PURPOSES OF SMALL GROUP WORK IN SIXTH-GRADE MATHEMATICS CLASSROOMS: WHAT DO STUDENTS PERCEIVE AND VALUE?

Amanda Jansen
University of Delaware
jansen@udel.edu

To construct insights about whether and how students develop productive values for engaging in small group work, I analyzed how sixth-grade students from two different classrooms talked about working in small groups. Students’ talk was analyzed to assess students’ perceived purposes and values for small group work. I interpreted these findings in relation to students’ histories with mathematical performance and teachers’ efforts to facilitate small group work. I considered whether teachers’ implied purposes for group work in each classroom were perceived and valued by students, and developed conjectures for facilitating small group work to promote productive values and dispositions.

Objectives of this Study

Small group work in mathematics classrooms can be conducted for different purposes, such as promoting learning and communication through collaborative peer interaction or to enhance direct instruction (Noddings, 1989). Not all purposes for group work or efforts to facilitate group work are similarly productive, and students may or may not interpret opportunities to participate in group work in ways that teachers intend. Following Flores and McCaslin (2008), students’ voices about their experiences in small group work can serve as an additional measure of purposes of group work (in complement to observations) and afford an understanding of affective outcomes of teachers’ efforts to facilitate group work.

In this study, I sought to understand relationships between the ways in which two middle school teachers facilitated small group work, what sixth-grade students perceived to be the purposes of small group work, and what students valued about small group work. This analysis had three purposes: (1) To determine whether students’ perceptions of the purposes of small group work aligned with the purposes promoted by the teacher, I contrasted observations how two sixth-grade teachers facilitated small group work with student interview data in which their students talked about purposes for small group work. (2) To assess affective outcomes of engaging in group work, I analyzed what students with different histories with mathematics performance valued about participating in group work. (3) To construct conjectures about how teachers can promote values for engaging in collaborative work in mathematics classrooms, I contrasted students’ values from each classroom.

Theoretical Perspective

Much of the scholarship on small group work focuses on the role of the teacher in facilitating classroom discourse (e.g. Cohen, 1994; Fuchs, Fuchs, Hamlett, Phillips, Karns, & Dutka, 1997). Fewer studies focus on students’ perceptions of purposes of small group work or values for group work. In studies when students’ roles in group work are studied, the focus is often on observable behaviors (e.g., Gresalfi, 2009; Esmonde, 2009). Outcomes of group work are usually assessed through achievement data (e.g., Fuchs, Fuchs, Hamlett, Phillips, Karns, & Dutka, 1997).

This study complements and extends those studies by listening to students’ voices rather than focusing on observations of their behavior, incorporating an alternative cognitive outcome to achievement (students’ perceptions), and an affective outcome (values) for examining teachers’
facilitation of classroom discourse. Additionally, contrasting students’ voices from two different classrooms supported the development of conjectures about teachers’ roles in facilitating discourse and group work that can help students develop productive values about group work in mathematics class. Students’ engagement can be understood through examining their opportunities to participate in groups, whether students are aware of (or perceive) these purposes (Levenson, Tirosh, & Tsamir, 2009), and whether students merely cooperate with these opportunities or come to value them (Cobb, Gresalfi, & Hodge, 2009).

Prior research provides insights on how teachers can effectively facilitate collaborative work. For instance, explicitly teaching students to provide more elaborated conceptual explanations to each other correlated with higher student achievement (e.g., Fuchs, Fuchs, Hamlett, Phillips, Karns, & Dutka, 1997). Effective groups work together as knowledge building communities that are truly collaborative and interdependent; knowledge is generated jointly (Scardamalia, 2002). Elizabeth Cohen’s (1994) work on Complex Instruction indicates that productive small groups are equitable - students all have equal opportunities to participate, all students’ contributions are valuable, and group member values are equally status. When students work together on challenging tasks, there are a number of ways to enter into and solve the problems, so there are more opportunities for more students to be competent. However, teachers may vary in the degree to which they promote engaging in group work for the purposes of promoting elaborated, conceptual explanations and collaborative, interdependent, and equitable interactions among students on challenging tasks.

