LISTENING TO MATHEMATICS STUDENTS’ VOICES TO ASSESS AND BUILD UPON THEIR MOTIVATION: LEARNING IN GROUPS

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Efforts to enhance students’ motivation should be targeted to the concerns and needs of students and the activity in which students engage. Students’ voices can be built upon to inform instruction and increase its efficacy, as education is for students (Levin 2000). Inherent in this perspective is a belief that if teachers understood motivation from students’ points-of-view, teachers could design increasingly productive experiences for students to learn mathematics.

Assessing Students’ Motivation to Participate in a Classroom Activity

In this chapter, I share an investigation of 24 sixth grade students’ motivation to participate in small group work in two mathematics classrooms. I was able to interact with the students when I worked with their teachers during a larger professional development project in which teachers were studying students’ mathematical thinking to improve instruction. Two teachers asked me to help them learn about their students’ motivation.

These two classrooms were at the same school located in the Mid-Atlantic region of the United States. The student demographics were 50.6% African-American, 27.5% White, 21.5% Latino/a, and 0.5% Asian-American. According to district data, 69% of the students were from low-income families. Teachers used the Mathematics in Context (2006) textbook materials, which were developed with funding from the National Science Foundation. The materials include rich mathematical problem solving tasks with the potential to foster dialogue among students. Both teachers asked their students to work together on investigation problems from their textbooks in small groups at least once during each mathematics class period.

Selecting a Focal Classroom Activity
The first decision made to support my process of learning about these students’ motivation was to decide upon a focal classroom activity. I wanted to focus on one activity among students’ experiences in mathematics classrooms, because one way to conceptualize motivation is as a motive (e.g., a wish, intention, or drive) to engage in a specific activity (Hulleman, Durik, Schweigert, and Harackiewicz 2008), in contrast with thinking about students’ motivation to learn more generally. Students who are motivated to engage in a specific classroom activity could be more engaged during that activity and learn more from that activity as a result.

One salient feature considered important for a focal activity was to identify an activity likely to support mathematics learning. I decided that participation in classroom discourse would be a worthwhile classroom activity, because engaging in discourse can help students develop their understanding of subject matter (Dillon 1994). At this point, I narrowed the activity further, because mathematics classroom discourse could occur in different structures, including whole-class discussions and small group work.

When selecting a focal classroom activity, I was also concerned about engaging adolescents, since the students were in sixth grade. The National Council of Teachers’ of Mathematics writes about unique challenges associated with inviting adolescents to participate in classroom discourse in the Communication Standard for the 6-8 grade band in its Principles and Standards for School Mathematics [PSSM]:

During adolescence, students are often reluctant to do anything that causes them to stand out from the group, and many middle-grades students are self-conscious and hesitant to expose their thinking to others. Peer pressure is powerful, and a desire to fit in is paramount (NCTM 2000, 268).
I wondered whether adolescents would find small groups to be less threatening than whole class discussions, because they would be sharing their thinking with a smaller group of peers.

Thus, I decided to investigate students’ motivation to participate in small groups. Talking with these sixth grade students would allow me to learn whether the students encountered social concerns while working on mathematics with peers, as described in the PSSM. I believed that small group work supported mathematics learning when students participated and engaged in trying to understand each others’ thinking.

**Considering What Productive Engagement Looks Like for that Activity**

After selecting the focal classroom activity for assessing students’ motivation, I reflected on what students might do if they engaged productively in small group work. I conjectured that students’ motivation to participate could be related to how students participated or what they thought it meant to participate. Students who did not express a strong motivation to participate in small group work may not have been participating in a way that would help them benefit from it or see the value in it.

I wondered whether these students engaged in small group work in ways that researchers have identified as productive behaviors. Webb and Mastergeorge (2003) indicate that students benefit from giving and receiving elaborated, conceptual explanations over getting answers or brief descriptions of procedures from peers in small groups. Also, students who seek help from peers benefit more if they ask for specific explanations over answers, if they persist in seeking help if they don’t receive it the first time, and if they apply and use the help they receive.

