Assessment of Student Learning

How do you do it?
Assessment of Student Learning

- More than just tests
- Includes higher-order thinking skills
- Allows students to reflect on their learning and accomplishments
- Gives instructor guidance on teaching effectiveness
- Should be built into courses during the planning stage
Summative Assessment

- End of instructional unit, or end of term
- Post-mortem
- Little opportunity for intervention
- Often high stakes and basis for grades
Formative Assessment

- Provides useful feedback about learning
- Determines nature of student understanding
- Provides opportunities for intervention
- Usually low stakes, although can be graded
# Bloom's Taxonomy

<table>
<thead>
<tr>
<th>Competence</th>
<th>Skills Demonstrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge (Information)</td>
<td>list, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.</td>
</tr>
<tr>
<td>Comprehension</td>
<td>summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend</td>
</tr>
<tr>
<td>Application</td>
<td>apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover</td>
</tr>
<tr>
<td>Analysis</td>
<td>analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer</td>
</tr>
<tr>
<td>Synthesis</td>
<td>combine, integrate, modify, rearrange, substitute, plan, create, design, invent, what if?, compose, formulate, prepare, generalize, rewrite</td>
</tr>
<tr>
<td>Evaluation</td>
<td>assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize</td>
</tr>
</tbody>
</table>
Useful Assessment Methods

- “Stop and Think” techniques
- Robust Exams
- Rubrics and “Primary Trait Analysis”
- Other Active-Learning Techniques
  - Gallery Walk
  - Concept Maps
  - Student Reports, Journals, Portfolios
Stop and Think: Predictive Demonstrations

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Professor, Physics
UMass Amherst
Stop and Think: Low-Stakes Writing

- