers' support of students to engage in epistemic practices in mathematics instruction. The research highlights a need for incorporating epistemic goals, along with conceptual and social goals, into instruction to promote students' epistemic practices. In this paper, I investigate how teachers interact with students to integrate epistemic goals. I examined 24 interaction excerpts that I identified from six interview transcripts of two beginning teachers' mathematics instruction. Each excerpt was related to the teachers' talk about their specific interaction(s) in a small group. I explored how each teacher's discursive moves and goals were conceptual, social, and epistemic-related as they intervened in small groups. I found that both teachers used conceptual, social, and epistemic discursive move but their discursive moves were related only to social and social goals. This paper suggests supporting teachers to develop epistemic goals in mathematics instruction, particularly in relation to small groups.

Keywords: epistemic practices, interaction with small groups, beginning teachers, mathematics instruction.
MESC Classification: B59
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I. INTRODUCTION

Students' epistemic practices have been an essential purpose of education and teaching (e.g., Ernest, 1993; Richardson, 2003; Vygotsky, 1978). I define epistemic practices in this paper as interactional processes in which students construct and evaluate school mathematics as knowledge (Kelly, Crawford, & Green, 2001; Kelly & Licona, 2018; Knorr-Cetina, 2007). Students often engage in epistemic practices in mathematics classrooms (Goizueta, 2019). Students' active engagement in epistemic practices requires teachers to interact with their students in ways that engage students in such epistemic

practices. Even though they do not explicitly use the notion of epistemic practices, teachers' discursive moves that can meet these needs are well known in mathematics education (e.g., Chapin, O'Connor, O'Connor, & Anderson, 2009; Herbal-Eisenmann, Steel, & Cirillo, 2013; Kazemi & Stipek, 2009). In a recent study on students' interactions with peers in small groups, Goizueta (2019) notes that "if we expect teachers to mediate the development of the classroom mathematics culture" that support students in engaging actively in epistemic practices, "they should be able to take part in meaningful (meta)mathematical conversations with their students" (p. 10). This statement indicates that teachers need to have meaningful interactions with students to promote students' epistemic practices and, importantly, that they should set up clear goals that create the classroom mathematics culture through interactions with students.

Utilizing the concept of epistemic practices (Knorr-Cetina, 2007), on the other hand, science education has made progress on teaching practices promoting students' epistemic practices (Kelly & Licona, 2018) Science education has also integrated epistemic goals that encourage students' epistemic practices into science instruction (e.g., Duschl, 2008; Jiménez-Aleixandre & Crujeiras, 2017; Stroupe, 2014). Promoting these epistemic practices on the part of teachers and students has been an explicit emphasis of science teaching and learning (Kelly et al., 2001; Sandoval, Bell, Coleman, Enyedy, & Suthers, 2000; Stroupe, 2014). This emphasis on epistemic practices and epistemic goals in science education is suggestive for mathematics education given students' engagement in epistemic practices can support them to develop epistemic agency in their learning (Stroupe, 2014). As such, I build this study on research done in science education to explicitly re-think how teachers' discursive moves could support students' epistemic practices in mathematics instruction.

One prevalent context in which teachers support students to engage in epistemic practices is small groups where students interact with each other to work on group tasks in mathematics classrooms. The context of small groups resonates with the view of several researchers on epistemic practices. Knorr-Cetina (2007) states that epistemic practices are what people do in relation to knowledge construction and learning to "enact their lives" (p. 364). These epistemic practices are "the socially organized and interactionally accomplished ways that members of a group propose, communicate, evaluate, and legitimize knowledge claims" (Kelly & Licona, 2018, p. 140). Such interactions between students need intentional support from teachers (e.g, Goizueta, 2019; Kazemi & Stipek, 2009). However, research on supporting students in working in small groups has emphasized conceptual and social aspects of small groups (Davidson, 1990; Featherstone et al., 2011; Horn, 2017; Lindquist, 1989; Yackel, Cobb, & Wood, 1991). This emphasis does not shed light on ways teachers could promote students' epistemic practices in small groups and integrate epistemic goals into mathematics instruction. As such, I conducted an

exploratory study to investigate teachers' discursive moves that support students' epistemic practices and teachers' epistemic goals in the context of small groups in mathematics classrooms.

This paper explores how teachers interact with students to promote students' epistemic practices and whether these discursive moves are connected to different goals, including epistemic goals, in interacting with students in small. This exploratory study can support mathematics teacher education researchers to initiate a conversation on helping students engage in epistemic practices in small groups. This paper can contribute to the field's understanding in relation to how teachers should support students' epistemic practices in mathematics instruction.

II. CONCEPTUAL FRAMEWORK

1. INCORPORATING CONCEPTUAL, SOCIAL, AND EPISTEMIC GOALS

Several researchers in science education recommended that science instruction incorporate epistemic goals along with conceptual and social goals (e.g., Duschl, 2008; Jiménez-Aleixandre & Crujeiras, 2017; Kelly & Licona, 2018). In a review that synthesized the learning sciences research, the science studies research, and science education research over the past 50 years, for example, Duschl (2008) proposes a need to incorporate epistemic goals while balancing these goals in science instruction. To support students to achieve these goals, students should have more opportunities to learn science in a context where teachers integrate these goals into science teaching.

Using Sroupe's (2014) descriptions of conceptual, social, and epistemic goals could help us understand what it means to have each of these three goals in teaching. Teachers aim to enable students to use theories, ideas, or models to reason with and about (conceptual goals). Teachers have a purpose of supporting students to agree on norms and routines for handling, developing, critiquing, and using ideas (social goals). Teachers seek to encourage students to think about how students decide what they know and why they are convinced by what they know (epistemic goals). Researchers in science education show that science educators are becoming more aware of the need for incorporating these goals, particularly epistemic goals, into teaching (Jiménez-Aleixandre & Crujeiras, 2017; Kelly & Licona, 2018).

