

Chapter 1

The Importance of Formative Assessment

When teachers understand what students know and can do, and then use that knowledge to make more effective instructional decisions, the net result is greater learning for students and a greater sense of satisfaction for teachers.

—Bright and Joyner (2005, p. 2)

What Is Formative Assessment, and Why Is It So Important?

FORMATIVE assessment is an ongoing process designed (a) to assess where a student is in the learning process and (b) to help a teacher use students' responses to determine the instructional activities necessary to further the student's learning. When we think about formative assessment, we must focus on the students and the activities in which the teacher daily engages them in the classroom (Wiliam 2007). The National Mathematics Advisory Panel (2008) cited research that confirms effective formative assessment's positive impact on students' achievement: "Formative assessment has been found to add the equivalent of two grades to students' achievement if done very well (Black and Wiliam 1998)."

Formative assessment is designed to make students' thinking visible. Teachers can gather information from observing and listening to students explain their reasoning and then make informed instructional decisions that go beyond students' initial responses to explore their underlying reasoning. For example, students may answer a question correctly, but without some aspect of formative assessment, a teacher may think that they understand the concept in question. Asking students to explain what they were thinking when solving the problem may reveal that they had appropriate procedural knowledge but not conceptual understanding and could not explain the mathematical ideas underlying why or how the procedure or algorithm worked.

When eighth-grade students were asked how to convert a base raised to a negative power to a base with a positive power, many students stated that "you just move the base from the numerator to the denominator and change the sign." When asked why, most of those same students replied, "Because that is the rule." Compare this response with that of a student who can explain the mathematics involved in this process. This student might begin by explaining that one cannot alter the value of the original fraction and so must identify an equivalent representation. The student most likely uses appropriate mathematical vocabulary to explain that multiplying the original expression by 1—the identity property of multiplication—does not change the value. The student may elaborate, adding that the value of 1 can take on a variety of representations, which

depend on the situation. This student most likely will include a mathematical representation to support the oral explanation.

Formative assessment is one important component in the learning progression of students. It should be an integral part of classroom assessment practices. Unfortunately, many teachers overlook daily formative assessment, focusing mostly on summative assessments, such as weekly quizzes, chapter tests, annual state-mandated tests, the National Assessment of Educational Progress, the Trends in Mathematics and Science Study, and other standardized tests. Such assessments actually do little to influence students' learning because they do little to influence teachers' practice. Summative assessments do have their place in the educational process and assessment system, but these tests—which are so far removed from students' daily experiences—do not affect students in real time. Every classroom must institute appropriate, daily formative assessments, since it is formative assessment that touches students on an ongoing basis, in real time, and has the power to effect students' achievement because it has the potential to develop and deepen their thinking.

Margaret Heritage, of the Assessment and Accountability Comprehensive Center, shares a graphic (fig. 1.1) to show how various assessments affect students. It illustrates how assessments that are removed from students' regular interaction have less influence on students' learning progressions.

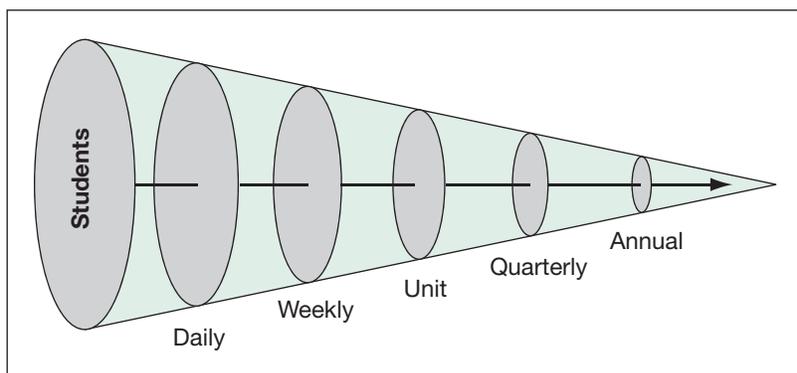


Fig. 1.1. How various assessments affect students

What happens daily is closest to students and has the greatest effect on them. This finding translates to the most important component of formative assessment: “What happens in the classroom has the greatest impact on student learning” (Heritage 2008). Notice how far away from the student the quarterly and annual assessments are located. The farther away from the student, the less likely the assessment is to have an immediate impact on the student's learning.

Many districts are now implementing benchmark assessments designed to inform district administrators about the progress students are making in mathematics. But take caution with these assessments: most benchmark assessments are better suited for instructional program decisions. For instance, a quarterly assessment may inform the school or district about the alignment of the textbook with the standards, whether a concept has been taught, or what skills students have solving unique problems when the teacher cannot offer suggestions or help. One effective use of the

benchmark assessments is to identify students who may be at risk. However, a significant limitation is that the benchmark results do not suggest how best the school or teacher should intervene in working effectively with those at-risk students. Also, these district-developed benchmark assessments often do not meet even minimum validity evidence (Shepard 2005).

What Does Formative Assessment Look Like in the Classroom?

Formative assessment varies and is ongoing. But effective formative assessment will do the following:

- Elicit evidence about students' learning
- Give teachers and students feedback about students' learning
- Provide information so that teachers can adjust instruction in real time
- Allow time for students' self-reflection
- Involve students actively in their learning

Effective formative assessment is not a one-size-fits-all concept. Rather, formative assessment includes a variety of practices designed to help the teacher understand what students think; how they reason through problems; the depth of their conceptual understanding as well as procedural competency; their proficiency in communicating mathematically, symbolically, orally, and in writing; their ability to work collaboratively; and the prior knowledge they bring to a concept and their ability to build on that prior knowledge. Most important, formative assessment is not something that teachers do *to* students; rather, it actively engages students in the process of their own learning. It empowers students to take control over their learning. Equally important: the assessment is built into the lesson planning.