I thought that students would be more likely to engage in these more productive behaviors if they held values that aligned with the behaviors. Students who are more likely to provide elaborated and conceptual explanations may be more likely to value working in small
groups for the purpose of understanding mathematics. Alternatively, students who are more likely to give procedural explanations or only share answers with peers when working in small groups may be more likely to value small group work for the purpose of completing and finishing their work in class. Students who would be more likely to try to understand the thinking of their peers and support the learning of their group may be more likely to care about the needs of the group, not just their own needs.

To assess students’ motivation to participate in small groups, I decided to ask students to talk about their experiences.

**Designing Questions to Assess Students’ Motivation**

My next step was to design interview questions to elicit students’ motives for engaging in small group work. Although I planned to pose these questions to the students in an interview, I wanted to design questions that teachers could use as journal prompts in the future.

**Identifying assumptions about students’ motivation.** Using my own assumptions about these students’ motivations to participate in small groups, I developed some conjectures about reasons students may give for why they did or did not participate. I related these assumptions to prior research on students’ motivation, including the assumption that the values an individual ascribes to an activity would be important to examine.

Values can be an indicator of a student’s interest in a task, according to an expectancy-value perspective on motivation. Eccles (1983) described four task values: attainment value, intrinsic value, utility value, and cost. *Attainment value* refers to the relative importance an individual assigns to being successful at the task. *Intrinsic value* refers to personal enjoyment derived from the task. *Utility value* refers to whether the task helps the individual achieve short or long term goals. *Cost* refers to negative consequences resulting from engaging in the task.
Whether or not students perceive a particular activity to be worthwhile, and to what degree, will affect their engagement in a task or activity.

Some assumptions I held were the following:

- Students may see some benefits in working together with peers.
- Adolescents like working in groups because the experience can feel less threatening than sharing their strategies or ideas about mathematics in front of the whole class during a large group discussion.

Creating questions to examine assumptions. I created questions that could be posed directly to students about their motivation in relation to ideas from research and the assumptions I held. Concepts and results from research can be context-dependent, so I wanted to assess whether they applied to these students in this classroom setting. Students’ responses to the questions would allow me to revise my assumptions about their motivation, either slightly or dramatically. I hoped these questions would help me examine students’ values for group work, whether students would speak about learning mathematics as an individual or collective experience because productive group work is collaborative, and the assumption in the PSSM about whether they avoided participating due to being self-conscious (see Table 1).

INSERT TABLE 1 ABOUT HERE

I intended to examine the social dimension of small group work in this setting, because researchers who have studied adolescents’ motivation to learn have found that social goals affect students’ learning (Urdan and Maehr 1995). Lampert, Rittenhouse, and Crumbaugh (1996) described a fifth-grade mathematics class in which some students expressed discomfort with
being incorrect in front of their peers, whereas others appreciated the opportunity to hear how other students solved problems. Being corrected during classroom discourse by their peers felt, for some students, like a personal attack and affected how they felt about themselves and their classmates. These students “believed it was at least as important to maintain relationships as it was to argue mathematics” (Lampert, Rittenhouse, and Crumbaugh 1996, p. 756).

**Listening to Students’ Voices about their Motivation to Participate in the Activity**

After conducting interviews, I listened to the students’ responses about their reasons for getting involved or not getting involved in small group work and revisited my assumptions and elaborated or revised them. Simultaneously, I was open to unanticipated themes in the students’ responses.

**Sixth-Grade Students’ Motivation to Participate in Small Groups: Their Task Values**

The students who shared their motivations to participate in group work reported task values that indicated what they perceived to be the purpose of the group work (utility values), the relative importance of group work (attainment values), and the costs associated with group work. Students expressed utility values in response to interview questions designed to elicit them as well as questions designed to reveal intrinsic values.

**Utility Value of Group Work**

Utility values help us understand what goals these students attempted to achieve through engaging in small group work. Students said that they were interested in working in groups for the purpose of learning mathematics, learning general social skills, and developing their mathematical autonomy.

**Participate to learn mathematics.** When students talked about how their small group work helped them learn mathematics, they talked about the power of learning from peers. For
instance, Clarissa said, “I like to work in groups so they can explain it to me.” Iris mentioned, “[classmates] don’t tell me the answers, but like they try to give me like, hints and stuff, so I can try to get it.” Shawn said, “If you are stuck on a problem, they [peers] can help you out.” Marisol described how she understood her peer’s explanations more than her teacher’s when she said, “Like, they [peers] can explain it better… like, let’s say if [teacher]’s talking about something that I don’t understand… I ask them [peers] first, and they explain it better.” These students spoke about the experience in group work mostly as listening to peers’ explanations or receiving help from their peers.

