The Role of Assessment

Brahier Text
Chapter 9

What is Assessment?

- Testing
- Evaluation
- Measurement
- Accountability
- Achievement
- Grades

Why Assessment?

- To gather information about how students are doing, understanding, etc.
- What is *assessed* in the classroom sends a loud message about what is *valued* in the classroom.
  - Note: not everything that is valued in the classroom can be measured or assessed by a written test.

Assessment vs. Evaluation

- Assessment = formative
  - Useful feedback to determine student progress
  - Are students "getting it"?
  - Used throughout the teaching/learning cycle
- Evaluation = summative
  - Final evaluation of performance
  - Used to determine a grade or value/ worth
  - Done at the end as a summary of other data

Assessment (NCTM)

- In 1995 Assessment Standards:
  - "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 the evidence for a variety of purposes."

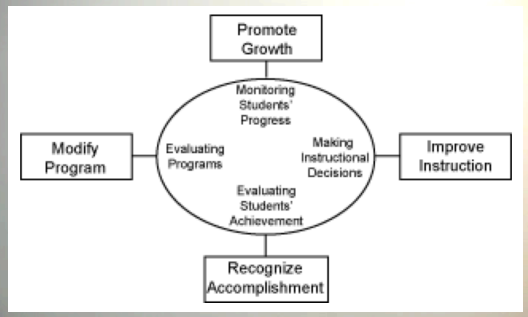
Assessment (NCTM)

- In 2000 Principles and Standards:
  - "Assessment should support the learning of important mathematics and furnish useful information to both teachers and students."

NCTM Perspective

- Four purposes of assessment
- Assumptions behind effective assessment practices
- Shifts in assessment practices
- Ongoing, multiple sources evidence
- The *process* of assessment

NCTM Four Purposes



Types of Tests

- Criterion-referenced
  - Aligned to a set of standards and student scores are based on the degree to which they have mastered those objectives.
  - Proficiency exams
  - Competency exams
  - NYS Regents Exams (?)
- Norm-referenced
  - Students are compared against some norm (e.g. students from the same grade level).
  - PSAT, SAT, ACT
  - CAT, ITBS
  - Most class tests (?)

Test Construction

- Preparing Items:
  - Goal: to determine the degree to which students have mastered the objectives set forth
  - Minimize chances of students being able to guess the correct answer
  - Consider alignment with day-to-day teaching practices
  - Include cumulative review items

Test Construction Issues

- Test Length
  - Longer
    - fewer points per problem
    - too long will cause anxiety
  - Reasonable fit to time period available
  - What range of things will students need to be able to demonstrate to show that they have met the stated objectives?

Test Construction Issues

- Mix of skill-based, concept-based and application-based questions
- Closed vs. open items
- Extended student-constructed response items - performance task assessment (must be paired with a scoring rubric - "a generalized scoring standard")
  - Either multiple acceptable answers or one correct answer with multiple possible means of arriving at the solution

Special Question Types

- True/False
  - When only two logical choices possible
  - Cannot help diagnose misconceptions
- Multiple Choice
  - Can be used to measure conceptual, procedural and problem-solving outcomes (when single, well-defined outcomes)
  - Best suited for measuring students' knowledge of facts, terminology, conventions, classifications, etc.
  - Aspects of math knowledge that can be stated in a clear and unambiguous way
  - Have a single correct answer

Multiple Choice Example

One bell rings every 8 minutes, and a second bell rings every 12 minutes. They both ring at exactly 12:00. After how many minutes will they next ring together?

A.8
B.12
C.20
D.24
E.96

Validity and Reliability

- Validity
  - Measure of the degree to which a test actually measures the content that the teacher intends it to measure
  - Taught vs. tested (greater overlap means greater validity)
- Reliability
  - The likelihood that a student will obtain roughly the same score if given different versions of the test multiple times
  - Degree to which score is a fair representation of the student's knowledge level

Scoring Student Work

- Consider the following solution:
  - » $2x - 4(x - 3) = 10$ (Problem says to "solve for x")
  - » $2x - 4x - 12 = 10$
  - » $-2x - 12 = 10$
  - » $-2x = 22$
  - » $x = -11$
- Where is the problem?
- What is the solution worth (out of 10 pts, say)?
- *Your grading scheme communicates your values!*

NAEP Scoring Rubric

- 0 = no response
- 1 = incorrect response (completely incorrect)
- 2 = minimal (no reasonable approach)
- 3 = partial (evidence of conceptual understanding, but mathematical errors)
- 4 = satisfactory (clear understanding; solution has minor weaknesses)
- 5 = extended (complete understanding; fully developed solution)

Using the NAEP Rubric

- Marcy's Dot Pattern (on overhead)
- Radio Stations handout (for homework)

Integrated Algebra Rubric

- From the first Integrated Algebra Regents Exam, given in June 2008:
  - A contractor needs 54 square feet of brick to construct a rectangular walkway. The length of the walkway is 15 feet more than the width.