Teachers' Role in Formative Assessment

Competency with mathematics content is a primary consideration for effective instruction and assessment. To be effective, middle school teachers of mathematics must have both conceptual and procedural mathematics content knowledge that goes beyond the grades they teach. Equally important is the need for the pedagogical content knowledge that will enable them to teach the conceptual and procedural content effectively to every student in the class. As teachers everywhere struggle to close the achievement gap, we acknowledge the need for teaching proficiencies with the following:

- The mathematical underpinnings of formulas and procedures that explain why they work
- The future mathematics for which the current mathematics lays the foundation
- Using many different representations of concepts and procedures
- Recognizing and encouraging deep thinking in classroom discussions

Assessing prior knowledge

Teachers must also have knowledge of the students they teach, how much mathematical knowledge the students have, and how students use that knowledge. Consider the following: *Stephen was heard explaining to his mother that he didn't need to go to school until November. When his mother asked why, Stephen explained, "All we do is repeat what we learned last year, and I remember all that stuff. We don't learn anything new until November."*

Assessing students' prior knowledge is a crucial component in determining whether a need exists to pose more challenging problems, more scaffolded problems, or both. Since learning is developmental, not everyone is in the same place at the same time. Students' marking time and waiting for others to catch up is not appropriate, nor is teaching at a level beyond their comprehension. Including *range questions* in your lessons—questions designed to identify students' mathematical development—is one way teachers can accurately determine where students are in the learning progression. Often the results of a range question dictate the need to differentiate instruction.

Giving feedback to teachers and students

The power of feedback is one facet of formative assessment that surprises many teachers. To use feedback effectively, all parties must agree on exactly what constitutes feedback. Wiggins (2004) states that “feedback is information about how we did in light of some goal.” It is useful information about how students solved a problem. Some feedback might be a question asked to a student engaged in a task. Other feedback may be written—for instance, a sticky note on a paper that poses a question for a student to reflect on. Feedback should not be labor intensive but rather a natural extension of our interactions with students. It is not evaluative, so we do not need to worry about recording a grade. Feedback is an important component in our goal of improving students' learning.

Research has shown that when students receive a graded paper, they look at the grade; often if the grade is good, they bring the paper home, but if it is not good many middle school students crumple it up and throw it away. When they receive a grade together with feedback on individual questions, students typically respond in the same fashion. However, when they receive feedback without a grade, students not only read the comments but often respond to the feedback. Giving students *neutral* and *descriptive feedback* usually results in their making more thoughtful responses and, by design, helps students reflect on their work. Neutral feedback includes asking students to explain their thinking further, such as asking, “What might happen if . . . ?” or “Will that always work?” Effective descriptive feedback gives students an idea of what they are doing well, informs them on how what they are doing links to classroom learning, and offers specific input on what they must do next to advance in their learning.

You might think about an assessment sandwich. The sandwich consists of a positive comment, followed by a clarifying question or comment written to help the student meet a standard, followed by an encouraging comment. Effective feedback is also a way to challenge thinking,

support generalizations of mathematical ideas, and help students communicate with clarity. Neutral and descriptive feedback are both powerful tools in motivating students and helping them move forward in reaching the next goal in their learning progression.

Students' Role in Formative Assessment

To really succeed, however, students must learn to self-assess so that they can understand the main purposes of their learning and thereby grasp what they need to do to achieve.

—Black and Wiliam (1998, p. 12)

For formative assessment to affect students' achievement positively, students must be actively involved in the process. By the middle grades, students should be able to articulate areas in which they are proficient and those in which they need more support. Students should be expected to maintain a record of their performance. Although the concept is novel for most middle schoolers, teachers should encourage students and give them time to reflect on their achievement. When students are actively engaged in criteria and goal setting, self-reflection and self-evaluation are the next logical steps in the learning process. “Without time to reflect on and interact meaningfully with new information, students are unlikely to retain much of what is ‘covered’ in their classrooms” (Dodge 2009, p. 4).

Since teaching is ultimately about student learning, stating that “I taught it, they just didn’t get it” is unacceptable. Rather, finding a method to engage students in a way that makes them accountable for their own learning is appropriate. An important part of this endeavor is to engage students in developing the criteria and goal setting. When students are engaged in setting goals, they have a better opportunity to understand the teacher’s expectations. When you share exemplar work illustrating your expectations, students are more likely to understand where they are and where they are expected to be. When students share their own work in the classroom community, when they have to defend their ideas publicly, they develop more effective ways of communicating their reasoning both orally and in writing. A collaborative effort by both you and students enhances both the teaching and the learning that occur in the classroom community.

Students often need assistance getting started in self-reflection. Asking students specific questions is often helpful for getting them to focus on what it is they are reflecting. Some suggestions:

- Describe the strategies you used to solve this problem. What other strategies might you use the next time you solve a similar problem?
- Did you receive feedback during the problem-solving process? If so, was it helpful? Explain how it helped you.
- Did you collaborate with peers when you were solving this problem? Was the collaboration helpful? If so, how? If not, why not?

If you are asking students to complete a portfolio, you may want to add the following types of questions as the students reflect on their progress:

- Why did you choose these entries?
- Which portfolio entry represents your best work? Why do you think so?
- Which portfolio entries represent the most mathematical growth? How do they show your growth in understanding?
- Which entries represent problems or tasks that you found most challenging? Explain those challenges.

Since one tenet of formative assessment includes students' taking responsibility for their own learning, it follows that these students participate in student-led parent–teacher conferences. By engaging students in discussing their work, you are actually empowering them to take responsibility for their progress and giving them a forum in which to display all that they have learned. These conferences should not be punitive; rather, they should be experiences in which the students have an opportunity to showcase their mathematical progress.

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