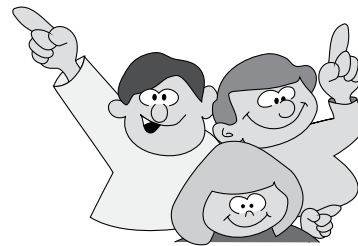


# Unsilence Students' Voices

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**P**icture a classroom. In it the teacher presents a problem and initiates a class discussion. Some students look attentive but are quiet. Could they be shy? Some students look like they are trying to catch up. Were they not paying attention and are lost because they mentally joined in late? Other students have their hands raised, prepared to talk. One or two students are waving their hands, eager to be recognized so that they can talk. Still other students are disengaged and are looking out the window or avoiding eye contact.

There are 20 or 30 students in this class and the activity, perhaps, is scheduled for 10 minutes. The teacher may use half that time to introduce and facilitate the discussion, which leaves 5 minutes to divide among the 20 or 30 students. If we think in terms of seconds, that would amount to 300 seconds to be divided by 20 or 30 and, if all things are equal (which we know is probably not the case), each student has 10–15 seconds to talk. If our goal is to provide an opportunity for “all” students to contribute, there would not be enough time, even if we were to double or triple the time spent on student talk. What is a teacher to do?

Every classroom has silenced voices—some more than others. Why? Suppose we look at three reasons and think about what we might do:

- ✓ As described above, there often are just too many voices and not enough time, so some go unheard.
- ✓ Some students may be unable to follow the conversation because they are not fluent in the language of English or mathematics or both.
- ✓ Some students have been conditioned to be passive learners. These students have developed habits of listening and following directions, but are not activators or initiators, nor do they embrace any of the thinking as their own. Instead, they learn

what others think where the “other” is often the teacher.

## Too Many Voices/Too Little Time

If we consider the time we have and the voices that need to be heard, how do we maximize the time for students' voices?

*Idea: Minimize the time a teacher talks.*

When you have a classroom discussion, do you find yourself repeating students' responses? Teachers whose classrooms I visit explain why they have developed this habit:

- ✓ Many of their students are soft-spoken and they repeat the student's comment in their more practiced teacher voice so it will be heard.
- ✓ Their classroom has poor acoustics due to loud heating/air-conditioning units and repeating is a way to help the student be heard.
- ✓ Rephrasing the student's comment, using more precise/accurate vocabulary, better reinforces the mathematical content.

When I mention to teachers that these habits are “robbing” the students of their mathematical thoughts, they take pause and think about what I might mean. I suggest that they try one small change in their classroom practice and reflect on how it affects their students.

*Tip: As you call on students during a classroom discussion, do **not** repeat.*

This is harder to do than you might think! Try it, though, and see what happens.

Do you find that your problem-solving work involves mostly whole class discussions? Some teachers I work with use problem-solving discussions as formative assessment. They assume that they need to hear students' voices to assess where each student is in the process. When I point out the little amount of time each student has for talking when the whole class discussion model is

used, they realize that something needs to be done to increase the time each student can talk. Working in pairs to “turn and talk” and then pairing the pairs to make groups of four increases the time that each student can develop both Mathematical Practice 1 (Make sense of problems and persevere in solving them) and Mathematical Practice 3 (Construct viable arguments and critique the reasoning of others). What does the teacher do during this time? He/she circulates and listens and reinforces the practice!

*Tip: Create environments that maximize the number of students talking with the teacher who is in a listening role.*

### Lack of Fluency in the Language

Language is a communication tool—people tend to use the language they spoke when they first met a person. So if you met someone and spoke German with him/her at first, your tendency is to communicate in German. Do students have trouble communicating in “math” with friends because they are more comfortable using a more relaxed language/vocabulary? It is certainly a possibility. Compounding that, if you are working with students whose second language is English, both issues might be contributing factors.

Since mathematics is a language, we have to establish environments in which students feel a need to communicate. But how do we create the need? One idea is to present “scenarios” instead of “problems.” Scenarios are problem-solving prompts with the question removed.

At the 2011 CMC-North conference in Asilomar, Marie Hogan and I presented the Math Forum’s “Noticing/Wondering” activity that uses four different types of scenarios that include:

- ✓ Reading the problem-solving prompt as a story and asking students: “What did you hear?”
- ✓ Showing a picture that illustrates the problem and asking students: “What do you see?”
- ✓ Showing students a diagram (possibly labeled) and asking: “What do you notice in the diagram?”

- ✓ Reading a longer problem-solving prompt in parts and, while displaying the text, asking students: “What did you hear? What do you notice?”

You can find more information about this idea, including samples of problems, on the page Marie and I made for the presentation (noted at the end of this article in the Related Links).

