Overview of Implementing Effective Teaching

Every student must have access to a high-quality mathematics learning experience. What does a high-quality learning experience look like? The answer is both simple and complex. Put simply, it is a daily experience in which a major focus is on mathematical proficiency, and therefore, the development of Mathematical Practices supersedes and interweaves with the content goals of a lesson. In other words, it matters *at least as much* that students can reason abstractly and quantitatively as that they can find the sum of two values. Mathematical proficiencies or processes are described effectively in the Mathematical Practices (NGA & CCSSO, 2010). Too often, the discussion of what students need to learn gets sidetracked with a dichotomy-type focus—for example, some argue that students need to understand what they are doing, while others argue they need to be efficient at using skills. The research is solid, however, in asserting that both strong conceptual understanding and procedural skills are absolutely essential in developing mathematical proficiency. The Mathematical Practices encompass this inclusive and comprehensive focus on mathematics; therefore, they must be a primary focus in any discussion about what students need to know and be able to do.

Developing mathematical proficiency (i.e., the Mathematical Practices) can be accomplished when teachers require that students engage in such practices as the way in which they learn about mathematics. There is significant evidence pointing toward Teaching Practices that support the development of mathematical proficiency, and these are comprehensively described in *Principles to Actions: Ensuring Mathematical Success for All* as Effective Mathematics Teaching Practices (see Figure 2.1).

Figure 2.1 **Effective Mathematics Teaching Practices *From Principles to Actions: Ensuring Mathematical Success for All***

Effective Mathematics Teaching Practices	
	Effective teaching of mathematics . . .
Establish mathematics goals to focus learning.	. . . establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem-solving.	. . . engages students in solving and discussing tasks that promote mathematical reasoning and problem-solving and allows multiple entry points and varied solution strategies.
Use and connect mathematical representations.	. . . engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem-solving.
Facilitate meaningful mathematical discourse.	. . . facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.
Pose purposeful questions.	. . . uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding.	. . . builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics.	. . . consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking.	. . . uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Source: National Council of Teachers of Mathematics (NCTM). (2014). Principles to Actions: Ensuring Mathematical Success for All. *Reston, VA: Author.*

Some of the Teaching Practices have clear and direct connections to Mathematical Practices. For example, supporting productive struggle (Teaching Practice) will support students' perseverance (Mathematical Practice). The better a teacher becomes at improving his or her ability to support productive struggle, the more a student has opportunities to make sense of mathematics and persevere. The effectiveness of a teacher in supporting productive struggle can be visualized as a continuum, as illustrated in Figure 2.2.

Figure 2.2 **Example of a *Shift in Classroom Practice***

Shift 7: From mathematics-made-easy toward mathematics-takes-time

Teacher presents mathematics in small chunks so that students reach solutions quickly. → Teacher questions, encourages, provides time, and explicitly states the value of grappling with mathematical tasks, making multiple attempts, and learning from mistakes.

Notice that the goal is to move Teaching Practices toward the right end of the continuum (which capture the essence of one of the NCTM Effective Mathematics Teaching Practices).

The connections between Mathematical Practices for students and Teaching Practices are actually not as straightforward or one-to-one as this example. Other *Shifts in Classroom Practice* can also impact a student's ability to make sense of and persevere in solving problems, for example. And teachers may not be focused specifically on a *Shift* or related teaching practice; instead, they may be zooming in on one topic—a Focus Zone such as formative assessment—and with this focus, their Teaching Practices are shifting to the right, thereby increasing students' opportunities to learn. This relationship is illustrated in the Leading for Mathematical Proficiency (LMP) Framework in Figure 2.3.

Professional learning can go in a myriad of directions. Attending a conference or reading a professional journal provides opportunities to explore many different zones. This can feel eclectic and unfocused, even overwhelming, as there are so many teaching ideas and **instructional strategies** that might support students. A way to bring cohesion to professional learning is to use this Framework. That means that whatever the professional learning focus might be, it is connected to the eight Effective Mathematics Teaching Practices, noticing professional growth along the *Shifts in Classroom Practice*, and ultimately, having data to support that this Practice or focus had an impact on students' emerging mathematical proficiency.

Figure 2.3 **Leading for Mathematical Proficiency (LMP) Framework**