

Classroom Collaboration: Moving beyond Helping

Do you use group work in your mathematics class? What does it look like? What do you expect your students to do when they work together? Have you ever wondered what your students *think* they are supposed to do?

In a recent research project, I investigated the perspectives of eight high school students whose teacher regularly asked them to work collectively to solve open-ended problems. I observed twenty-three classes during the semester and interviewed each of the eight students twice, inquiring about their goals related to working together. During the second interview, I showed each student clips of his or her own participation in small group work and asked each to reflect on the recorded episode (Kotsopoulos 2008).

Although the teacher, Mr. Neal (all names in the article are pseudonyms), described the importance of students collaborating to generate solutions together, not all the students I interviewed described their goals for working together in the same way. Some students emphasized nonmathematical goals, such as working with friends or getting through the tasks, but others emphasized mathematical goals, such as learning multiple strategies. Some students seemed to place responsibility for meeting goals primarily on individuals, emphasizing behaviors such as paying attention and “getting help.” A focus on getting and receiving

help implies that some students will be treated as “experts” whereas others are treated as “novices” and are helped by the experts. This is sometimes referred to as *asymmetric positioning* (Esmonde 2009). A few students, however, described solving problems as a group responsibility, emphasizing behaviors such as resolving disagreements, collecting ideas, and wanting to be convinced. These behaviors suggest a more *symmetric* positioning among students.

In this article, I focus on three students—Logan, Sevanye, and Connor—to illustrate these contrasting views. Each student took on a unique role while working in groups. However, their actions along with their reflections revealed that Logan and Sevanye had similar perspectives about how collaboration should work.

SIMILAR PERSPECTIVES: LOGAN AND SEVANYE

During one of my class visits toward the end of the school year, Mr. Neal asked his students to work together on the following task (Hirsch et al. 2008):

Kent County has \$200,000 to spend on student salaries.

(a) How many student workers can be hired if the county pays \$2,000 per worker for a summer contract covering eight weeks? What if

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the county pays only \$1,500 per worker? What if the county pays only \$1,000 per worker?

- (b) If the pay per worker is represented by p , what function $h(p)$ shows how the number of students who could be hired depends on the level of pay offered?
- (c) Sketch a graph of the function $h(p)$ and write a brief description of the way $h(p)$ changes as p increases.

(Before continuing, try the task yourself and make some conjectures about how students might approach it.)

Mr. Neal introduced the task by asking students about their own experiences with summer jobs and about how much they would like to be paid. Then he instructed the class to complete the task in groups of their own choosing. Mr. Neal's typical practice was to break group work up into short segments during class, usually having students work on only one task per segment (see Webel 2010). On this day, he announced that he was going to try a different strategy—he would give students a whole period to work in groups on an entire investigation, collecting their work at the end.

Sevanye and Lindsay formed a group, which Logan later joined. The following episode ensued. As you read the episode, consider the effectiveness of the interactions involved.

Sevanye takes the calculator from Lindsay and begins to punch buttons. "First, you gotta see ... for \$2,000 times 8 weeks ... Whoa, what am I doing?" She writes something on her paper. "What is that, 16,000?" She checks her calculator again. "Yeah, 16,000."

Lindsay, writing and trying to keep up, leans over to look at Sevanye's paper. "Sixteen, hold on ..."

"You take \$200,000," Sevanye explains, "and divide it by [16,000, and you get] 12 workers." She writes on her paper. Lindsay alternates between looking at Sevanye's paper and writing.

The two girls continue to work in silence for nearly a full minute. Lindsay continues writing and looking at Sevanye's paper but then gets distracted by an off-task conversation in an adjacent group. When she looks

back at Sevanye's paper, she frowns and asks, "What is all this math?"

Sevanye explains, "You do \$200,000 divided by 16,000, 'cause that's how much each worker gets paid. And that equals 12, so you can hire 12 workers Two hundred, divide it by the number, 12,000, so then 16 workers. And then you go and divide 2,000 by 8,000."

At this point, Logan pulls up a chair to join Sevanye and Lindsay. "What are we doing, number 1?" he asks.

The group gets sidetracked for the next couple of minutes, discussing

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college applications. Then Sevanye, looking back at her book, suddenly raises her hand. "Mr. Neal!"

Mr. Neal comes over to the group. "Yes?"

"I don't understand what number 2—or, well, what 1(b)—is asking."

While Mr. Neal and Sevanye start to discuss the problem, Logan and Lindsay appear to read problem 1(b) for themselves. But as Mr. Neal tries to convince Sevanye that her solution to problem 1(a) contains an error, Logan and Lindsay again get distracted and start having another side conversation. So far, the group work session has lasted for about eight minutes.