Less often, students said that working in small groups was an opportunity to give help to their peers (in contrast to a high degree of frequency with which students described wanting to work in groups to receive help from peers). Brian said, “I like working with groups most of the time because the group can help you out, and I can help the group out.” Jasmine responded, “If they [peers] got it wrong, you can help them like get the right answer and stuff.” For group work to be collaborative, students need to be engaged in receiving and giving help, and more students talked about receiving help than giving help.

Students described the content of what they were learning from their peers’ explanations to be alternative solution strategies.

I: why do you think your teacher has you work in groups?

Constance: So then you can back up your answers and get more multiple strategies, because not everyone thinks the same. And then if you get, if someone has something different, and you have something different than them, then you can work it out, and make it into a big strategy or something like that.
Constance noted that you can “make it into a big strategy,” which suggested that the teacher might have promoted looking for connections between the strategies. Students appeared to like the opportunity to hear additional solution strategies from peers.

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

Marisol: Like how we, you know, like [teacher] says, find multiple strategies? 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: Yeah. And you like that? [student nods] Why?

Marisol: Because we, like, we can learn from each other.

Marisol’s interview excerpt revealed not only the utility value she had for small group work to be an opportunity for learning alternative solution strategies, but also that she had intrinsic value for learning additional strategies. Other students also identified small group work as an opportunity to learn alternative solution strategies and liked that purpose, such as Travis, who said, “I like to work with another person, and sometimes they might come up with a better strategy.” When students talked about group work in mathematics class as useful to them, they often discussed an interest in receiving explanations about alternative strategies, but they did not say that they were only looking for answers from peers.

**Participate to develop social skills.** Students said that working with peers in small groups in their mathematics class was an opportunity to develop general social skills.

I: What do you like about working in a group in math class?

Bianca: You get to learn that other people learn different than you. And, like, you get to work together with people, and you get to learn other people’s attitudes and stuff.

I: So why is that a good thing?
Bianca: Because you might not get along with somebody, but then you figure out they have the same as you, and then you start getting along with them and not fight so much.

Kaylee: Later on when we grow up we are going to have to work with people that maybe we might not like, [teacher] tells us this, with people we might not like, but we have to work with them anyway. So [teacher] kind of puts us with people maybe that we don’t talk much with, and then we start getting used to working with people we don’t really talk to anymore.

When students talked about participating to develop general social skills, these goals were longer-term in comparison to their shorter-term goal of wanting to learn mathematics.

**Participating to develop mathematical autonomy.** Students reported that participation in small group work allowed them to enact and develop their autonomy as mathematics learners.

Freddie: It’s like, uh, instead of [teacher] talking, we can decide, and [teacher] doesn’t tell us any answers, we have to figure it out on our own. So, it’s like, brain time. And you’re just discovering the answer. It’s fun… [Teacher] makes us discover it. We have to discover it, I have to discover it on my own. In order to learn it and get it in my system. My brain.

Marisol: So we can like, think of it, like we can get it by ourself. Not just like, [teacher] being up there at the overhead just talking to us or something. Like, we can like brainstorm it and then us, like saying stuff. Like, explaining the problems.

Students appreciated the opportunity to communicate and reason with each other about challenging mathematics.
Attainment Value of Group Work

Although students described ways in which small group work helped them achieve particular goals, such as learning mathematics, developing social goals, or achieving mathematical autonomy, the relative importance students attributed to working in small groups varied. Some students preferred to work alone. Clarissa said, “Sometimes I like working by myself, cause…some people in my group they don’t like to work like, as a team, and sometimes we usually end up working by ourselves anyway.” When asked why he preferred to sit by himself, Travis said, “Because I get my work done better, and less distractions.” These students talked about being able to complete their work better when they worked alone, and “better” implied more efficiently. Other students appeared to rely on group work heavily.

I: What if your teacher said, well, we’re not going to work in small groups anymore, you have to work by yourself. What would you think?

Shawn: I would think, I probably can’t do that, because I have to have some help.

