

Have You Ever Wondered What Assessment Should Look Like in Mathematics?

by the California Mathematics Council State Board

Assessment should support the learning of important concepts and furnish useful information. A student's opportunity to demonstrate what he/she knows and can do should not be hampered by time limits or facility with language. It should be more than merely a test at the end of instruction to see how the student performs under special conditions. Rather, it should be an integral part of instruction that informs and guides decisions both immediate and long term (NCTM 2000, 22). This article will discuss why we assess, what should be assessed, what we are currently assessing, and how we can most effectively assess.

What Is the Purpose of Assessment?

The purpose of assessment should be to support the learning of important concepts and furnish useful information to students, parents, teachers, and community members. What is assessed communicates what is valued and considered important. What is assessed applies pressure to change what is taught.

Ideally, teachers use assessment to plan instruction, to adjust instruction as they are teaching, and to determine who learned the planned content at the end of the unit and at the end of the year. Students can use the assessments to demonstrate mathematical understandings and skills, to set goals for themselves, to assume responsibility for their own learning, and to become more independent learners. Parents use assessments to tell them how well their children are learning, and whether they are learning at grade level. Stakeholders want assessments that indicate that students are mastering grade level standards and are preparing for the workforce and future learning. They also want assessments that indicate where resources need to be allocated to improve the learning of all students. Stakeholders who are concerned with equity issues want assessment information to determine if groups within the general population are receiving an appropriate education as well. Can a single assessment meet all these purposes?

What Should Be Assessed in Mathematics?

Schools now have several documents that define what students should know and be able to do in mathematics as they progress through the grades: the *California Mathematics Framework*, the *California Mathematics Standards*,

and NCTM's *Principles and Standards for School Mathematics*. These documents advocate for assessments that focus on students' understanding as well as their procedural skills. As described in these standards, assessment should measure:

- computational skills as well as the application of these skills in familiar and unfamiliar contexts;
- the use of mathematical processes in context;
- the use of mathematics to make sense of complex situations;
- how well students formulate hypotheses, collect and organize information, and draw conclusions; and
- how well students communicate their mathematical reasoning both verbally and in writing.

Can a single assessment meet all these purposes?

What Is the Current Mathematics Assessment System in California?

At the end of the year, stakeholders want to know how well students have learned the mathematics that is described in the standards. In California, the mathematics portion of the STAR (State Testing and Reporting) Program includes both a nationally-normed, standardized test and a criterion-referenced test, which are given to students in grades 2 through 11. These tests are given toward the end of the school year. The norm-referenced test (SAT 9) measures the basic skills of students as compared to a nationally normed group that reflected the student population of our nation at the time of the norming. (The normed group may not reflect the population in a particular district). The score a student receives is a percentile score, indicating how that student compares to the normed group; it does not indicate how well the student has learned the mathematics standards. Mike Schmoker (2000), author of "Results: The Key to Continuous School Improvement," states: "Norm-referenced tests complicate the assessment mission by seeking to sort and rank students. And their data are less reliable for students near the high end, where a correct answer to even one more item can push a student up several percentile points" (60). The criterion-referenced test (California Standards Test) estimates how much of the mathematics standards for that grade level each student has learned. However, the score at this time is only a raw score, not yet providing useful information. The content of both tests is limited. Schmoker continues: "Standardized tests have serious limitations. They do not fully measure

students' critical and inventive powers. Their multiple-choice format doesn't reveal a student's ability to construct a proposal, build a case, analyze an issue in writing, or originally apply a host of mathematical processes—all things we value."

There are two other serious drawbacks to these standardized tests. Children who are not yet proficient in English will have difficulty demonstrating their mathematics knowledge and understanding because even the mathematics tests are language dependent. The tests also have a time limit, which penalizes students who could show more of their mathematics learning given adequate time.

The results of these end-of-year assessments provide information that may be used to alter the next year's program but do not inform more immediate instructional decisions.

What Should Be in a Complete Assessment System?

If the ultimate purpose of assessment is to inform and improve the learning of mathematics, then an end-of-the-year test is not enough. If we want to assess how much students have deepened their understanding of mathematics concepts during the year, we need appropriate pre- and post-assessments. If we want to assess a student's expertise with mathematical reasoning, a standardized test is not enough. If we want to know how well students can use their mathematical knowledge and understandings in complex situations, we need to assess them in complex situations. If assessment were used diagnostically to meet the educational needs of students, perhaps we would not have to use the tests punitively and create high stakes situations that erode the fundamental purpose of education.

Just as we would not use a person's temperature as the only measurement to determine good health, we should not use one type of assessment to determine quality instruction, student growth, and mastery of standards. A complete assessment system for mathematics needs to provide meaningful information about the strengths and weaknesses of individual students in a variety of areas such as skills and the application of skills in various contexts, concepts, problem solving, and mathematical reasoning. And a complete assessment system needs to provide this information throughout the year.

Questions to Discuss at Your School Site

How do teachers at your school site assess where students begin in relation to the mathematics standards?

How do teachers at your school site assess progress toward meeting the mathematics standards so they can adjust instruction to more closely meet the needs of the students?

How does your school site assess and work to meet the needs of all populations?

Resources

California Department of Education. *Mathematics Framework for California Public Schools, Kindergarten through Grade Twelve*. Sacramento, CA: Author, 1999.

California Department of Education. *California Mathematics Standards*. Sacramento, CA: Author, 1998.

National Council of Teachers of Mathematics. *Principles and Standards for School Mathematics*. Reston, VA: The Council, 2000.

Schmoker, Mike. "Results: The Key to Continuous School Improvement." *Educational Leadership* 57 (February 2000): 62.