*Tip: Use “scenarios” to help create a need for students to talk about mathematics with each other.*

When you are communicating with someone and do not quite understand what he/she means, you can make comments or ask questions such as:

- ✓ I am not sure I understand.
- ✓ How does that work?
- ✓ Why did you use “(insert a word)” —can you tell me what that means?
- ✓ Why did you say that?
- ✓ Can you tell me more?

*Tip: Provide students with lists of questions to ask, scaffolding their need and ability to communicate.*

### Moving from Passive to Active Learners

Students who have not been in an environment conducive to their development of the mathematical practices may benefit from some training to learn and practice how to be active learners. In my experience middle and high school students may very well be in this situation.

One sixth-grade teacher I work with has been training her students to have mathematical conversations with each other. She started with having them practice the question, “How do you know?” Once they were using that question effectively in pairs, she introduced a second question for them to use, “How does that make sense?” And the third question she gave them was, “Can you say it another way?”

*Tip: Provide a question for students to practice and then another and another until they have a working list of questions to ask during their mathematics discussions.*

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Max Ray, a Math Forum colleague, wrote the following advice to students as part of his commentary for the first Pre-Algebra Problem of the Week.

I really like to know how you got from that initial head-scratching to your final answer. Why do I like to know? Three reasons:

- I think you're really smart and interesting and have good mathematical ideas, and getting to learn about how you think is like getting backstage passes to a really good concert. I get sad when I don't get to see behind the thinking.
- Your personal journey in solving a problem can help another person get unstuck, learn a new math idea, or find a new problem-solving strategy to use. I choose solutions to highlight when I think we can learn by reading them.
- Telling your story can help you learn, too. Have you ever had something really complicated happen and you wrote about it (in a journal or a letter to someone else or something) and as you were writing you got a new perspective? That can happen with math, too. You might remember the insight that helped you solve this problem better if you can explain it. Or you might actually uncover a mistake you made or something you don't understand, and be able to fix it, just by writing out why you did what you did.

Next time you write a PoW submission, you might want to try writing a "because" sentence with each step. You might say "because I wanted to get. . ." or "because I knew it had to be. . ." or "because I noticed. . ." Tell me more about how your mind works!

Perhaps a teacher could adapt this advice to explain why talking and writing have value, including some of the suggestions at the end for extending what students say or write.

**Tip:** *Value students' stories! Invite them to tell more!*

In my ideal world, students will begin their problem-solving journeys at the primary level. Here are two stories from first grade teachers who give me great hope!

I am noticing that all of my students have fallen into a sort of routine; they no longer stand around listlessly waiting for me to direct them to the next step but instead have become independent problem solvers who are capable of taking the problem-solving process on alone. I am also noticing that more students are explaining to their partners their ideas and are describing why they think it will work or why they think their partner's idea will not work.

After the problem-solving time, we come back together as a class and I ask them to share what was tricky about the problem. I notice that I am doing less talking and more facilitating as the students

take charge of the discussion. It is amazing to think of how their behaviors and attitudes towards problem solving have changed drastically since the beginning of the school year! (Elaine, 1st grade teacher)

We usually begin discussions with a knee-to-knee partner and then add two other knee-to-knee partners to think-pair-share. The students are comfortable enough now to share out their way for solving a problem and then someone else shares a different way. We use pictures, words, manipulatives, or act out a problem to come up with solutions. For those students who still need a little more help or guidance, I use the document camera to display the problem, and a different student every week will come up and show their solution on the screen. This seems to calm everyone's frustration level while celebrating someone's solution. (Beverly, 1st grade teacher)

**Tip:** *Let us start early! If problem-solving thoughts are valued at an early age, think where students will be on the problem-solving journey when they reach high school.*

I am optimistic that as teachers encourage their students' development of the Mathematical Practices they will find ways to have each student's voice heard in celebration!

### Related Links at the Math Forum Website

"Get Your Students Hooked On Noticing and Wondering." <http://mathforum.org/workshops/cmc/2011/hogan.html>.

"Problems of the Week Engage Students with Special Needs." <http://mathforum.org/articles/fetter.html>.

"Problem Solving—It Has to Begin with Noticing and Wondering." <http://mathforum.org/articles/communicator2010.html>.

"Max Ray: Why  $2 > 4$ : A Proof by Induction." <http://www.screencast.com/t/wqBSFhi0>.

Sample Problems with Supplemental Materials. <http://mathforum.org/pow/teacher/samples.html>.

Suzanne's Blog. <http://mathforum.org/blogs/suzanne/>.

Think You Don't Have Time to Use the PoWs? <http://mathforum.org/pow/teacher/PoWsDontHaveTime.pdf>.

The Math Forum @ Drexel's Problems of the Week service. [http://mathforum.org/problems\\_puzzles\\_landing.html](http://mathforum.org/problems_puzzles_landing.html).

Product Information. <http://mathforum.org/pow/productinfo.html>.

Trial Account. <http://mathforum.org/products/trial.html>. 