Mathematics education seems to be aware of these epistemic goals. For example, Common Core State Standards for Mathematics (National Governors Association Center for Best Practices Council of Chief State School Officers, 2010) expects teachers to support students to engage in these epistemic practices through the Standards for Mathematical Practice (e.g., MP 3. Construct viable arguments and critique the reasoning of others).

National Council of Teachers of Mathematics [NCTM] (2014) recommends teaching practices relevant to these epistemic goals (e.g., facilitating meaningful mathematical discourse). However, little research has yet been done to explicitly incorporate the concept of epistemic goals that promote students' epistemic practices in mathematics instruction. Research with a focus on epistemic practices and goals would contribute to understand ways to support students to develop their epistemic agency in mathematics classrooms. I suggest that researchers who are interested on epistemic practices need to know first about whether epistemic goals are currently incorporated into mathematics instruction.

2. INTERACTIONAL ASPECT OF EPISTEMIC PRACTICES IN TEACHING

As shown in the definition in the introduction, epistemic practices occurred through interaction among actors in classrooms (Kelly et al., 2001; Kelly & Licona, 2018). Knowledge is co-constructed through interaction among actors, such as teachers and students, in a classroom context (Richardson, 2003; Vygotsky, 1978). The interactional aspect of epistemic practices indicates that teachers' interaction with students would help achieve epistemic goals and often that teachers have to press students to engage in such practices (Stroupe, 2014).

Mathematics education shares the view that teachers and students participate in epistemic practices through interaction in mathematics instruction. The NCTM's documents (1989, 2000) include communication as one of the standards, including problem solving, reasoning, and mathematical connection, for the students by encouraging students to communicate their mathematical thinking coherently and clearly to peers, teachers, and others. Sfard, Nesher, Streefland, Cobb, and Mason (1998) argued that learning mathematics occurs through communication, supporting students' mathematical knowledge construction. Ernest (1993) also points out that "sustained two-way participation in such conversations is necessary to generate … mathematical knowledge and competencies and not some partial or distorted version" (p. 22). Recently, Goizueta (2019) shows that students engage in epistemic practices through interactions with peers and teachers in the context of small groups. All things considered, teachers' interaction is vital for promoting students' epistemic practices in mathematics instruction. As such, I argue for investigating mathematics instruction in terms of teachers' interactions with students that may support students to engage in epistemic practices.

3. PROMOTING EPISTEMIC PRACTICES IN SMALL GROUPS

In mathematics education, research on small groups has acknowledged the academic and social goals for student learning (e.g., Davidson, 1990; Horn, 2017; Lindquist, 1989; Yackel, Cobb, & Wood, 1991). In relation to the benefits for small groups in mathematics classrooms on the part of students, Lindquist (1989) notes that small groups can "encourage students to work together, a social skill that all persons need," and "increase the possibility of students solving certain problems or looking at problems in a variety of ways" (pp. 629-630). Similarly, outside of mathematics education, Cohen and Lotan (2014) note that students can learn academically in small groups, including conceptual learning and creative problem solving, and that they can also learn to listen to or work with other students. Particularly, when they work together, students have more opportunities to use each other as a learning resource rather than to depend on external help in comparison to whole-class instruction (Hertz-Lazarowitz & Shachar, 1990). These researchers claimed that participating in small groups can be effective for academic and social learning benefits, indicating both academic and social goals of using small groups. It is not clear how epistemic goals are mixed with academic goals. Instead, academic goals above seem to be closer to conceptual goals given that they explicitly mention conceptual goals ("students solving certain problems" or "conceptual learning and creative problem solving") rather than students' engagement in epistemic practices. As such, I use conceptual goals with academic goals interchangeably in this paper.

Building on constructivism (e.g., Richardson, 2003; Vygotsky, 1978), small groups could be a potential learning context where students engage in epistemic practices. There is a notion, however, that "simply placing students in groups and telling them to work together does not in and of itself" guarantee that learning will occur on the part of students (Johnson & Johnson, 1990, p. 104). The statement suggests that simply putting students in groups will not engage students in epistemic practices. In mathematics education, realizing the small group's potential benefits from epistemic practices requires students to actively participate in small groups through interactions with peers and teachers (e.g., Goizueta, 2019; Wood & Kalinec, 2012). Research on teachers' interaction with small groups has shown that teachers interact with small groups in ways to promote student learning (e.g., Brodie, 2000; Dekker & Elshout-Mohr, 2004; Ding, Li, Piccolo, & Kulm, 2007; Featherstone et al., 2011; Gillies & Boyle, 2006; Hoffman & Mercer, 2016; Meloth & Deering, 1999; Webb, 2009). Even though these researchers are likely to agree with the view of small groups as a potential context for epistemic practices, these studies did not discuss how teachers' interaction support students' epistemic practices, which is to achieve epistemic goals.

In this paper, I pay attention to teachers' discursive moves in teachers' interaction with students, which increases students' epistemic practices in mathematics instruction. There are two reasons for the specific focus on teachers' discursive moves. First, teachers'

discursive moves can promote students' construction of mathematics understanding (Chapin, O'Connor, O'Connor, & Anderson,2009; Herbal-Eisenmann, Steel, & Cirillo, 2013; Kazemi & Stipek, 2009). Second, students interact with other students in the way teachers interact with students (e.g., providing help behavior or challenging each other) in small groups (Brodie, 2000; Ehrenfeld & Horn, 2020; Stroupe, 2014).

