How Can Teachers Help Students Who Lack Foundational Math Skills But Have Been Passed Into Advanced Math Classes?

: : Alan Schoenfeld, U.C. Berkeley

Under the best of circumstances, the students in any class have a wide variety of strengths and weaknesses, so teaching can seem like a balancing act. At times, due to intentional or unintentional policies, we find a substantial percentage of students lacking what we would consider foundational skills.
THE EVIDENCE

What Doesn’t Work
The “obvious” solutions don’t always work: for example, “doubling up” on math prep can sometimes have advantages and sometimes improve test scores but can also increase failure rates (Nomi & Allensworth 2013, U.S. Department of Education 2018). Likewise, within-class differentiation can be problematic. In English Language Arts, for example, separating a class into reading groups where the skilled young readers discuss plot and motive while remedial readers get help sounding out words increases differences in student performance. (After all, the remedial readers didn’t get to engage with meaningful content!) A focus on “missing” skills in mathematics presumes a rigidly hierarchical curriculum where you have to know A before you can do B, before you do C, etc. It doesn’t have to be that way: it’s often possible for students to learn core ideas in the context of problem solving rather than assuming that they need the core understandings before proceeding. For one example of how a school opened up curricular practice, see Horn (2007).

Worthy Tasks
One of the very useful things to come out of an equity-oriented approach known as complex instruction (see Cohen & Lotan 1997 or better, follow the leads in Google) is the concept of “group worthy math problems”—tasks that have multiple entry points and allow for multiple solutions. A well-framed task might be solvable in a “brute force” way, through the clever use of a technique just learned, and possibly (though it may not have been covered in the past week) through graphing or algebra. Different students might approach the task in different ways, so more students have pathways into the core content. Then, comparing and contrasting solutions and showing how they connect is something that all students profit from. Those with less sophisticated approaches see how their ideas link to other methods, including recent content; those who used, say, an algebra solution, may see interesting things when they examine a graphical solution. This kind of problem enables all students to engage with the core mathematics, rather than segregating out those who lack certain skills.

CONCLUSION

Teaching for Robust Understanding
A key to making all of this work is establishing discourse structures in class that involve students being active participants in sense making. Doing so involves a shift in perspective, from “What should teachers do” to “How are students experiencing instruction, and what kind of sense making are they doing?” That shift lies at the heart of the Teaching for Robust Understanding (TRU) Framework (2018), which you can find at https://truframework.org/. Take a look at the TRU tools, specifically the Observation Guide at https://truframework.org/tru-observation-guide/ and the Conversation guide at https://truframework.org/tru-conversation-guide/. They point to things you can look for and questions you can ask yourself when you plan and review lessons. For example, the table on the following page lists the “look fors” for content from the observation guide.
The example discussed above shows that even mundane curricular tasks (and there are lots in our curricula!), when opened up, invite many more students into mathematically productive dialogues. If you try to make things like these happen, then you’ll be on the way to having a class in which both students who need to build foundational skills and those who are fluent in the most recently studied techniques can interact profitably.

**References**