When interpreting students’ motivation, it is important to recognize that students may believe small group work has the potential to help them achieve a range of goals, but the opportunity to do so may be more or less important to particular students. Overall, most students in this sample had relatively strong attainment values for small group work in mathematics class.

Cost of Small Group Work

Some students also described the challenges of working in small groups in their mathematics classes. They described conflicts among group members and found themselves taking on the role of mediator to establish harmony.

I: Okay, so do you think that you worked well together or no?
Jeremy: No, because they keep arguing. Like, [peer] will say something and [another peer] will get mad. So, it’s hard to, like, cooperate, like.

I: So what do you do when they’re arguing?

Jeremy: I try to get them to stop. They’re arguing over stupid stuff.

I: Is it about math or no?

Jeremy: No. It’s just about stupid stuff. It’s like, if [peer] is saying something, she’ll get mad about it, and then they just start going back and forth, back and forth. So I just, like, forget about it. I mean, I try to get ‘em to stop, but they don’t.

Other students talked about one member of the group taking control and dominating the discussion.

I: And what do you not like about it, if anything, when you work in groups?

Marisol: When we discuss, like when…let’s say, like, we’re trying to do group work, and then another person, he tries to take care of like the whole group… it’s taking over our work. It’s like, he’s taking over the whole group.

According to these students, at times the social dynamic in their groups detracted from students’ learning of mathematics. Notice that the students did not mention that it was threatening to participate in small groups, but small groups were not consistently safe for students to participate, either, due to social conflicts.

Building upon Students’ Motivations: Creating Instructional Goals for Students

Knowledge about students’ self-reported motivations could inform the creation of instructional goals for these students, as well as instructional strategies to support their achievement of these new instructional goals. When working to improve students’ motivation
and engagement, the instructional goals are broader than what can be accomplished in a single lesson. They are process-oriented goals that should be revisited over time.

New instructional goals were inspired by comparing and contrasting students’ voices, behaviors, and values that align with productive engagement in small group work. I considered whether students talked about their involvement in ways that aligned with these productive ways of engaging. Instructional goals were created to address problematic issues mentioned by students. Additionally, students’ voices provided new insights about productive ways to engage in small group work. Instructional goals addressed less productive motivations and extended and built upon more productive motivations that were revealed through students’ talk.

Table 2 describes instructional goals for students’ work in small groups that were inspired by these students’ interviews. I purposefully listed goals for instruction rather than descriptions of specific instructional interventions, because their teachers could achieve these goals through a range of instructional strategies.

INSERT TABLE 2 ABOUT HERE

Looking across the instructional goals for these students proposed in Table 2, a few themes can be seen: (a) moving toward an orientation of considering whether the group has learned, (b) monitoring a balance between individual needs and the group needs, and (c) putting a priority on mathematical understanding over task completion. These instructional goals align well with the productive motivations that were revealed in these students’ talk. Some students valued small group work because they could learn general social skills. Explicitly teaching strategies for interacting productively in groups may appeal to these students. Other students valued the opportunity to learn multiple solution strategies. To build upon this value, students
could be taught to provide increasingly elaborated and conceptual explanations of their strategies, which would support learning about mathematics from each other.

**Concluding Thoughts**

Teachers cannot observe students’ behavior at all times during all instructional activities. Listening to how students talk about their motivation to participate in particular classroom activities can provide information for teachers regarding which students are benefiting from current classroom practices and how, as well as which students are not benefiting and how they are not benefiting. This chapter illustrated a process for assessing students’ motivation to participate in small group work and an application for using the data collected to enhance students’ learning of mathematics through group work.

To assess students’ motivation to participate in a particular activity, teachers could engage in the process described in this chapter. First, they could choose a focus activity and reflect upon or read about productive behaviors for student engagement in that activity. Next, they could review their assumptions about students’ motivation to participate in that activity, developed through experience or reading about students’ motivation. These assumptions about students could inform the design of journal prompts or interview questions to elicit whether or not students hold those motivations. The design of questions could be tailored to the specific activity or they could be modifications of the general task value questions in Table 1. Teachers should design questions that address the needs of their students.