In complement with understanding teachers’ efforts to productively facilitate students’ engagement in small group work, listening to students’ voices can provide insight about why they do or do not engage productively during small group work. Students’ talk about their experiences in group work affords an understanding of the degree to which students’ perceptions of the purposes of group work are similar to or different from the purposes promoted by their teachers. Students’ perceptions are worth investigating because even when students enact behaviors promoted by teachers, students’ perceptions of the purposes of participating may or may not align with what the teacher promotes (Levenson, Tirosh, & Tsamir, 2009). Students’ perceptions may serve to mediate relationships between teachers’ facilitation of students’ participation and how students participate (Peterson & Swing, 1985). In this way, students’ perceptions provide a lens to understand the nature of students’ engagement during group work.

Students’ voices can provide evidence of affective outcomes. Students with positive dispositions toward mathematics (National Research Council, 2001) believe that they can do mathematics, value the utility of mathematics, and value engaging in mathematics. Opportunities to develop these positive dispositions are situated in opportunities to enact particular roles in classrooms. As students participate in school mathematics, they receive messages about their competencies and develop their sense of efficacy in mathematics. Higher self-efficacy correlates with higher effort and interest (Zimmerman, 2000), so students with a higher sense of competence in mathematics are likely to persist in the face of challenge and be more interested in mathematics. Similarly, students who value collaborative activity may be more likely to put forth effort into sharing their thinking with peers and trying to understand the thinking of others to develop new understandings as a result of collaboration.

In this study, I described how two teachers facilitated small group work, assessed students’ perceptions of purposes of group work and values for engaging in group work through listening to students’ voices, and explored which instructional practices appeared to promote productive dispositions and values.
Methods

Data were collected in two sixth-grade classrooms in the same school in the Mid-Atlantic region of the United States. The demographics of the school’s student population were the following: 50.6% African-American, 27.5% White, 21.5% Latino/a, and 0.5% Asian-American. According to school district data, 69% of the students were from low-income families. Teachers at this school used the *Mathematics in Context* (2006) textbook series, which is a set of curriculum materials developed with funding from the National Science Foundation. The materials include mathematical problem solving tasks that have the potential to foster dialogue among students.

The two teachers in this study were Ms. Summers and Mr. Winters. Mr. Winters was a second year mathematics teacher at the time of this study. Ms. Summers was in her sixth year of teaching, but this was her first year teaching at this school. Both teachers had experience using these curriculum materials for at least one school year prior to this study. As participants in a statewide professional development activity, the two teachers studied students’ engagement with mathematics through video recordings of focus students and developed interventions for their mathematics classroom based upon what they learned about their students. These teachers asked me to interview a range of students for them as a part of their professional development work.

Data Sources

There were two data sources for this study: video recorded classroom observations and one-on-one interviews with students. Video recorded observations from each classroom were analyzed to describe the ways in which the two teachers facilitated classroom discourse and small group work. The set of observations was comprised of five class periods from each teacher across the school year (November to March). Data about students’ perceptions and values were gathered through one-on-one interviews that lasted approximately 30 minutes. I conducted interviews with 24 sixth-grade students (12 from each teacher’s classroom) in February and March of that school year. Interviewees were purposefully selected; I asked their teachers to identify students who they considered to be generally successful problem solvers, generally struggling problem solvers, and students who were sometimes successful and sometimes struggling. Students responded to a range of interview questions, such as, Why do you think your teacher asks you to work in groups during mathematics class? Do you like (or dislike) working in groups during math class? Why?

Data Analysis

When analyzing the video recorded observations, I sought to describe how each teacher monitored and debriefed group work to infer what teachers could be communicating to students about the purposes of group work. This analysis was conducted through an emergent process (Corbin & Strauss, 2008), with multiple passes through the data. Initial conjectures of significant themes were developed based upon the first two passes through the data. During additional passes through the data, I revisited the conjectures and sought to revise them by seeking confirming or contradictory evidence.

When analyzing the interviews with students, during the first phase of analysis, I sought to identify what students perceived to be the purposes for small group work in their classrooms. This process involved multiple passes through the data, as described above. For the second phase of analysis through the interviews, I sought to distinguish between students’ *own* purposes for group work (values for group work) and what students perceived to be their *teacher’s* purposes for group work. Following Cobb, Gresalfi, & Hodge (2009), I conducted discourse analysis of student interview responses to distinguish between obligations-for-others (identifying
perceptions of their teacher’s purposes) and obligations-for-self (what students valued). Obligations-for-others, or perceptions of teacher’s purposes, were revealed when the students said that they engaged in a behavior because the teacher required them to do so. Their perceptions of teachers’ perceptions were analytically determined through students’ use of verbs with high modality (e.g., “have to” or “need to”). Obligations-for-self, or students’ values, were revealed when students reported that they wanted to engage in a behavior or that they preferred or liked engaging in a behavior.