4. CONNECTIONS BETWEEN EPISTEMIC GOALS AND DISCURSIVE MOVES

Stoupe (2014) provides an explicit example of discursive moves that teachers may use to promote students' epistemic practices in small groups. Working with five secondary beginning science teachers, Stroupe's (2014) work shows a discursive move of "epistemic press on students' science ideas" used by all five teachers (p. 499). Building on Stroupe (2014), I consider this epistemic press-related move to be an epistemic discursive move to achieve epistemic goals. These five teachers were divided into two categories: whether or not their teaching was aligned with ambitious teaching in which teachers support students to shift "students' roles from passive information recipients to epistemic agent" (Stroupe, 2014, p. 488). Three teachers, whose teaching was aligned with ambitious teaching, used the discursive move that "asked each other for evidence or ideas to support or refute prior statements" (e.g., "how do you know that?" "What is your evidence?" "Unpack that claim some more") (Stroupe, 2014, p. 499).

On the other hand, the other two beginning teachers, whose teaching was aligned with traditional teaching, also used an epistemic discursive move in ways to focus on "the correctness of ideas" (e.g., "What is wrong with what you just said?") (Stroupe, 2014, p. 499). Unlike the first three teachers, the latter two teachers lacked epistemic goals to promote students' epistemic practices in small groups. As a result, their epistemic discursive moves focused more on the correctness of students' ideas, rather than epistemically supporting their students to engage in knowledge claim, production, and evaluation.

Stroupe's (2014) study suggests re-thinking teachers' discursive moves in mathematics instruction in terms of whether teachers have epistemic goals in mind. There have been many studies on teachers' discursive moves in mathematics education (e.g., Chapin, O'Connor, O'Connor, & Anderson, 2009; Franke et al., 2015; Herbal-Eisenmann, Steel, & Cirillo, 2013; Hufferd-Ackles, Fuson, & Sherin, 2004; Kazemi & Stipek, 2009). For example, teachers ask questions "to uncover the mathematical thinking behind the answers" (Hufferd-Ackles, Fuson, & Sherin, 2004, p. 92). Teachers also use talk moves in ways to support students to engage in each other's ideas (Franke et al., 2015). These studies show

teachers' discursive moves in mathematics instruction similar to Stroupe's (2014) epistemic press-related discursive move. These studies, however, do not explicitly show how such discursive moves are related to epistemic goals, which raises a concern that such discursive moves may not fully support students in engaging in epistemic practices without having epistemic goals in mind. In relation to small groups, it also informs that using epistemic press-related discursive moves intervening in small groups may not necessarily promote students' epistemic practices. Therefore, I investigate in this paper teachers' discursive moves and their connection to different goals with a focus on whether epistemic goals are related to teachers' discursive moves as they intervene in small groups in mathematics instruction.

Building on the argument I have built on in this section, I pose two research questions that drive this paper. How do teachers use discursive moves related to epistemic practices in interacting with small groups in mathematics classrooms? How do teachers use discursive moves related to epistemic goals as well as conceptual and social goals in interacting with small groups in mathematics classrooms?

III. METHODS

1. PARTICIPANTS

Two teachers, Leslie and Marva (pseudonyms), were selected as participants in this study from a longitudinal research project named Developing Ambitious Instruction. They were beginning teachers in the sense that they were in their second or third year in teaching careers in 2018-2019. I recruited them because they reported they had implemented small groups regularly as an instructional structure to teach mathematical concepts and decided to participate in the study.

Leslie was in the third year of her teaching career in 2018-2019. She taught at a private Catholic school for K-8 students, which was located in a city area. She taught 20 fourth-grade students in her classroom. Students in her classroom as well as in the school were predominantly White. Her teaching subjects included Social Studies, English Language Arts, and Science. Mathematics was not a subject area assigned for her to teach. However, she had integrated mathematical concepts into Social Studies lessons. Even though mathematics was not her teaching subject, I recruited her because her teaching was aligned with this study's focus on ways teachers intervened in small groups where students worked together on mathematical tasks.

Marva was in the second year of her teaching career in 2018-2019. She taught at a public charter school for K-12 students, which was located in an urban city area. This area was

highly diverse in race/ethnicity, culture, and language, which was reflected in the school as well. She taught 23 first-grade students in her classroom. Seventy-three percent of the students were English Language Learners. All their parents were from Bengal, Yemen, Bosnia, and Poland. Her teaching subjects included Mathematics, Social Studies, English Language Arts, and Science.

2. DATA COLLECTION AND SOURCES

In this section, I describe the data collection process and data sources. First, I explain how I used stimulated recall interviews to collect interview data. Second, I present the data sources I obtained as a result of the stimulated recall interview. For this study, I received approval from the Institutional Review Board (IRB) at the university.

I conducted three stimulated recall interviews per teacher (Dempsey, 2010; Nguyen, McFadden, Tangen, & Beutel, 2013; Stough, 2001). The reason for using stimulated recall interviews as the way to collect the data was that data from stimulated recall interviews give the researcher "a valuable source of information on the teacher's theory of action as well" in that stimulated recall responses allows the teacher to explain why they chose one course of action over another in the classroom (Marland & Obsborne, 1990, as cited in Stough, 2001, p. 3).

Before each stimulated recall interview, I first video-recorded the entire length of a mathematics lesson. As a result, I obtained video recordings of six different mathematics lessons, three of which came from each teacher. The lessons lasted about 51 minutes on average and ranged from 41 minutes to 60 minutes. The number of small groups was four groups of four to five students in Leslie's lessons and eight groups of two or three students in Marva's lessons. Second, watching each video recording, I identified four or five episodes of interaction in each video where I could see teachers interact with students in a productive way (e.g., Chiu, 2004; Dekker & Elshout-Mohr, 2004; Featherstone et al., 2011; Gillies & Boyle, 2006). These approaches included asking students to evaluate other students' work, asking students to explain their mathematical thinking, encouraging students to work together, and mediating students' thinking.

