Overview of Questioning and Discourse

Crafting and posing questions are both critical aspects of a teacher's practice, which is why "Pose purposeful questions" is one of the eight Effective Mathematics Teaching Practices in *Principles to Actions: Ensuring Mathematical Success for All* (NCTM, 2014). The first part of posing a question is to craft one that has the potential to elicit high-level thinking. The second aspect, posing the question, may seem like a routine act, but it also requires purposeful actions. In fact, crafting and posing questions both require explicit attention on the part of the teacher in order for this complex process to be effective.

Crafting High-Level Thinking Questions

Teachers ask many questions every day. Research from the early 1980s suggested that teachers asked between 300 and 400 questions daily (Leven & Long, 1981), a number that is probably even greater today. However, most questions asked by teachers do not support students in high-level thinking. Mid-continent Research for Education Learning (McREL) collected data from 23,000 classroom observations and found that 60 percent of questions posed were at the lowest two levels of Bloom's Taxonomy (McREL, 2009). Stigler and Hiebert (2009), focusing specifically on mathematics classrooms, found that middle school mathematics teachers in the United States posed fewer high-level questions than teachers in other countries.

Bloom's Taxonomy is probably the best-known framework for identifying the level of cognitive demand of questions (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). In 2001, a revised version of Bloom's Taxonomy was published in an attempt to update the taxonomy to be relevant in the twenty-first century (Krathwohl, 2002; see Figure 5.1). Asking students questions from the upper end of these frameworks (Application/Applying, Analysis/Analyzing, Synthesis/Evaluating, and Evaluation/Creating) supports students in high-level thinking.



Source: Krathwohl, D. R. (2002). A revision of Bloom's Taxonomy: An overview. Theory Into Practice, 41(4), 212–218.

Crafting high-level thinking questions for the lesson's learning objectives requires preplanning. To support teachers in planning effective questions, it can be helpful to consider the *purposes* questions might serve. These purposes include: (1) gathering information, (2) probing thinking, (3) making the mathematics visible, (4) encouraging reflection and justification, and (5) engaging with the reasoning of others (Huinker & Bill, 2017; NCTM, 2014, pp. 36–37). Once high-level thinking questions are crafted, the focus can change to posing questions in ways that ensure that *all* students are thinking.

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Posing High-Level Thinking Questions

An important aspect of posing high-level questions is thinking about the *patterns* of questions. There are (at least) three patterns of questioning that typically occur in mathematics classrooms (Herbel-Eisenmann & Breyfogle, 2005). Most common is the **initiation-response-feedback** (IRF), in which the teacher asks a question ("What is ...?"), a student responds ("Fifteen"), and the teacher provides or evaluates the response ("Good"). Typically, this questioning pattern does not engage students in high-level thinking. A second questioning pattern is **funneling**, wherein the teacher leads students through a series of questions to the teacher's desired end. In this pattern, the teacher is doing the high-level thinking of making connections; the students are merely supplying quick responses to questioning in which the teacher asks questions based on the students' thinking to support them in thinking at high levels. For example, after hearing a student respond, a teacher might say, "Tell me more about why you ..." or "Look at Amy's equation and tell me how each variable and number connects to the story situation." Questions such as these probe into student thinking and ask them to make predictions, compare, classify, evaluate, analyze, or estimate.

Classroom Discourse

Posing effective questions is just one aspect of a larger concept: **classroom discourse** (also one of the NCTM Effective Mathematics Teaching Practices). The role of the teacher in supporting meaningful mathematical discourse is complex (Chapin, O'Connor, & Anderson, 2013; Hufferd-Ackles, Fuson, & Sherin, 2015; NCTM, 2014; Smith & Stein, 2011). Discourse involves various teaching actions, including the following:

- Asking questions to understand and deepen students' thinking
- Listening to students' responses to gauge their learning
- Encouraging students to listen and respond to their peers
- Requiring students to explain their thinking
- Encouraging students to use multiple representations
- Allowing students to engage in productive struggle

Chapin and colleagues (2013) identify **talk moves** and tools that teachers can use to orchestrate classroom discussions that support increased student participation, as seen in Figure 5.2(a). These talk moves are used in various discourse situations, illustrated by the example scenarios in Figure 5.2(b). Taking time to focus on crafting and posing high-level thinking questions is critical to facilitating productive discourse; making this a focus of collaborative work in PLCs can save everyone time. And the increased student involvement in classroom discourse will lead to increases in students' understanding of mathematics.



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