Results

Two Teachers’ Efforts to Facilitate Small Group Work

When monitoring small group work in progress, Mr. Winters did more cognitive work for the students than Ms. Summers. For instance, when he visited a group of students that was trying to estimate the equivalent percentage for a fraction (e.g., 156/216), after the student divided using a calculator and held it up to the teacher, Mr. Winters looked at the calculator and said, “Point 72, 72 hundredths, what percentage is that? 72% What is that, almost? 75% what do we know about that? It’s close to ¾, you could have estimated…” If a student asked Ms. Summers for help when she monitored the small groups, she would say, “That’s why you’re in groups – to be open to multiple strategies and teach each other.” Then, she would step away from the group.

During whole-class discussions after group work, teachers posed different types of questions and appeared to hold different expectations for students’ participation. Mr. Winters’ questions were “how” and “what” questions, such as asking students what answer they found, how they found it, and about which step came next in a procedure. When a student responded to his question, he would ask students to raise their hands to see how many of them agreed their classmate. The discussion continued if there was disagreement, and the class went on to the next problem if there was agreement. In contrast, during whole class discussion after small group work, Ms. Summers’s questions included many “why” questions, such as “Why does that work?” These questions arose when students went up to the overhead as a group and spent time writing out solutions at the overhead and explaining the solution strategy in detail. Students would ask their peers questions or request elaboration from one another (e.g., “I don’t understand why you…”) No students posed questions to their peers in Mr. Winters’s class.

Looking across the ways in which the teachers facilitated small group work, these teachers appeared to promote different purposes for group work. Given that Mr. Winters asked the students for single answers or individual steps during whole-class discussion, the purpose of group work appeared to be to prepare for whole-class discussion by finding a single correct solution. In contrast, the purpose of group work in Ms. Summers’s classroom appeared to be to prepare for whole-class discussion by trying to find more than one solution strategy.

Sixth-Grade Students’ Voices and Purposes of Small Group Work: Perceptions and Values

To explore whether the teachers’ purposes for group work (implied by how the teachers facilitated small group work) were perceived or valued by students, I will present a subset of the sixth-grade students’ voices. These four students were selected as cases based upon two criteria: data from these students represented the most prevalent themes from the students interviewed from each classroom and these students represented a range of performance in mathematics. Below, I will share how these students talked about obligations-for-others (perceptions of their teacher’s purposes) and obligations-for-themselves (what they valued) regarding small group work in their mathematics classrooms.

Enrique: Successful problem solver, Mr. Winters’s classroom. Enrique was one of four (out of 12 sixth-grade students) that Mr. Winters identified as a successful problem solver. Enrique
said that math had been his favorite subject ever since the 4th grade. Enrique reported earning near perfect grades that year, even a grade above 100% the most recent marking period. He was aware that he was considered by peers and his teacher to be mathematically competent, as he reported that his peers relied on him for help and that his teacher said that he was the highest performing student in his class.

Enrique perceived that the purpose of group work was to complete his work efficiently. When I asked Enrique about working in small groups, he said, “Sometimes I would rather work by myself.” When I asked why, he said, “Because I’m good at math. I’m done faster by myself.” When given a choice of talking to a teacher or a peer during mathematics class, he said, “More to a teacher. He knows more.” When he talked about group work, he emphasized efficiency. At times, he thought it would be more efficient to talk with his teacher rather than his peers. Other times, he sought efficiency through dividing the work among his peers.

We can get more done, like, faster… sometimes we just like, tell each other so we all get the one part. Like, there’s four, um, four kids in each group, and there are four problems, we just say, ‘you do this problem, you do this problem, you do this, you do this.’ Then we just share. Although he said that he would rather work alone or get help from a teacher, Enrique was willing to work in a group of peers if it helped him complete his work efficiently. His desire to efficiently completing his work aligned with the focus of whole-class discussion in Mr. Winter’s class, which was usually to find a single strategy that reached a correct answer.