During each stimulated recall interview, I had the teacher watch each interaction episode I had identified prior to the interview. After watching each episode, I asked the teachers to explain, elaborate on, and reason about what they noticed, what they thought went on in the small group, where they learned the interaction, and how they viewed themselves as teachers when interacting with students in the small group. Even though I identified five moments in some video-recordings, I asked the teachers to elaborate four interaction episodes due to time constraints. It is possible that the teachers might intend an epistemic goal in the fifth interaction episode. I chose four episodes in which the teachers asked

several questions or made comments, followed by students' responses, instead of asking students a short question to check-in and leaving them. I conducted each interview in about 60 minutes in the afternoon on the same day I observed the lesson. In other words, I video-recorded a mathematics lesson in the morning, analyzed the video to select four or five moments to elaborate, and completed each interview in the afternoon on the same day. I did all on one day according to Stough (2001)'s suggestion that "stimulated recall procedures should be conducted as soon as possible after a task is completed" (p. 2). The interview data were audio-recorded and fully transcribed for analysis.

As a result, the data resources were 24 interaction excerpts, four of which came from each of the six stimulated recall interview transcripts. Each excerpt consisted of two parts- 1) a transcription of the teachers' verbal interaction with students in a small group and 2) a transcription of their explanation, elaboration, and reasoning about their interaction. I used the first part to understand teachers' discursive moves in terms of being epistemic, conceptual, and social and the second part of making sense of goals (epistemic, conceptual, and social) they had in mind as they interacted with students in small groups.

3. DATA ANALYSIS

I analyzed the 24 interaction excerpts to examine ways the two beginning teachers interacted with students in small groups (discursive moves) and for what purposes (goals). Using a thematic analysis (Glesne, 2011), I coded and categorized teachers' discursive moves, identified specific themes, and compared themes to find patterns. I took three steps to analyze the 24 interaction excerpts.

First, reading a transcription of the teachers' interaction with students in a small group in the 24 interaction excerpts, I coded both teachers' interactions with students regarding conceptual, social, and epistemic discursive moves (See Appendix A). The unit of analysis was teachers' discursive moves (a set of questions or comments) in the transcription. For conceptual discursive moves, I looked for cues related to teachers' focus on students' mathematical thinking (e.g., providing content-related help or problem-solving progress). I also looked for cues related to social discursive moves (e.g., teachers' reminders related to talk norms or asking students to respect peers). For epistemic discursive moves, beginning with codes from Stroupe's (2014) epistemic discursive moves used by the beginning teachers, I looked for cues related to knowledge claim, production, and evaluation (e.g., "what did you think of the problem?" "how do you know that?" "What is your evidence?" "Do you agree with his idea and why?"). In coding, I did not count if a teacher repeated the same question after a student responded to a question. As a result, I obtained 35 units from 24 excerpts, each coded as epistemic, conceptual, or social.

Second, reading a transcription of their explanation, elaboration, and reasoning about their interaction in the 24 interaction excerpts, I analyzed the excerpts to identify descriptions related to goals or purposes that the teachers reported as they were asked why they interacted in the way they did. The unit of analysis was teachers' descriptions related to goals or purposes (e.g., "get them all to realize that they're all on the same page"). I coded each description in terms of conceptual, social, and epistemic goals (See Appendix B). As a result, I obtained 33 units and coded them as epistemic, conceptual, or social. The number of the units regarding goals were not necessarily the same as those regarding discursive moves because I coded a transcription of their explanation, elaboration, and reasoning about their interactions in each interview transcripts.

Third, I analyzed each excerpt to understand the teachers' different discursive moves and their connections to epistemic moves as well as conceptual and social goals. Specifically, I examined discursive moves in each interaction excerpt and what both teachers said about their goals related to the interaction in the excerpt.

4. INTERRATER RELIABILITY

To measure the interrater reliability, which dealt with the reliability of my coding process using the codes (See Appendices A and B), I worked with a mathematics educator with coding experience. To double code part of the whole code, I used 20 percent of the excerpts related to the codes of discursive moves and goals. Before coding the data, we read each code's description together. We then coded the excerpts independently and compared each other's coding. The agreement rate was 86 percent for discursive moves and 89 percent for goals. After discussing the reasoning behind our coding, the disagreements were resolved.

IV. FINDINGS

1. BOTH TEACHERS' DISCURSIVE MOVES IN SMALL GROUPS

Concerning discursive moves, overall, I found that even though Leslie and Marva taught in different areas (Leslie-city area/ Marva-urban area), both teachers used conceptual, social, and epistemic discursive moves as they interacted with students in small groups (See Figure 1). Two distinctions between the teachers were that Leslie's discursive moves were more conceptual than Marva's and that Marva engaged in social and epistemic discursive

moves slightly more than Leslie. I present conceptual, social, and epistemic moves that both teachers interacted with students in small groups.

