



Fostering Small-Group, Student-to-Student Discourse:
Discoveries from a Practitioner Action Research Project

Sarah Quebec Fuentes

Texas Christian University

Andrews Institute of Mathematics and Science Education

RME 2015 Conference

Table 1

Framework Used to Analyze Students' Communication

Question/Comment	Response
1. A asks B to show work	1. B shows own work
2. A asks B to explain work	2. B explains own work
3. A criticizes B's work	3. B justifies own work
4. A rejects B's justification	4. B reconstructs own work
5. A asks B to evaluate work	5. B evaluates A's work
6. A suggests a strategy to the group	6. The group tries the strategy
7. A asks B a content question	7. B answers A's question
8. A asks B a clarification question	8. B answers A's question

Note. Question/response pairs 1 through 4 are from the framework created by Dekker and Elshout-Mohr (2004). Question/response pairs 5 through 8 were created by the Quebec Fuentes. Question/response pairs 1 through 6 are regulating activities.

References

- Dekker, R. & Elshout-Mohr, M. (2004). Teacher interventions aimed at mathematical level raising during collaborative learning. *Educational Studies in Mathematics*, 56, 39-65.
- Quebec Fuentes, S. (2011). The evolution of one teacher's interventions with students working in groups. In M. S. Khine & I. M. Saleh (Eds.), *Practitioner research: Teachers' investigations in classroom teaching* (pp. 81-102). Hauppauge, NY: Nova Science Publishers.

Table 2

Descriptions of the 10 Issues with Students' Communication

Category/Issue	Description
Communicate	
Cannot Work Without Teacher or Dominant Student	The students cannot approach a task without the presence of the teacher or student that typically leads the group. They sit in silence or engage in off-task communication.
Help/Leave/Silence	The teacher works with a group so that they are communicating about a task. When the teacher leaves, the communication about the task ceases.
Own Zones	The students are all independently working on the task.
Non-participatory Student	One or two students are not participating in the discussion between the other group members.
Quality of Communication	
Need Appropriate First Question	The students seek the teacher's assistance, but the teacher is unaware of what the group has done related to the task.
Student Unsuccessfully Tries to Help Another Student	A student attempts to help a peer but that group member does not understand, often not acknowledging his continued confusion.
Dominant Student	A student dominates the group discussion often at the expense of contributions from other students.
Socio-Cultural Norms	
Rush to Complete Task	The students' goal is to get any answer with little to no focus on strategy and/or evaluation of the solution.
Teacher as Only Resource	The students view the teacher as the only person that can help them.
Blindly Accept Work of Others	A student agrees with an incorrect explanation.

Reference

Quebec Fuentes, S. (2013). Small-group discourse: Establishing a communication-rich classroom. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 86(3), 93-98.

Fostering Small-Group, Student-to-Student Discourse:
Discoveries from a Practitioner Action Research Project
Sarah Quebec Fuentes
s.quebec.fuentes@tcu.edu

Figure 1. Three dialogues from the geometry class.

Dialogue A		Dialogue B	
Laura	Teacher, can you come to us next... or me?	Kevin	Is that without the four triangles or with the four triangles? One, two three, four.
.	.	Teacher	So can you ask your question to [your group]?
.	.	Kevin	This is for this, for the sum of the interior angles, is it ... is it without the triangles or is it just ... are these one, two, three, four, without the diagonal?
Laura	So it's AAS?	Ellen	Oh, these are without the diagonal. Wait, some ... yeah.
Teacher	But I don't think we know that these angles up here are congruent.	Beth	Isn't it all together?
Laura	I don't... I've made an assumption but I guess I shouldn't.	Ellen	No, the diagonal just says that these two triangles can be made, but that's without it.
Teacher	What else can you figure out from the picture? ... What else do we know? ... Because there are things that you can infer from pictures that you're not necessarily given, like vertical angles. What's another thing that we always can infer from a picture?	Laura	Guys, it's the sum of all the interior angles, whether we added these, all of them, or whether we added these, it's going to equal the same thing.
Laura	Um, because I just knew... I just assumed because this was... if it's saying that these two are congruent then this would be the midpoint, and if it's dividing it's right at the midpoint of this... but that... it's dividing it right in the angle; I don't know.	Beth	Yeah, so it doesn't matter.
Teacher	It doesn't necessarily mean you have to bisect the angle. Just because it's the midpoint here doesn't necessarily mean it bisects the angle. There's something that those two triangles have in common. So like for this triangle, name the sides of this triangle.	Dialogue C	
Laura	The sides of this triangle? They're all going to have J. They have... oh, so that's a side...	Teacher	So did ... with what Kevin did, did he satisfy that hint?
Teacher	That's a pair of sides, yeah. So even though we are just marking it like as a single side, it's actually a pair because it's on that triangle and it's on...	Laura	Yes.
Laura	So it's SAS.	Ellen	Yeah.
		Teacher	Read the hint again.
		Kevin	Divide each polygon into triangles by drawing all the diagonals from one vertex.
		Teacher	Okay, so that is important.
		Laura	So you would only take it from one corner.
		Beth	Oh, it's only one.
		Laura	It's like something there.
		Kevin	So that would be two, two.
		Beth	That would only be two triangles ...
		Ellen	But why would that be two?
		Laura	I could be wrong. That could be from one vertex. So, that's to say we pick this one, it would have to be like that.
		Kevin	Ah!