Enrique did not actively resist group work, but he did not appear to value working with peers. When I asked him why he worked with his classmates in a group, he said, “The teacher tells us to work with a group.” This suggests that he cooperated with his teacher’s request to work in groups (for the purpose of efficiently obtaining an answer), but he didn’t necessarily value collaborating with peers (as he would rather talk with teacher).

**Kiara: Struggling problem solver, Mr. Winters’s classroom.** Mr. Winters identified Kiara as one of four struggling problem solvers (out of 12 students interviewed from his class). When asked about what I should know about her as a mathematics learner, she self-identified as “one of the middle-low students, but not the lowest.” Kiara said that she had been having trouble with math lately, but she said that she liked math, particularly when she had a nice teacher, as she said that did that year. Kiara said, “I like doing math, I just have problems… I’ve been struggling through math, but Mr. Winters and my group helps [sic] me out.” She also said that she attended help sessions after school with her teacher.

When Kiara talked about group work, she perceived that the purpose of small group work was to develop social skills.

…when we grow up we are going to have to work with people that maybe we might not like, he [Mr. Winters] tells us this, with people we might not like, but we have to work with them, anyway. So he kind of puts us with people maybe that we don’t talk much with, and then we start getting used to working with people...

She talked about being aware of and cooperating with her teacher’s expectations when she mentioned what they “have to” do and what her teacher told the class (“he tells us this”).

However, even though Kiara appeared to be willing to work in a group, her preference was to get help from her teacher; she did not appear to consistently value working in a group. I asked her with whom she would rather work during math class. Kiara said, “Sometimes the group, but mostly, in my opinion, would be the teacher. … Well, Mr. Winters says he puts geniuses in our groups, so I listen to [classmate], and he gets it right.” Her preference appeared to be working
with whoever would be most likely to help her obtain a most direct route to the correct response, such as the teacher or a “genius.”

Carolina: Successful problem solver, Ms. Summers’s classroom. Ms. Summers identified Carolina as one of the two strongest problem solvers in her class. Carolina self-identified to me as one of the first students to participate and get involved with her group during small group work.

Carolina perceived that the purpose of group work was to obtain multiple solution strategies.

I: Would you rather have groups, or would you rather have individual time to work?

Carolina: Groups! [I: Why?] Because, like I said, we get like multiple strategies.

When I asked Carolina for advice to give her teacher, she said, “Like to her, like not to always, like, talk. Like, she can talk and whatever, but… we can, like, brainstorm it.” I asked her whether her teacher let them brainstorm it, and she said, yes, her teacher allowed them to brainstorm, and she wanted her teacher to continue to let them do so. This suggests that Carolina believed that students were able to develop and contribute their own mathematical insights.

Carolina not only appeared to cooperate with Ms. Summers’s expectation that students find multiple solution strategies, but she appeared to value finding multiple solution strategies.

I: And what do you like about working in groups, if anything?

Carolina: Like how we, you know, like she says, find multiple strategies? [I: Yeah.] So, we, like, we found, let’s say we take…like we are working by ourselves? Then after we are done we share with each other and we have two strategies, or something like that…

I: And you like that? (Carolina nodded.) Why?

Carolina: Because we can learn from each other.

Carolina said that she liked doing what her teacher asked them to do. Also, Carolina expressed that she wanted to exercise her own autonomy when working with peers.

I: … what helps you learn math the most [in groups]?

Carolina: Like, they [peers] can, like, explain it better…like, let’s say if Ms. Summers is talking about something that I don’t understand, I ask them first, and then I ask her. So I ask them first, and they explain it better… like, he [a peer] like, tries to take care of everybody’s work. Like we got different work--

I: And you don’t like that?

Carolina: It’s taking over our work. It’s like, he’s taking over the whole group.

I: And what do you think he should do instead?

Carolina: Like, work, do his part, and everybody else does their part.

Carolina wanted to learn from her classmates, and she did not like it when peers tried impose their way of thinking onto her or others. She valued interactions that were more collaborative.