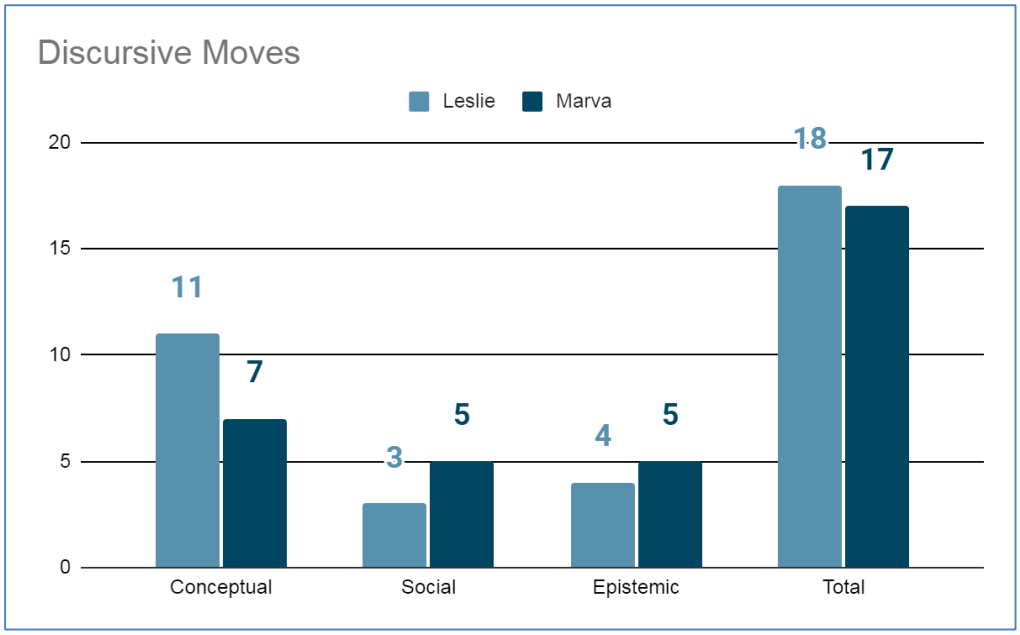

Figure 1. Discursive moves of Leslie and Marva

For conceptual discursive moves, both teachers provided content-related help or checked in the problem-solving process. The following example comes from Leslie's third lesson. In this lesson, the students in small groups had worked on addition, money, and decimals in teaching scarcity and opportunity cost. The students engaged in a group activity based on a hypothetical scenario regarding students' background knowledge about Black Friday shopping. Leslie provided content help to a student in a small group. In this excerpt below, Leslie helped students in a small group figure out a mistake they had made.

1. Jack: Yeah. I just added this number.
2. Leslie: Are you guys adding in that [inaudible] on the side or something so that you can make sure-
3. Jack: We're adding 14 [inaudible].
4. Leslie: Are you doing it in your head or are you doing it [inaudible] to the side? Because I already see a mistake.
5. Jack: I know.
6. Leslie: Adam, did you see our mistake?
7. Adam: I do.

In this excerpt, she provided content help to the students by pointing directly to the mistake. Leslie pointed out a mistake that students made (Lines 2, 4, and 6). By offering this kind of content-related help, the teacher tried to help the students think of problem-solving process that they went through with the group task. As in this excerpt above, both teachers provided content-related help or suggestions for solving the mathematical task at hand.

For social discursive moves, both teachers encouraged students to work tougher. For example, Marva used conceptual discursive moves in the following example, which comes from Marva's first lesson. The goal of this lesson was to "follow procedures of addition and recognize that addition is two parts making a whole." In this lesson, the students had worked on simple addition problems with a missing part in the addends, such as 4 + [ ] = 8. This interaction occurred when Marva monitored two students (Ben and Brice) in a small group, and she heard a student (Ben) say to another student (Brice), "Yeah, count with me, count with me" solving several addition problems on the worksheet.

1. Marva: (Sits down on a chair at the group.) Are you guys doing it together? Because I hear you talking. (Talks to Brice) Are you copying what he's doing or are you-- or you were actually talking with him?
2. Brice: He's helping me count.
3. Marva: Oh he's helping you count them. Okay that's good. So you guys are working together to count them out.

This excerpt shows a way that Marva encouraged students to work together with each other to solve the problems. At the beginning of her interaction, she wanted to make sure that Ben was not doing all the work and Brice was copying what Ben was doing. In Line 1, she asked the two students (Brice and Ben) if they were working together to count the numbers. After listening to Brice having worked with Ben (Line 2), she became certain that the two students were counting numbers (Line 3). As in this excerpt above, both teachers used social discursive moves in interaction with students in small groups.

For epistemic discursive moves, both teachers asked students to explain their mathematical thinking and evaluate or comment on each other's mathematical ideas. For example, Marva used epistemic discursive moves in the following example, which comes from Marva's second lesson. The goal of this lesson was to "figure out how to use the measuring tools and the ideas behind accurate measuring." In this lesson, the students in small groups had to measure the length of their desk, a marker, their book, and then a fish figure in the book using connecting blocks, paper clips, rulers, and tape measures.

1. Marva: Well, see I had another group measure this way and get seven. Please show me how you got seven? Show me. So if you're going to close it-- okay.
2. Kristin: And then counting to one. One by one like this. One, two, three, four, five, six, seven. See?
3. Marva: Hmm.
4. Kristin: One, two—
5. Marva: I want your opinion, Cathy. What do you think of how they [Kristin] measured it?
6. Cathy: Well, first [inaudible], when we were first doing it, she didn't leave that much space.
7. Marva: So you're saying she left too much space over here

This excerpt shows how Marva interacted with the students to help them engage in epistemic practices, such as explaining mathematical ideas students constructed or evaluating each other's ideas. In Line 1, Marva pressed Kristin to explicitly talk about how she solved the measurement task ("Please show me how you got seven"). In Line 2, Kristin tried to show how she got seven by counting the paper clips one by one. Here she revealed how she constructed her way to get seven. In Line 3, it seems that Marva was not satisfied with Kristin's strategy because of "much space" between the paper clips. In Line 5, Marva asked Cathy to comment on Kristin's way to get the answer ("What do you think of how they measured it?"). This discursive move pressed Cathy (Line 6) to explain how the other group got the different answer. In Line 5, Marva used a discursive move that encouraged Cathay to evaluate Kristin's ideas. As in this excerpt above, both teachers engage in epistemic discursive moves as they are interacting with students in small groups.

2. CONNECTING DISCURSIVE MOVES AND GOALS IN SMALL GROUPS

Concerning goals, overall, I found that descriptions from interaction excerpts of Leslie and Marva included conceptual and social goals, but they did not show epistemic goals related to how knowledge was constructed and evaluated (see Figure 2). Some distinctions between the teachers were that Leslie's descriptions were related to conceptual goals more than Marva's. I also found that these conceptual and social goals are always connected to different discursive moves. Leslie and Marva explained their goals (conceptual and social) as they were asked to explain, elaborate on, and reason why they interacted with students in different ways (conceptual, social, and epistemic discursive moves).