This episode reflects notable aspects related to interactions between participants. Sevanye appeared to misinterpret the \$2,000 as referring to the amount per worker *per week* rather than the amount for the entire 8-week period. After reading part (b), Sevanye seemed to be confused and sought help from Mr. Neal. Logan and Lindsay seemed to accept Sevanye's work as correct.

Sevanye's Perspective

After watching the video clip of this episode with Sevanye, I asked her why she never asked Lindsay or Logan to share their ideas about the problem.

Sevanye: They didn't know what they were doing. They were copying my answers.

Interviewer: Right ... so did you assume before that they weren't going to be able to help if you asked them?

Sevanye: I assumed it, 'cause I had asked her, like, a little bit, I asked Lindsay a little bit about, like, what

she was doing, and she didn't really seem to know. If I [had] asked her some more, she probably would have confused me more than what I was already confused about ... so I just went right to Mr. Neal.

Interviewer: So were you not asking them because you thought that they wouldn't be able to help or because they didn't want to help?

Sevanye: Because I didn't think that they would be able to.

I found it interesting that Sevanye did not think that Lindsay or Logan would be able to help; she never actually asked them what they thought about the problem (although in the interview she claimed that she did). She assumed that the only one who could provide assistance was Mr. Neal. In her actions and her explanation, Sevanye was revealing the belief that contributions can be made only by those who already understand the problem. In fact, when initially asked why teachers use group work, she said, "You put the stronger people with some people who may not know the

subject as well, and it helps them.” In essence, she was saying that working in groups involves asymmetric positioning.

Sevanye also reiterated throughout her interviews that she did not like working in groups, a reasonable view: Because she does much of the work, Sevanye appears to get very little out of group work. In her interactions, she helps others primarily by providing explanations.

Logan’s Perspective

In Logan’s interview, I asked him about his participation in the episode, focusing on why he was not listening to Sevanye and Mr. Neal’s conversation about the summer wages problem.

Logan: [Sevanye] kind of left me and Lindsay out to dry, and we were kind of over there doing our own thing. So we didn’t know what was going on.

Interviewer: Would you have preferred it if she had said, “Hey, what do you guys think about this problem?” instead of going straight to Mr. Neal?

Logan: Probably. It would’ve just been, like, more interesting to me if she tried to involve me. But [she and Mr.

discussing, he admitted, “I was going to copy it.” This response suggests that he never planned to press his group to explain or justify their answers.

For Logan, working together seemed to be about getting the answers from someone who already understood the problem. This theme was repeated throughout my interviews with Logan, in which he indicated that he was “not the brightest kid” and that he preferred explanations from Mr. Neal or from the “smartest kid” he could find.

A DIFFERENT PERSPECTIVE: CONNOR

Connor, another student in Mr. Neal’s class, had a different perspective on working in groups. The following episode took place earlier in the school year, in an introductory lesson on functions. Mr. Neal had used two segments of group work already in the ninety-minute period, and this episode occurred about fifteen minutes before the end of the class.

““Explain why light is a function of distance from light source to a receiving surface,” Seth reads

“Cool.” Both students write in their notebooks.

In this episode, both students make contributions to solving the problem. Connor does not function as an expert or a novice. He is willing to offer his ideas even when he is not confident about them (“I don’t know what [light intensity] is. I’ll have to think about it.”). After watching this clip, I asked Connor to talk about this phrase.

Connor: Yeah, when I was doing that, like, I didn’t really understand. So I was just kind of thinking out loud, and if Seth had his opinion, he could tell me, like, what he thinks, whether that’s right or wrong. I was basically throwing ideas out there. I think it’s good to share your ideas and what you’re thinking. You don’t really have to figure it out for yourself first.

This episode and Connor’s explanation reveal that solving problems seems to be, for Connor, a task that involves contributions from several people. Ideas need not be “correct” or accompanied by confidence. “Thinking out loud” is an intermediate step that provides an opportunity for Seth to make a contribution, moving the group forward.

At times, Connor did seek help from Mr. Neal, but he thought of this as a last resort:

Connor: But if we do need help, we will go to Mr. Neal, but we try to explain it to each other as much as we can so that we really understand ... If we all understand it, then we move on the next question.

Here Connor emphasizes that solving problems is a job for the group; everyone needs to understand before they move on to another problem. Group work is about members of the group making contributions (perhaps before knowing whether they are correct) and coming to agreement through discussion. This perspective contrasts with those of Logan and Sevanye, who seem to view group work as an opportunity for knowledge to be delivered from one participant to another in an asymmetric relationship.

