5 Practices for Orchestrating Productive Mathematics Discussions

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Part Three – Selecting, Sequencing and Connecting

As we close out the current school year we are excited to bring you Part Three of the Three-Part Series centered on "5 Practices for Orchestrating Productive Mathematics Discussions" by Margaret S. Smith and Mary Kay Klein. The practices expressed in these three articles have shifted many teachers' perceptions of what learning is possible in the math classrooms. More importantly, students' voices are being heard and connected to their community which gives them a mirror to see themselves as mathematicians.

Part One of the series states the importance of having clearly defined learning *goals* that are tied to mathematical *tasks*. These tasks allow students a playground to apply their schema, try novel approaches and learn new strategies. Part Two helps us understand the importance of *anticipating* student responses and *monitoring* what work is actually being generated. These are the first beacons of formative assessment that reveal the current location of student thought.

The purpose of this article serves to provide us with the tools to guide our students' thoughts to the target by *selecting*, *sequencing* and *monitoring*. When we are know exactly where students are and where we want them to go, we need to be very purposeful in selecting student work and how it provides clear learning path to our target.

Selecting determines what mathematical ideas and content will be discussed by the students. To do this, the teacher selects a set of specific work samples that will serve as the pathway for learning. This is a critical step in that it is defining what mathematics the students will engage and ultimately learn. Smith and Klein go on to add "By asking for volunteers to present, teachers relinquish control over the conversation and leave themselves – and their students – at the mercy of the student whom they have placed at center stage" (p.44). By accurately selecting, teachers are in control of the direction of the conversation but are still able to honor students work by facilitating dialogue around student-generated processes and products.

Depending on the complexity of the problem and your purpose in *selecting* student samples you may find yourself selecting 2-3 student work samples. If your purpose for the day is to increase engagement and further develop community, you may err on the side of selecting more work samples. Paraphrasing and highlighting key

mathematical thinking with each share out reveals an authentic appreciation for students' thinking. If the day requires key mathematical understanding you may find yourself selecting 2 work samples that center on the mathematical understanding you wish to reveal.

Sequencing is simply the act of ordering how the selected work samples will be presented to students. Smith and Klein add "The key is to order the work in such a way as to make the mathematics accessible to all students and to build a mathematically coherent story line" (p. 44). Access is a key when selecting the first work sample. A sample which is too easily understood by all students will generate disengagement but one too difficult that might further extend mathematical thinking beyond the reach of the students. This is why it's key to ***sequence*** a learning pathway for students by allowing the mathematics to be completely accessible at first and then nudging students to new forms of thinking in alignment to the day's target.

Connecting highlights the teacher's moves that bridge the divide between students current level of understanding to the mathematical target. Questioning is the teachers primary tool. However "the questions must go beyond merely clarifying and probing what individual students did and how. Instead, they must focus on mathematical meaning and relationships and make links between mathematical ideas and representations" (Smith and Klein p. 49-50). By asking students to simply repeat what was done by another students, or ourselves, suffocates their agency and restricts their ability to make sense of what was done or why the specific math skill was used in this context. This would center the mathematics and leave students on the sideline. Instead, questions to consider might include "What about the problem made you think to do it that way?" or "How might this strategy compare to what we heard from the other student? What are the pros and cons of each approach?" When discussing student work samples, it's important to question *why* and not just the *what and the how.*

Establishing goals, identifying tasks, anticipating, monitoring, selecting, sequencing and connecting are the tools used to orchestrate productive mathematics discussions. Continuing to hone your skills with these tools will cultivate a learning space ripe for discourse and deeper mathematical understanding. Your students deserve it and you will likely find yourself recharged and connecting with the passion that brought you into the math classroom in the first place.

Margaret Schwan Smith, & Mary Kay Stein. (2018). *5 Practices for Orchestrating Productive Mathematical Discussions.* The National Council of Teachers of Mathematics, Inc.