MQI COACHING

Getting your students' math minds fired back up

Evidence-based guidance for improving student engagement in mathematics

As we continue to grapple with the impact and effects of the COVID-19 pandemic, we know that student engagement in the math classroom is more important than ever. MQI Coaching, an initiative of the Center for Education Policy Research at Harvard University, offers a pathway for achieving this by offering **specific, actionable strategies to substantively engage students in the mathematical work of classrooms**.

Each question below offers you something to ask yourself as you plan and implement your math instruction.

ASK YOURSELF: Are students offering substantive mathematical contributions?

What it gets at: Students talk a lot in math class, but in terms of student learning, some talk matters more than others. In particular, substantive mathematical contributions can help students make sense of and internalize the ideas presented in class. Substantive mathematics contributions go beyond one or two-word answers to encapsulate student thinking and reasoning.

Instructional practice. To encourage substantive student contributions, you can:

- Ask students to present their solution methods publicly (with or without words)
- Ask students to describe the meaning of a term
- Ask students to comment on the reasoning of a peer

You can also offer students sentence starters to spur substantive mathematical contributions. For example, try:

- "My first step was.." "My next step was..." to support students in describing their procedure/ solution method
- "I agree/disagree with what you said because" to support students in commenting on the reasoning of others

The questions in this resource come from the Mathematical Quality of Instruction (MQI), a math specific observation rubric. To request access to MQI Video Library or rubric, please visit ***cepr.harvard.edu/mqi***.

ASK YOURSELF: Are students offering contributions that go beyond the HOW and incorporate an element of WHY— i.e., are students offering explanations?

What it gets at: Students often present descriptions of their thinking in mathematics class. When talking about simplifying 2/4, for instance, they might say "I divided the numerator by 2 and denominator by 2 and got 1/2." But research suggests that turning these "how" descriptions into "why" explanations can help students better understand mathematics. For instance, a student might explain the procedure above by saying "I was dividing by 2/2, which is 1, so the number doesn't change its value but looks different."

Instructional practice. While lesson planning, identify one explanation that is essential to the math concept. Explicitly outline the key components of the explanation. Then, in order to elicit this explanation from students, ask questions such as:

- Why did you choose that particular solution method?
- Why did your solution method work?
- Why did you take that step in the procedure?
- How do you know that to be true?

To offer multiple students time to think and respond, consider posing these questions as a turn and talk.

ASK YOURSELF: Are students engaging in mathematics at a high level of cognitive demand?

What it gets at: High quality curricula offer tasks that are designed to be cognitively demanding for students. However, these tasks can easily be over-scaffolded during their launch, taking the challenging elements of the task away and making the resulting student work more procedural. Research suggests, however, that students need ample opportunity to grapple with and make sense of the mathematics to succeed. Therefore, we want to ensure that students, as opposed to the teacher, are doing the "heavy lifting" in math class.

Instructional practice. When launching a task, consider these strategies[1] to maintain the high level of cognitive demand:

- Making sure students understand the features of the problem context and have the mathematical vocabulary to talk about the problem. This provides everyone an equal starting point, and will help students work productively on the task once launched
- Encouraging students to make sense of problems before starting to solve them. Get them to ask themselves: "What is this problem asking me to do?"
- As students make sense of the problem context and mathematical vocabulary, encouraging students to respond to one another and drawing explicit connection between students ideas
- Without prescribing a particular solution method, ensuring clear social expectations on what the final product includes and how students should get the work done

[1] Jackson, K., Garrison, A., Wilson, J., Gibbons, L., & Shahan, E. (2013). "Exploring relationships between setting up complex tasks and opportunities to learn in concluding whole-class discussions in middle-grades mathematics instruction." *Journal for Research in Mathematics Education*, 44(4), 646-682.