    Write an equation that could be used to determine the dimensions of the walkway. Solve this equation to find the length and width, in feet, of the walkway.

Integrated Algebra Rubric

- [4] An appropriate equation is written, width = 3, length = 18, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational or factoring error is made, ***or***
- [3] Appropriate work is shown, but the length and width are not labeled or are labeled incorrectly, ***or***
- [3] Appropriate work is shown to find either the length or the width of the walkway, but no further correct work is shown.
- [2] Appropriate work is shown, but two computational or factoring errors are made, ***or***
- [2] Appropriate work is shown, but one conceptual error is made, ***or***

Integrated Algebra Rubric

- [2] An appropriate quadratic equation in standard form (set equal to zero) is written, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or factoring error are made, ***or***
- [1] An appropriate equation is written, but no further correct work is shown, ***or***
- [1] Width = 3 and length = 18, but no work is shown.
- [0] Width = 3 or length = 18, but no work is shown, ***or***
- [0] 3 and 18, but no work is shown, ***or***
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Written Test Issues

- No single written test can accurately measure a student's achievement
- A test is a "snapshot" of a student's performance on a particular day and with a particular set of items
- Little opportunity for follow-up
- Some students are not good "test-takers" (they may be math- or test-anxious, or have poor reading ability)
- Variation on teacher grading schemes
- What does a test score *really* mean?

Alternative Assessments

- Journals
- Open-ended questions and scoring rubrics
- Individual and team projects
- Observations and checklists
- Interviews
- Portfolios

Student Journals

- Student writing that reflects on their thinking, problem-solving approaches and opinions
- Valuable insight into student thinking
- Can promote rich classroom discourse
- May use a *prompt* – some specific question or problem posed to elicit student reaction

For instance: *"What was the most difficult topic we studied this week? What made it difficult for you?"*

Individual/Team Projects

- Authentic (real-world) tasks
- Carried out over time
- Associated rubric can judge on thoroughness, rigor, creativity, neatness and quality of presentation (written or oral) in addition to content judgment

Observations/Checklists

- Systematic way of watching what students are doing in class
- Good source of insight into student understanding
- Informal observation of students as they participate in discussions, attempt to solve problems and work in groups
- Can take notes or develop checklists of anticipated student behaviors (*see text for examples*)

Student Interviews

- Best way to gain deep understanding of students' thought processes
- Probing and challenging questions
- Opportunity to follow-up
- May involve a few questions in a problem-solving situation or an extended session

Student Portfolios

- Purposeful collection of work, produced by a student over time
- Evidence of student growth
- Glimpse of what student is able to do and believes about mathematics
- Can include: corrected tests, sample homeworks, project work, interesting solutions, sample journal entries, etc.
- See textbook for sample portfolio rubric

Brahier Chapter 10

- NCTM recommendations on assessment
- Equity through assessment
- Homework assignments:
  - Homework amount/frequency
  - Checking assignments
  - Using homework in assessment
- Evaluation: determining final grades

Equity in Math Education

All students have a right to equal access to the study of mathematics.

Assessment Equity Issues

- Historically, in math achievement:
  - males outperform females
  - whites outperform other ethnic groups (except Asian groups)
- What accounts for these differences?
  - Genetic superiority??
  - Cultural bias in assessment?
  - Language differences?
  - Different learning styles?

Equity Principles

- Assessment goals need to be made clear to students
- Students should be assessed on the same principles that guide classroom practice
- Equitable assessment tools should be used
- Instruction should be connected to assessment
- Self-assessment should be encouraged
- Using a variety of assessment approaches supports equity

Homework Issues

- Amount – as much as necessary to:
  - provide practice on problems explored in class that day
  - allow students to complete a problem or project begun in class
  - Lay the groundwork for a new lesson
- Amount and Frequency – homework should be purposefully and carefully selected (not just "*2-32 evens*")
  - It is not necessary to assign homework every day

Checking Homework

- Students put all of the problems on the board
- Teacher asks students for difficult problems
- Teacher reads correct answers
- Students work homework in a notebook which is collected
- Students compare answers in small groups

Homework "Grading"

- Collect homework daily and score as complete or not complete (or missing)
- Collect homework daily and score on a rubric
- Collect homework and grade on how many problems solved correctly

Note: if you assign homework, you must do something with it, but it doesn't have to be used for grades.

Only 32% of Japanese teachers use homework in final grades, compared to 95% of US teachers.

Evaluation: Final Grades

- Ultimately must report a letter grade or numerical average
- Think about how all the pieces of assessment come together
- No grading system is perfect

- *Remember – your grading scheme communicates your values!*