Reference

Quebec Fuentes, S. (2013). Small-group discourse: Establishing a communication-rich classroom. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 86(3), 93-98.

Table 3

Scenarios, corresponding interventions, and examples for the Communication category

Scenario	Intervention	Example Teacher Responses
Cannot Work Without Teacher or Dominant Student	What are your questions?	Can you ask me a specific question?
	Redirect questions to group	Teacher restates student question directed at teacher to the rest of the group.
	Direct explanations to group members Refer to other resources	Explain that to your group members. Where can you find the answer to your question?
Help/Leave/Silence	Leave group with a task	Each write down your explanation and then compare it with those of your groupmates.
	Follow-up on progress	Did you compare your explanations? What are the similarities and differences?
Own Zones	Redirect questions	Could you answer her question?
	Individual work and then compare strategies	Explain your strategies to each other and then compare them.
Non-participatory Student	Explain what has been done	Can you explain what they were just discussing?
	Another student explain Restate in own words	Can you explain your strategy to him? To person being helped: Now what are you going to do to figure out ...?
	Answer another student's question	Could you help her with her question?

Reference

Quebec Fuentes, S. (2012). Promoting student-to-student discourse in small groups: Findings of a practitioner action research project. *Learning & Teaching Mathematics*, 12, 45-50.

Table 4

Scenarios, corresponding interventions, and example for the Quality of Communication category

Scenario	Intervention	Example Teacher Responses
Need Appropriate First Question	Explain what done so far	What did you do to figure out ...?
	Errors as opportunity for inquiry	Without directly identifying error, the teacher models the process of evaluating work. Do you agree with what he did? Why not? What is the difference between your strategies?
Student Unsuccessfully Tries to Help Another Student	Restate in own words	Can you explain what she is saying/doing?
	Agree with restatement	Do you agree with how he described your strategy/reasoning? Why or why not?
Dominant Student	Restate in own words	Can you explain what they just said?
	Highlight overlooked idea of another student	How did you (ignored student) solve the problem?

Reference

Quebec Fuentes, S. (2012). Promoting student-to-student discourse in small groups: Findings of a practitioner action research project. *Learning & Teaching Mathematics*, 12, 45-50.

Table 5

Scenarios, corresponding interventions, and example for the Socio-Cultural Norms category

Scenario	Intervention	Example Teacher Responses
Rush to Complete Task	Compare strategies	Compare your answers/strategies.
	Evaluate work of others	Can you determine which answers/strategies are correct and which are incorrect?
Teacher as Only Resource	Redirect questions to group	A student asks the teacher a question. The teacher restates the question to the group.
	Ask student to redirect question to group	Can you ask your question to them (other group members)?
	Explain work to others	Explain to the group what you did and maybe they can come up with a suggestion.
	Ask others to evaluate work	Do you agree with what he said? Why or why not?
Blindly Accept Work of Others	Restate in own words	Can you explain it now in your own words?
	Evaluate student's ideas	Does that explanation make sense? Why?

Reference

Quebec Fuentes, S. (2012). Promoting student-to-student discourse in small groups: Findings of a practitioner action research project. *Learning & Teaching Mathematics*, 12, 45-50.

Take-Home Tool

Stage 1: Evaluate Student Communication

Listen to or audio-record your students while they are working in groups. Use the framework in Table 1 to analyze the students' interactions.

- What are the question/response pairs are occurring often?
- What question/response pairs are occurring less frequently?
- What are any question/response interactions that you heard but do not appear in the framework?

Stage 2: Evaluate Group Communication

Listen to or audio-record your students while they are working in groups. Use the framework in Table 2 to analyze the dynamics of the various groups in your class.

- What are the communication issues that emerge in the groups in your class?
- What are any issues that emerge but do not appear in the framework?

Stage 3: Evaluate Your Communication

Listen to or audio-record your interactions with students while they are working in groups. Compare your interactions with the three dialogues in Figure 1.

What is the nature of your interactions?

- Are you providing help with the content (product help)?
- Are you interacting with one student only?
- Are you dominating the conversation?
- Do your interactions focus on helping the students communicate about the mathematics with each other (process help)?
- Are multiple students responding to each other as a result of your interactions?
- Are the students talking more than you?

Stage 4: Try the Interventions

Try the interventions in Tables 3, 4, and 5. Continue to listen to or record your students when they are working in groups both when you are and are not present.

- Is the quality of the student-to-student communication improving as a result of the interventions? If so, how?
- What interventions and in what situations are the interventions helping to improve the student-to-student communication?
- What interventions and in what situations are the interventions not helping to improve the student-to-student communication?
- Are you using any interventions that do not appear in Tables 3, 4, and 5?