

## MATHEMATICS ASSESSMENT STANDARDS—IN BRIEF

### National Council of Teachers of Mathematics

The National Council of Teachers of Mathematics (NCTM) has produced three key documents: *Curriculum and Evaluation Standards for School Mathematics* (1989), *Professional Standards for Teaching Mathematics* (1991) and, most recently, *Assessment Standards for School Mathematics* (1995).

The first draft of the *Assessment Standards for School Mathematics* was completed in August 1993. During the 1993–94 school year, critiques and comments were received from more than two thousand reviewers. During summer, fall and winter, 1994–1995, the document was revised and produced.

The Assessment Standards were developed because assessment needs to reflect the reform vision of school mathematics:

- All students are capable of learning mathematics, and their learning can be assessed.
- Assessment should be a means of fostering growth toward high expectations.
- Assessment procedures must no longer be used to deny students the opportunity to learn important mathematics.
- Teachers are in the best position to judge students' progress.

The following key points, made in the *Evaluation Standards*, are expanded upon in the *Assessment Standards*:

- Student assessment should be aligned with and integral to instruction;
- Multiple sources of assessment information should be used;
- Assessment methods must be appropriate for their purposes;
- Instruction and curriculum should be considered equally in judging the quality of a program.

#### **NCTM defines assessment:**

**ASSESSMENT IS THE PROCESS OF GATHERING EVIDENCE ABOUT A STUDENT'S KNOWLEDGE OF, ABILITY TO USE, AND DISPOSITION TOWARD, MATHEMATICS AND OF MAKING INFERENCES FROM THAT EVIDENCE FOR A VARIETY OF PURPOSES.**

If the NCTM's vision is to be realized, all aspects of school mathematics—content, teaching and assessment—need to change on a systemic basis. This includes a shift in the following:

**SHIFT IN CONTENT:** **Toward** a rich variety of mathematical topics and problem situations. **Away from** just arithmetic.

**SHIFT IN LEARNING:** **Toward** investigating problems. **Away from** memorizing and repeating.

**SHIFT IN TEACHING:** **Toward** questioning and listening. **Away from** telling.

**SHIFT IN EVALUATION:** **Toward** evidence from several sources judged by teachers. **Away from** a single test judged externally.

**SHIFT IN EXPECTATIONS:** **Toward** using concepts and procedures to solve problems. **Away from** just mastering isolated concepts and procedures.

Adapted from *Assessment Standards for School Mathematics*. NCTM 1995, by Betz Frederick.

**Handout A1.11,H3, p. 1**

### **ASSESSMENT STANDARDS FOR SCHOOL MATHEMATICS**

Six ASSESSMENT STANDARDS provide criteria for judging the quality of mathematics assessments. They apply to *all* mathematics assessments.

#### **ASSESSMENT SHOULD REFLECT THE MATHEMATICS THAT ALL STUDENTS NEED TO KNOW AND BE ABLE TO DO.**

Assessment should match the current vision of school mathematics and involve activities that are based on significant and correct mathematics. These activities should provide all students with opportunities to formulate problems, reason mathematically, make connections among mathematical ideas, and communicate about mathematics. Skills, procedural knowledge, and factual knowledge are best assessed in the same way they are used, as tools for performing mathematically significant tasks.

#### **ASSESSMENT SHOULD ENHANCE MATHEMATICS LEARNING.**

Assessment that enhances mathematics learning becomes a routine part of ongoing classroom activity rather than an interruption. Assessment does not simply mark the end of a learning cycle. Rather, it is an integral part of instruction that encourages and supports further learning. Opportunities for informal assessment occur naturally in every lesson. They include listening to students, observing them, and making sense of what they say and do.

#### **ASSESSMENT SHOULD PROMOTE EQUITY.**

In an equitable assessment, each student has an opportunity to demonstrate his or her mathematical power and reach high levels of accomplishments. Because different students show what they know and can do in different ways, assessments should allow for multiple approaches. When students have special needs, provision is made to ensure that they can demonstrate their understanding. Assessment is equitable when students with special needs or talents have access to the same accommodations and modifications they receive in instruction.

#### **ASSESSMENT SHOULD BE AN OPEN PROCESS.**

Openness in the process of assessment can be assured in several ways. Firstly, information about the process is made available to those affected by it. Secondly, an open assessment process honors professional involvement and teachers are active participants in all phases. Thirdly, the assessment process is open to scrutiny and modification. Assessments are continually examined for flaws and continually revised to be in harmony with other reforms. Openness in assessment includes informing the public [parents, policy-makers, business and industry leaders, members of the mathematics community, and interested citizens] about the process.

#### **ASSESSMENT SHOULD PROMOTE VALID INFERENCES ABOUT MATHEMATICS LEARNING.**

An inference about learning is a conclusion about a student's cognitive processes that cannot be observed directly. The conclusion has to be based instead on the student's performance. Using multiple sources of evidence can improve the validity of the inferences made about students' learning. Mathematics assessment includes evidence from observations, interviews, open-ended tasks, extended problem situations, and portfolios as well as more traditional instruments such as multiple-choice and short-answer tests. The use of multiple sources allows strengths in one source to compensate for weaknesses in others. It also helps teachers judge the consistency of students' mathematical work.

#### **ASSESSMENT SHOULD BE A COHERENT PROCESS.**

A coherent mathematics assessment system assures that assessors will develop activities and performance criteria tailored to the purposes of each assessment. Coherence in assessment involves three types of agreement. Firstly, the assessment process forms a coherent whole; the phases fit together. Secondly, the assessment matches the purposes for which it is being done. When the design, evidence-gathering, evidence-interpreting, and action phases of the assessment process are consistent with one another and with the purposes of the assessment, it has educational value. Thirdly, the assessment is aligned with the curriculum and with instruction. Students' learning connects with their assessment experiences.

**Handout A1.11,H3, p. 2**

## MAJOR SHIFTS IN ASSESSMENT PRACTICES

TOWARD	AWAY FROM
<ul style="list-style-type: none"> <li>• Assessing students’ full mathematical power</li> <li>• Comparing students’ performance with established criteria</li> <li>• Giving support to teachers and credence to their informed judgment</li> <li>• Making the assessment process public, participatory, and dynamic</li> <li>• Giving students multiple opportunities to demonstrate their full mathematical power</li> <li>• Developing a shared vision of what to assess and how to do it</li> <li>• Using assessment results to ensure that all students have the opportunity to achieve their potential</li> <li>• Aligning assessment with curriculum and instruction</li> <li>• Basing inferences on multiple sources of evidence</li> <li>• Viewing students as active participants in the assessment process</li> <li>• Regarding assessment as continual and recursive</li> <li>• Holding all concerned with mathematical learning accountable for assessment result</li> </ul>	<ul style="list-style-type: none"> <li>• Assessing only students’ knowledge of specific facts and isolated skills</li> <li>• Comparing students’ performance with that of other students</li> <li>• Designing “teacher–proof” assessment systems</li> <li>• Making the assessment process secret, exclusive, and fixed</li> <li>• Restricting students to a single way of demonstrating their mathematical knowledge</li> <li>• Developing assessment by oneself</li> <li>• Using assessment to filter and select students out of the opportunities to learn mathematics</li> <li>• Treating assessment as independent of curriculum or instruction</li> <li>• Basing inferences on restricted or single sources of evidence</li> <li>• Viewing students as the objects of assessment</li> <li>• Regarding assessment as sporadic and conclusive</li> <li>• Holding only a few accountable for assessment results</li> </ul>

**Handout A1.11,H3, p. 3**