To build upon students’ voices, teachers could then compare what their students said about participating to what they would want them to say about participating. Teachers could consider which motivational beliefs, goals, or values support productive engagement in a particular classroom activity. Then, teachers could design instructional strategies to support the
development of these beliefs, goals, or values in connection with promoting productive behaviors. For students who hold productive motivational beliefs, goals, or values, teachers can explicitly validate students’ experiences and articulate the connections that they see between what those students value or believe and the behaviors they promote.

Teachers could also consider how their interactions with students can impact their students’ engagement. Research has shown that the behaviors students exhibit in small groups mirror the ways in which teachers interact with students in whole class discussion, even after interventions have been implemented over an extended period of time to promote productive engagement in small groups (Webb, Nemer, and Ing 2006). If teachers would like their students to engage in effective help-giving practices, such as giving elaborated, conceptual explanations (instead of only sharing answers) and checking for whether their peers understood their explanations, then teachers would need to model these sorts of explanations and checks for understanding during whole-class discussions. Also, if teachers want students to allow those who sought help to have a chance to apply the help they received, teachers should not do all of the cognitive work for students during the whole-class discussion.

The students’ voices in this chapter can provide inspiration for those teachers who want to get to know their students and can validate the efforts of those teachers who already work hard to understand their students’ perspectives. Prior research suggests that teachers are not necessarily effective at predicting what motivates their students (Middleton 1995), so teachers would benefit from developing strategies to learn about what motivates their students to engage productively in mathematics classroom activities. As we learn what motivates our students, we can challenge our assumptions about who is motivated and who is not motivated. Through this

sort of dedicated professional work of listening to students’ voices, mathematics teachers can generate ideas for learning experiences that meet their students’ needs more effectively.
References


Table 1. Questions Designed to Assess Students’ Motivation to Participate in Small Groups

<table>
<thead>
<tr>
<th>Questions</th>
<th>Alignment with Task Values</th>
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<tbody>
<tr>
<td>Why do you think your teacher has you work in groups in your math class?</td>
<td>Utility Values (potential for achieving short or long term goals)</td>
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<tr>
<td>What do you like about working in groups in math class, if anything?</td>
<td>Intrinsic (personal enjoyment)</td>
</tr>
<tr>
<td>What do you dislike about working in groups, if anything?</td>
<td>Cost (negative consequences)</td>
</tr>
<tr>
<td>What would you say if your teacher stopped having you work in groups in your math class?</td>
<td>Attainment Value (relative importance assigned to the task)</td>
</tr>
<tr>
<td>Does working in groups help you learn math? Why or why not?</td>
<td>Utility Value (specifically for the goal of learning mathematics)</td>
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<tr>
<td>How often do you talk during small groups? Or do you mostly listen? Why?</td>
<td>Social dimension: Students’ roles in discourse</td>
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</tbody>
</table>
**Table 2. Goals for Instruction Aligned with Student Interview Findings**

<table>
<thead>
<tr>
<th>Student Interview Findings</th>
<th>Suggested Instructional Goals</th>
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<tbody>
<tr>
<td>Small group work supports mathematics learning.</td>
<td>Students move toward monitoring whether <em>all</em> students in the group are learning. Consider learning of the group.</td>
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<tr>
<td>Small group work supports learning to work with others.</td>
<td>Those students who have strong skills in this area (social skills, working well with others) can teach them to peers.</td>
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<tr>
<td>Small group work supports development of mathematical autonomy.</td>
<td>Students who appreciate the opportunity to exercise their mathematical autonomy can help others have the opportunity to do so as well through active listening.</td>
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<tr>
<td>Small group work decreases efficiency of task completion.</td>
<td>Students would benefit from developing a focus on mathematical understanding over task completion.</td>
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<tr>
<td>Some students are overly reliant upon peers.</td>
<td>Students would benefit from attempting to solve problems themselves prior to listening to a peer’s solution, and their group members would benefit from hearing their ideas.</td>
</tr>
<tr>
<td>Social conflicts occur during group work.</td>
<td><em>All</em> students should take responsibility for monitoring the harmony of their interactions, so that the same student is not always mediating conflict within a small group.</td>
</tr>
<tr>
<td>Peers can dominate the group work discussion.</td>
<td>Students would benefit from developing a value for opportunities to listen to a peer’s solution in balance with sharing their own thinking.</td>
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</table>