POWERFULPRACTICES
The Instructional Leadership Experience

Mathematical Learning Through Rigorous Tasks

By Mary Swack

Traditional mathematics classroom instruction typically plays out with the teacher providing some form of direct instruction on a topic followed by guided practice and then independent student practice.

It is often skill-based and filled with a variety of "tricks" and mnemonic devices to help students remember a formula or strategy. This approach may work for the mathematically proficient student for whom the concepts come easily. However, for students who are turned off by teacher discourse, challenged in attaining a deeper understanding of the concepts, fail to perform mathematical computations with fluency, and have difficulty engaging in learning a concept that seems completely irrelevant to their world, this instructional model is simply ineffective.

In Smarter Than We Think by Cathy L. Seeley, the author proposes to move from the teacher-centered model described above to a teacher-structured model where students begin by engaging in productive struggle with a challenging application problem followed by a teacher- facilitated class discussion that guides students toward solving the problem. Here are some key components to implementing mathematical learning through rigorous tasks:

1. SELECT THE RIGHT TASK

Begin with a rich problem students can relate to that invites the sharing of solutions. This provides students the opportunity to wrestle with the problem and promotes mathematical thinking rather than passively listening to a teacher explain how to solve a problem. Tasks should stimulate connections among mathematical concepts, extend beyond a one or two-step process, involve an authentic application of the content whenever possible, promote student collaboration, and draw upon students' backgrounds and experiences.

2. CREATE A SAFE ENVIRONMENT

Establishing a supportive learning environment encourages student engagement, participation, and collaboration.

One way to foster student-centered instruction is to have students brainstorm dialogue based on primary source analysis.

Mistakes are learning opportunities that often lead to constructive struggle and important learning when conducted in a positive classroom atmosphere. Safe environments promote behaviors of mathematically proficient students centered around having them reason, construct arguments, defend their thinking, create models, attend to precision, make sense of problems, persevere, and make mathematical connections. [CCSS Standards for Mathematical Practice] In short, students need to be able to take risks and communicate with one another in a safe environment conducive to learning.

3.ALLOW ENOUGH TIME

Planning and implementing a lesson using this instructional approach takes time and effort, but it is well worth the investment. Providing students the opportunity to constructively build their own understanding of the problem with new content connected to prior knowledge is a highly valued skill by employers in the twenty-first century marketplace.

4. NATURALLY EMBED INFORMAL ASSESSMENT

With the teacher acting as the facilitator of the learning, opportunities to monitor student learning are naturally built into the lesson. Circulating as students engage in communicating their thinking, responding to student questions with guiding questions, observing and highlighting different approaches and models used to solve the problem, and facilitating a class discussion to guide the learning are part of the process that provides the teacher a clear understanding of what students know and where the learning should go next.

When students engage in challenging and relevant tasks, they develop positive attitudes and increased confidence in mathematics. Using this type of instructional approach is not necessarily the right choice for every math lesson, but when mathematics instruction is student-centered and teacher-structured, students will naturally deepen their understanding of the concepts, make more mathematical connections, and retain new knowledge.

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