Julius: Struggling problem solver, Ms. Summers’s classroom. Ms. Summers expressed concerns about Julius as a problem solver. Julius self-identified to me as “not good at fractions,” which was the unit they were doing when I interviewed the students, but he self-identified as being generally “good with numbers.” He self-reported that he was earning a D in math at the time, and he said that he had gotten behind in his homework.

I: I don’t know you yet, so how would you say you are in math?

Julius: Well, I don’t really think nobody’s the best. I think we’re all the same, but, it’s to the point where someone, I think if they try hard enough, then they’ll all be, like, we’ll all be the same.

I: So, anybody can.
Julius: Yeah. They’re just not trying. They’re not trying to become better. They just decide, some people just decide not to do it, and that’s how they get bad grades.
I: Oh, it’s not that they can’t.
Julius: Everybody can do it!

Notice that he attributed lack of success in mathematics to lack of effort. He did not speak of mathematical ability as fixed, as if some students were geniuses and others were not.

Regarding obligations-for-others, Julius appeared to be aware of his teacher’s expectations. “When the teacher’s stopped talking, she’ll say go, and she’ll say ‘math talk’ and all that other stuff, that’s when I know it’s time to start talking.” He did not appear to resist.

In terms of obligations-for-himself, Julius appeared to value multiple strategies, as he internalized the process of finding more than one solution. I asked Julius what he would do if he was stuck when working on a mathematics problem.

Julius: I would ask myself, like.
I: You would ask yourself a question. What do you ask yourself?
Julius: Like, how would you explain it? I would explain it another way, just in case, like, somebody asked, I still don’t get it, then I would explain it another way to make it easier.

Julius described a metacognitive process of asking himself for another strategy, which suggests that he internalized his teacher’s expectations and used them as a strategy for learning.

**Discussion**

Students from both classrooms appeared to perceive purposes for group work that aligned with what their teachers implicitly promoted as they facilitated small group work, but Ms. Summers’s students were more likely to value their teachers’ purposes. Mr. Winters’s students did not actively resist working in a group, but they reported that they would rather circumnavigate group work and go directly to a teacher or a “genius” to efficiently complete their work. In contrast, Ms. Summers’s students appeared to value their teacher’s request to work with peers and learn multiple strategies for solving a problem, as exemplified by Carolina’s self-reported preferences and Julius’s internalization of the process of seeking multiple strategies. A contribution of this study is the use of students’ self-reported values to assess the effectiveness of group work.

Another contribution of this study is that the results serve as an existence proof that relationships between performance and affect (productive dispositions and values) can be complex. Enrique was a case of a student who had a history of success with problem solving, but he may not necessarily be developing a productive disposition toward mathematics. Even though he was performing well in mathematics, he spoke about mathematical authority as lying in teachers or more knowledgeable others. He happened to be a peer authority in his classroom at this point in time. However, if a student like Enrique encounters challenge in mathematics repeatedly over time, will he give up or will he persist? Compared to Enrique, Carolina was an example of a successful problem solver who was developing a more productive disposition toward mathematics, as she talked about students being able to make sense of mathematics. Julius was a case of a student who appeared to be struggling with problem solving, but he appeared to be developing a productive disposition toward mathematics. Although he was not performing well in a unit about fractions, he expressed that everyone and anyone could do math, and he attributed lack of success to lack of effort. This suggests that he could be likely to persist in mathematics when he encounters difficulty because he said that it was possible for him to be mathematically successful, in contrast to Kiara (who talked about others being geniuses).
I conjecture that efforts to facilitate group work similar to Ms. Summers’s efforts would be likely to promote values for engaging in collaborative work. Consider that a purpose of small group work may be to prepare for whole-class discussion. Mr. Winters’s classroom discussed one solution strategy for each problem, with a focus on the correct answer. Ms. Summers’s classroom discussed multiple solution strategies, even if the strategy was not necessarily correct, with a focus on understanding the process. A focus on answers in Mr. Winters’s classroom could lead to a decreased need to engage with mathematics collaboratively; successful students would be those who correctly answered his questions first, and then the conversation would end. Alternatively, if there is a focus on multiple solution strategies, as in Ms. Summers’s class, there can be more opportunities to be successful (Cohen, 1994) and more reasons to interact about mathematics. Values for collaborative work may be promoted through an emphasis on understanding relationships between multiple solution strategies, because the conversation does not end once a correct answer is obtained.

References