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Secondary School Mathematics Teachers' Classroom Practices

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THIS article focuses on research regarding three features of mathematics teachers' classroom practices that have been shown to influence students' opportunities to learn: (a) supporting productive discourse, (b) establishing norms, and (c) building relationships. In an extensive review of research on classroom teaching and its impact on student learning, researchers identified these practices as ones that not only went beyond supporting an improvement of student test scores but also positively influenced students' understanding of and dispositions toward mathematics [3]. This article considers each of these practices in turn.

1. What does research say about how teachers can orchestrate productive discourse in the mathematics classroom?

A prominent theme in the research over the past two decades is the importance of classroom discourse in enhancing students' opportunities to learn [3]. A classroom where productive classroom discourse is present is a classroom where students are presenting problem solutions, making conjectures about mathematical relationships, proving why mathematical processes work, and challenging others to think explicitly about the mathematics they are learning. It also allows teachers a window into students' thinking, supporting teachers' abilities to assess correctly students' progress with the mathematical topics they are studying. Research indicates that teachers support their students' classroom conversations by (a) giving students sufficient time to work on and discuss worthwhile mathemati-

cal problems, (b) pressing for justifications and explanations, (c) refraining from thinking for the students, and (d) encouraging students to learn from one another by modeling productive thinking [4].

Another prominent finding from the research literature on teaching is that “communication in the traditional mathematics classroom can be characterized by teacher talk: teachers explaining procedures, giving directions, explaining mistakes in ways that require very little student-to-student or even student-to-teacher talk” [3, p. 230–31]. This discourse pattern has been coined *IRE*—where the teacher *initiates* by asking a question, a student *responds*, and then the teacher *evaluates* that response. Researchers have argued that this type of classroom discourse limits students’ opportunities to learn and provides very little information for the teacher about what students know and can do.

Research that has been undertaken in the past two decades indicates that students’ learning is better supported through teachers’ incorporation of more inclusive patterns of discourse in the mathematics classroom [3]. One such practice is that of *revoicing*, or reuttering someone else’s talk. A teacher who revoices students’ ideas can clarify a mathematical relationship, identify or insert important mathematical vocabulary, or allow a misconception to be a place for learning. Also, revoicing can communicate a way of thinking mathematically, demonstrate respect for students’ ideas, and encourage the development of students’ mathematical voice.

Productive mathematics classroom discourse practices are of utmost importance when considering the needs of English language learners. Research indicates that the practice of revoicing is very effective in supporting the participation of students with limited English proficiency in mathematical discussions [7]. In fact, researchers argue that a classroom practice like revoicing can support *all* students as they learn mathematical terminology [3].

Another discourse pattern that has been found to support productive discourse in a classroom is that of “focusing” mathematical talk [9]. Most often, mathematics teachers “funnel” mathematical talk, meaning they ask questions that are meant to guide students to a particular answer. For example, consider the following exchange between a teacher and student in a high school geometry class:

- Teacher:* What is the sum of the angles in a parallelogram?
Student: 180 degrees?
Teacher: How many triangles can you cut the parallelogram into?
Student: 2.
Teacher: And how many degrees are in each of those triangles?
Student: 180.