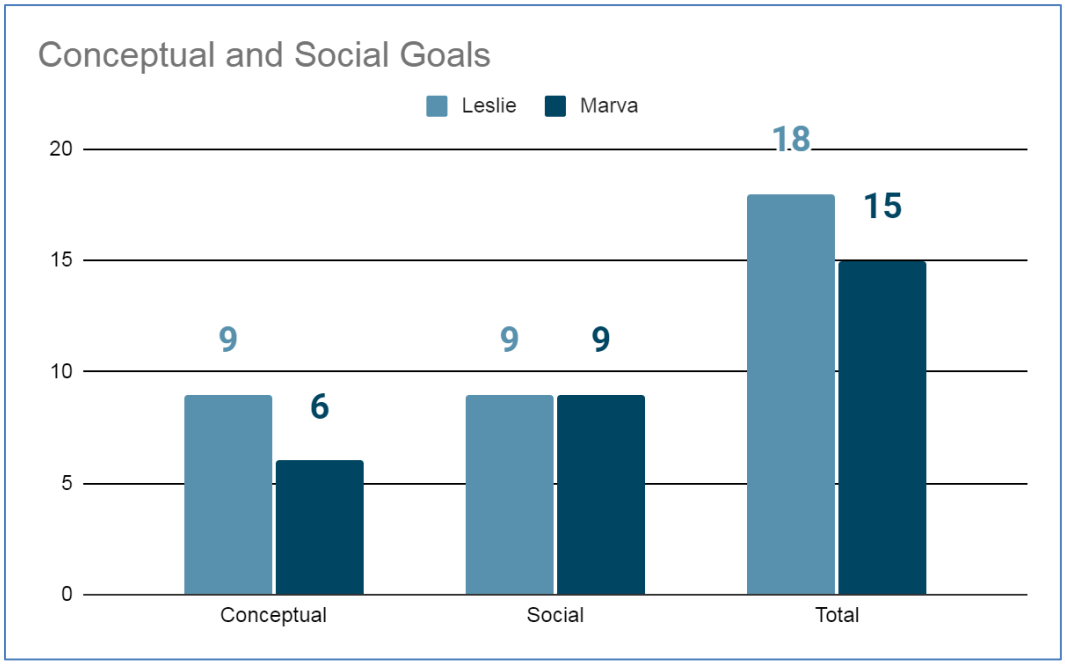

Figure 2. Conceptual and social goals of Leslie and Marva

I present one interaction to illustrate how both teachers used different discursive moves (conceptual and epistemic) and how they are related to conceptual and social goals. The example is from Leslie's first lesson. This lesson's goal was to make sure that students knew how to add decimals, add them correctly, and started to get that language down to place value. Students were supposed to have all the ingredients that a group of students would need in a group activity. Each group was expected to identify different kinds of grocery lists and then the prices they would need to make dinner; that is, each group had to figure out the cost for each meal. The following interaction occurred as she monitored students working in a small group, and she heard Julia saying "you're not listening, that's not what I said, well that's wrong," and so just that one talking over the other, talking over the other.

1. Leslie: Okay Julia, you in on this? What's your group doing, Julia?
2. Julia: [inaudible] doing nothing. No, so –
3. Leslie: Julia, explain to me what the group's doing.
4. Julia: We're not multiplying [inaudible]
5. Leslie: Okay, Amy, why don't you explain to Julia what we're doing right now?

6. Amy: So, we're taking all of these - like for the tacos cause it's [our group's] favorite meal - and we're putting it onto the blank space to find out the answer or the sum.
7. Leslie: So, I see you have all these numbers written together. Julia, what do you think you're going to do with all those numbers?
8. Julia: Add them together.
9. Leslie: Add them together because you're trying to find the -- the what?
10. Julia: The sum.
11. Leslie: The sum or the total, yup. So Julia, how would you do it? If it was just you, how would you do it?
12. Julia: Start with the [inaudible]. Put these together then [inaudible]
13. Leslie: So start from your right and then add to your left?
14. Julia: Oh wait. You can group these and then these. Leave these two out so 18 times 2. 18 times 2. I just sometimes -- I add all them like 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45 ,45, 46, 47, 48, 49, 50, 51, 52, 53, No –
15. Leslie: Okay so my question is, we had three or four different ways of doing this. Are any of them wrong?
16. A student: No.
17. Leslie: No. Any of them are going to make the right answer, right? Okay. So maybe you could use different ways to check your work, right? Double check, we got the right answer?

This excerpt shows how Leslie used conceptual and epistemic discursive moves. For conceptual discursive moves, she provided content-related help, especially in Lines 7, 9, 13, and 15. For example, in Line 13, Leslie was leading Julia to a way to solve the find sum for the group task by providing how Julia might add ("So start from your right and then add to your left?"). For epistemic discursive moves, in Lines 3, 5, 7, and 11, Leslie tried to help Julia explain explicitly how she solved the group task. For example, in Line 11, she asked Julia to talk about how she could solve the problem on her own ("Julia, how would you do it? If it was just you, how would you do it?"). Leslie's request provided Julia with an opportunity to construct her strategy to solve the task on her own.

Leslie described two goals concerning the conceptual and epistemic discursive moves in the following excerpt. It shows Leslie's conceptual and social goals as she intervened in the small group (Lines 1 through 17 in the transcript above).

> I was trying to think of a way to get them all to realize that they're all on the same page, they're all trying to get to the same goal. They're all saying the same idea, they're just doing different strategies to get to the answer. So, it felt like that whole group had just shut down and, "no I'm right, you're wrong" and I was trying to get them to open back up to, "okay, let's listen to what so and so said. Let's listen to what they said, are you guys all saying the same thing?" So just trying to get them back to working as a team versus individually.