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Neal] just left us out, like we weren’t even part of their conversation.

Interviewer: So you don’t feel that it was your choice to remove yourself from the conversation?

Logan: Uh-uh. It just ended up that way because Sevanye did all of the talking.

In this excerpt, Logan describes feeling left out of the mathematical conversation between Sevanye and Mr. Neal. One might argue that he never made an effort to contribute, but, at the same time, it is true that he was never asked (by his group mates or Mr. Neal) what he thought about the problem. When I asked him if he planned to find out later what Sevanye and Mr. Neal were

from the textbook. He pauses. “The more intense the light, then the more light...”

Connor speaks up: “Because it depends on how far ... receiving source is away from it ... until the [speech trails off]. Light intensity ... I don’t know what that is. I’ll have to think about it.”

Seth pauses and then says, “If it’s closer ... it’ll be more intense.”

“Yeah,” Connor agrees. “Okay. So it would be like, the light intensity is a function of distance from light source. The farther away the receiving source is, the lower intensity it’s going to be. And how close it is, the higher intensity.”

IMPLICATIONS

Interviewing these students allowed me to see that even though Logan and Sevanye participated differently, their views about what it means to work together were quite similar. In contrast with Connor, they both seemed to see working together primarily in terms of getting or giving help, where students are positioned asymmetrically. Sevanye found herself assuming the role of explainer, whereas Logan was relegated to a novice role, dependent on experts like Sevanye or Mr. Neal.

The view of working together as helping is problematic with respect to productive group work. In situations in which no group member can function as an expert, students with this view have no choice but to call on the teacher, as we saw Sevanye do in this episode. They will miss simple errors, as her group did, because Lindsay and Logan were not thinking critically about what Sevanye was doing. They will not persist in solving difficult problems but, instead, will seek a knowledgeable person to tell them how to solve the problems. Students like Connor, on the other hand, will persist in the face of challenge because they believe that even if no one in the group knows immediately what to do, sharing ideas can lead to progress.

How do we help students see that working together is something more than just helping and getting help? One thing we should probably *not* do is explicitly or implicitly endorse asymmetric positioning. For example, Jansen (2012) describes how one middle school teacher assured students that he had placed a “genius” in each group to help them if they were stuck. This strategy (and explaining the strategy to students) appeared to encourage the students to seek out expert peers who could act as mathematical authorities and generally led to less productive mathematical discussions. This finding also raises questions about the potential impact of such strategies on students’ sense of their own mathematical abilities.

Mr. Neal did believe that students could work together without relying on an external authority. In an interview, he said:

Mr. Neal: When we do work in groups, the goal is to have as many thoughts

and opinions and ideas as possible so that together, collectively, that group or the whole class can determine what it is that is correct ... as opposed to me saying this is right, this is not.

But in practice, Mr. Neal’s instruction may have at times unintentionally encouraged asymmetric positioning.

With regard to the episode involving Logan and Sevanye, Mr. Neal might have been able to promote a more symmetrical approach by avoiding an extensive dialogue with Sevanye. Such one-on-one dialogue reinforces the help-giving model (see Webb, Nemer, and Ing 2006) and releases Logan and Lindsay from any responsibility for making contributions.

Instead, Mr. Neal could have elicited ideas from Logan and Lindsay, a strategy sometimes referred to as *social scaffolding* (Dekker and Elshout-Mohr 2004). For example, he could have addressed Logan and Lindsay by asking, “Have you shared your ideas about this problem?” and addressed the entire group by asking, “Did the group come to an agreement on the first part of the problem?” By doing so, he would indicate the value of each person’s contributions to the group.

Mr. Neal might have then praised Logan’s and Lindsay’s contributions, a practice that affirms student competence and encourages future participation (Boaler and Staples 2008). Mr. Neal might also have drawn on the class community by stopping and having multiple groups share different ideas, a strategy that could remove him from the help-giving role and shift authority to the class and to the mathematics (Webel 2010).

All these strategies emphasize generating, testing, comparing, and revising ideas rather than getting ideas from experts.

WORKING TOGETHER

Both Logan and Sevanye adopted roles that were reasonably connected to their expressed view that working together is mostly about helping or getting help. This view should encourage us to create opportunities for students to experience and see working together as a collaborative endeavor, as Connor did, in which the goal is to build knowledge collectively by listening to and reflecting on one another’s ideas.

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