Introduction to Assessment

Defining Assessment

“An assessment is an activity, assigned by the professor, that yields comprehensive information for analyzing, discussing, and judging a learner’s performance of valued abilities and skills.”

- Huba and Freed, Learner-Centered Assessment on College Campuses: Shifting the Focus from Teaching to Learning, 2000

Assessment is more than assigning grades: it implies ongoing interaction and communication between instructor and student.

Assessment Decisions

Faculty Perspective:
“Learning drives everything.”
- Barbara Walvoord

Student Perspective:
“Grading drives everything”

Key Questions

• What do I want my students to learn?
⇒ Learning objectives
  - Content knowledge
  - Process skills

• How will I know if they have learned it?
⇒ Assessment strategies
  - Summative
  - Formative

• How much do I value that learning?
⇒ Look at what counts towards the grade

Types of Assessment

• Summative assessment
  - Traditional grading for accountability
  - Usually formal, comprehensive
  - Judgmental

• Formative assessment
  - Feedback for improvement/development
  - Usually informal, narrow/specialized
  - Suggestive

Assessment and Learning Objectives

Bringing content and process together

Content Knowledge

Process Skills

Assessment
An Example:
Probing Critical Thinking Skills in a Chem Exam

Goal: to design an exam question that:
• goes beyond simple knowledge or comprehension
• uses novel situation or “real world” context
• involves multiple concepts
• requires recognition of concepts involved (analysis), their roles here (application), and how several ideas come together (synthesis)

Chemical Solutions: Typical Questions

Calculate the vapor pressure of a solution of 5.8 g of NaCl in 100 g of water.
Bloom Level: Knowledge

Explain why a solution of NaCl will have a lower vapor pressure than pure water.
Bloom Level: Comprehension

A “Critical Thinking” Exam Question

The relative humidity inside a museum display case can be maintained at 75.3% by placing within the case a saturated solution of NaCl (containing excess solid NaCl). Explain, in molecular level terms, why the humidity remains constant - even when water-saturated air (100% humidity) diffuses into the case.

An Alternative Approach…

Design a solution-based system that could be used to maintain a constant humidity within a museum display case.

Explain in molecular-level terms why this would work.

Bloom’s Cognitive Levels

- **Evaluation**: make a judgment based on criteria
- **Synthesis**: produce something *new* from component parts
- **Analysis**: break material into parts to see interrelationships
- **Application**: apply concept to a *new* situation
- **Comprehension**: explain, interpret
- **Knowledge**: remember facts, concepts, definitions

Assess at Several Bloom Levels

<table>
<thead>
<tr>
<th>Example: Chem exam</th>
<th># of points</th>
<th>sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Comprehension</td>
<td>36</td>
<td>45  (D')</td>
</tr>
<tr>
<td>Application</td>
<td>22</td>
<td>67  (C')</td>
</tr>
<tr>
<td>Analysis</td>
<td>20</td>
<td>87  (A)</td>
</tr>
<tr>
<td>Synthesis</td>
<td>9</td>
<td>96  (A)</td>
</tr>
<tr>
<td>Evaluation</td>
<td>4</td>
<td>100</td>
</tr>
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</table>
Evaluating Learning through Rubrics

Rubric: a set of specific criteria against which a product is to be judged
• Criteria reflect learning objectives for that activity
• Several achievement levels are identified for each criterion
• Benchmark features indicating quality of work at each level are clearly described for each criterion

Rubrics can be used for both formative and summative assessment.

Rubric Design

<table>
<thead>
<tr>
<th>Objective</th>
<th>Achievement Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excellent</td>
</tr>
<tr>
<td>Objective 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>Objective 2</td>
<td>Expert</td>
</tr>
<tr>
<td>Objective 3</td>
<td>6-5</td>
</tr>
</tbody>
</table>

Rubric for Planning of a Middle School Science Unit

<table>
<thead>
<tr>
<th>State &amp; national standards</th>
<th>Excellent</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate; listed for each lesson</td>
<td>Appropriate; listed for most lessons</td>
<td>Most lessons are appropriate; misconceptions addressed in few lessons</td>
<td>Few standards, listed or not listed</td>
<td></td>
</tr>
<tr>
<td>Developmental level of lesson</td>
<td>Appropriate; misconceptions addressed in all lessons</td>
<td>Appropriate; misconceptions addressed in most lessons</td>
<td>Few lessons are appropriate; misconceptions not addressed</td>
<td></td>
</tr>
<tr>
<td>Includes nature of science, inquiry in</td>
<td>All lessons</td>
<td>Most lessons</td>
<td>Many lessons</td>
<td>Few lessons</td>
</tr>
<tr>
<td>Assessment</td>
<td>Variety of activities, well-integrated</td>
<td>Used in most areas but missed in some</td>
<td>Used but with little planning or integration</td>
<td>Little use of assessment throughout unit</td>
</tr>
</tbody>
</table>

Advantages of Rubric Use

• Clarifies expectations
• Efficient, specific feedback concerning areas of strength, weakness
• Convenient evaluation of both content and process learning objectives
• Encourages self-assessment: use as guideline
• Minimizes subjectivity in scoring
• Focal point for ongoing feedback for improvement

Other Ideas for Rubric Use

• Have students participate in setting criteria, performance descriptions
  – Use old student work as “data”
• Have students use rubric to rate own work; submit rating with assignment
• Others