Before the interaction, as mentioned above, Leslie sensed power dynamics at work in a small group as hearing Julia has difficulty in communicating with her peers in the small group ("you're not listening, that's not what I said, well that's wrong.") In the same interview, Leslie also expressed her concern, "I think that was kind of the biggest red flag to me because they're working well as a group." As such, it seems that she had a social goal, which is evident in the transcript ("get them all to realize that they're all on the same page"), eventually having them work together on the group task. This goal might not be clearly reflected in the discursive moves but having them cooperate (a social goal) was clear given the group dynamics in the small group.

Leslie also had a conceptual goal by wanting Julia and her peers to understand that "they're all saying the same idea, they're just doing different strategies to get to the answer." What she said in the same interview also explained, "I was hoping that they would just kinda realize that, "hey, you know we are all on the same page. Let's keep going, we can do it once your way." This conceptual goal was clearly reflected in Leslie's interactions with students in conceptual ways ("we had three or four different ways of doing this. Are any of them wrong?") and epistemic ways ("how would you do it?"). As shown in the excerpts, conceptual and social goals were present in these two teachers' descriptions of their discursive moves in interaction with small groups.

V. DISCUSSIONS AND IMPLICATIONS

In this section, I present two points with the findings and implications for research and teacher education. First, teachers may interact with students to promote students' epistemic practices (epistemic discursive moves) along with conceptual and social discursive moves in the context of small groups. In this current study, Leslie and Marva used epistemic discursive moves along with conceptual and social discursive moves as they intervened in their small groups. For example, Marva's interaction with Kristin suggests ways in which she used epistemic discursive moves that allowed the student to show how she constructed

the strategies to solve the group task. Discursive moves of this kind are consistent with what mathematics education researchers (e.g., Chapin, O'Connor, O'Connor, & Anderson, 2009; Franke et al., 2015; Herbal-Eisenmann, Steel, & Cirillo, 2013; Hufferd-Ackles, Fuson, & Sherin, 2004; Kazemi & Stipek, 2009) have found in relation to teachers' discursive moves. This current study also echoes Stroupe's (2014) finding in science education where the beginning teachers used epistemic discursive moves to interact with students in small groups. What is new in this study is that it can provide the field of mathematics teacher education with clear examples of beginning teachers' use of epistemic discursive moves to promote students' engagement in epistemic practices in the context of small groups in mathematics instruction. Building on this finding, researchers may begin to explicitly utilize the notion of epistemic practices to understand ways in which teachers interact with students in small groups to support students to engage in epistemic practices.

Second, teachers should be encouraged to explicitly integrate epistemic goals into their mathematics instruction in order to encourage students to engage in epistemic practices. Researchers in science education have already emphasized a need for incorporating epistemic goals into instruction (e.g., Duschl, 2008; Jiménez-Aleixandre & Crujeiras, 2017; Kelly & Licona, 2018). As mentioned in the earlier section, there has not yet been empirical evidence of how teachers integrate epistemic goals into mathematics instruction in mathematics education. In this current study, unsurprisingly, Leslie and Marva did not connect their discursive moves to epistemic goals in their interviews. Instead, they reported only conceptual and social goals even when they used epistemic discursive moves. According to the findings, they incorporated conceptual and social goals in their mathematics instruction. As such, it seems that Leslie and Marva did not have epistemic goals in mind, especially when they intervened in small groups.

What is new in this study is that beginning teachers may not consider their epistemic discursive moves in terms of epistemic goals. I do not claim that all teachers do not have such goals when interacting with students. I do not believe that Leslie and Marva did not have goals related to students' epistemic practices in their mathematics teaching. Despite the small number of participants, however, the lack of the teachers' acknowledgement regarding epistemic goals across the 24 interactions in this current study suggests that some teachers, particularly beginning teachers, may not think about their discursive moves in terms of epistemic goals in small group contexts. One possible way to explain the lack would be that the notion of epistemic goals has not explicitly been used in research on teachers' interaction in small groups. As mentioned in the framework section earlier, research on teachers' interaction with small groups (e.g., Brodie, 2000; Dekker & Elshout-Mohr, 2004; Ding, Li, Piccolo, & Kulm, 2007; Featherstone et al., 2011; Gillies & Boyle, 2006; Hoffman & Mercer, 2016; Meloth & Deering, 1999; Webb, 2009) has paid great attention to conceptual and social goals. This emphasis might therefore shape what teachers

have in mind when setting up and implementing small groups, given ways to teach is shaped by what they learned through teacher preparation programs (Clift & Brady, 2005). Building on this current study, therefore, research in mathematics instruction should also pay attention to ways to support teachers, particularly novice teachers, to be aware of epistemic goals they might already have in mind in mathematics instruction in general and in small groups in particular.

As such, there are several implications based on this study in terms of research and teacher education. First, research should provide the field of mathematics teacher education with more empirical evidence of ways to support teachers, particularly novice teachers, to integrate epistemic goals into mathematics instruction explicitly. This study could serve as a starting point to develop a research agenda because it shows the lack of epistemic goals concerning teachers' interactions with students. One way to further this research is that researchers may develop ways for teachers to be more aware of epistemic goals embedded implicitly into Common Core State Standards for Mathematics (National Governors Association Center for Best Practices Council of Chief State School Officers, 2010) and NCTM's eight teaching practices (2014) and integrate them into their mathematics lesson plans.

Second, teacher education may support teachers to learn to integrate epistemic goals into mathematics instruction explicitly. I noted earlier in Methods that Leslie and Marva perceived their roles as teachers as facilitating students to develop their ability to work with others in small groups. Their perceptions of teachers' roles might shape their goals other than epistemic goals. Given that both teachers reported they did not have training experiences related to cooperative learning, teachers need to be provided with multiple opportunities to learn about epistemic practices and epistemic goals explicitly. As such, teacher education may need to help teachers, particularly novice teachers, perceive their discursive moves as ways to achieve epistemic goals through teacher preparation programs and professional developments.

This study has three limitations. First, the analysis was based on two particular beginning teachers graduating from a single teacher preparation program at one specific point. Thus, this study cannot tell whether the responses would represent the other beginning teachers graduating from other teacher preparation programs. It also cannot be generalized to experienced teachers.

Second, I video-recorded three mathematics instructions per teacher, paying attention to teachers' discursive moves since my research purpose was to understand how beginning teachers intervened in small groups in mathematics instruction. As such, this study cannot inform how these discursive moves, particularly epistemic discursive moves, would affect students' interactions with each other in small groups.

Third, this study did not pay attention to the relationships between these teachers' teaching contexts and their discursive moves/goals. Their teaching contexts were very different in their teaching grades (Leslie- fourth grade/ Marva- first grade), students' racial composition (Leslie- White student dominant/ Marva- students of color) as well as school contexts (Leslie- White-dominant community/ Marva- inner city with diverse population). Marva's students were predominantly English Language Learners, while Leslie's students were fluent native speakers. Therefore, this study cannot predict how these different contexts would shape these teachers' epistemic discursive moves and epistemic goals.

Despite these limitations, the findings in this current study contribute to the field's efforts to raise awareness of the need for teachers to support students' engagement in epistemic practices in the teaching context, mainly when they interact with students in small groups in mathematics instruction.

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Appendix A. Codes of discursive moves

Discursive moves	Codes	Descriptions	Examples
Conceptual	Providing content help to students	Teachers help students make sense of the mathematical task in small groups. In this code, teachers lead students to certain ways to solve the task especially when students are struggling with the task.	T: Is that working on the addition problems?/ A student: I was only trying to understand when it applies./ T: We need a single number in those math problems written down, okay?
Conceptual	Asking students to provide reasons	Teachers ask students to provide why they think what they did works.	T: Why did you bring the five up there. T: Wait. Right. So why do you go from twenty to-- from forty to fifty? So twenty--
Conceptual	Asking students metacognitive questions	Teachers ask students to think of what they do to solve the task, to help students be self-aware of task-related behaviors.	I asked them "What are you doing? Or what strategy are you using?"
Social	Encouraging students to work together	Teachers tell students that they have to work as a group to solve the group task. Teachers often ask students to specify what to do to work together.	T: Are you guys doing it together? Because I hear you talking. Are you copying what he's doing or are you-- or you were actually talking with him?/ A student: He's helping me count./ T: Oh he's helping you count them. Okay that's good. So you guys are working together to count them out.

Epistemic	Asking students to explain their thinking	Teachers ask students to describe how they got the answer. Teachers sometimes want students to explain their thinking to other students in small groups.	T: So, explain it to me, please./ A student: So, 60--I'm going to explain it. T: Well, see I had another group measure this way and get seven. Please show me how you got seven? Show me.
Epistemic	Evaluating other students' ideas	Teachers ask students if they agree or disagree with other students' answers or strategies. The focus of this evaluating response is on pressing students to evaluate each other's ideas.	T: So do you guys agree on this number? Let's go back to it./ A student: five minus--/ T: Everybody agrees on this number?/ A student: No. [Why do?]--/ T: Why do you not agree? --[you need a four?]/ T: Okay. We're not arguing about what people are saying. We're making sure that the math is correct, which it is. Keep going
Epistemic	Asking students to comment on peers' strategies	Teachers ask students to make comments on other students' solutions to the mathematical task.	how about-- can you come over and look at his measurement? … Go-- you use it way too much, though. What do you li-- do you like his measurement? What do you like about it?

Appendix B. Codes of goals

Goals	Codes	Descriptions	Examples
Epistemic	Giving students more opportunities to think about their knowledge construction.	Teachers encourage students to think about how students decide what they know and why they are convinced by what they know	As a teacher, I won't be up here talking for long. Instead, I want my students to practice working with their own ideas or solutions working with others in small groups.

Conceptual	Mediating students' mathematical thinking	Teachers decide to help students pay attention to mathematics in the small group work.	When I do it like that I'm not working as a facilitator, I'm more so-- now I'm actually-- now I'm giving you information. Now how can you use it? So I'm still-- now, I still want them to use it. It's not just okay now you know how to do this. Just now you got it. It adds to what you've already been doing.
Social	Making sure students work together	Teachers decide to ensure that all students work together in small groups. Teachers may intend students to include off-task students in group work. It differs from the code below, "Increasing on-task behaviors," in that its focus is on on-task students as the ones who teachers expect to include off-task students.	So my thinking at that point was I have to get her back on track because otherwise the whole group is just - I mean those two girls aren't gonna talk the boys would be the only ones talking. I'm just trying to get, I'm just trying to make them realize that, hey, you're responsible for working with him, too. It's not just him that's at fault here. Because I did tell them, "It's not just you two, he's part of the group."
Social	Increasing on-task behaviors	Teachers decide to manage students' behavioral issues, including off-task behaviors, in small groups so that they engage in group work.	I have to get them back on-task So I just knew I had to get him-- I had to stop him from tipping because it's a safety thing and I had to get him to see that, "Hey, this isn't a choice, you have to work."

Social	Understanding group work progress	Teachers decide to check in what and how students work in relation to problem solving progress or communication progress. They are curious about collective progress and a particular student's progress.	So it was more so I stopped to figure out what was going on because of that answer that was so blatantly wrong. The student that I was talking to most of the time, she's actually a new student. So I'm still trying to get a feel for where she's at academically so I know how I can help catch her up to where everyone else is at. So that's why I chose her over the other students to talk.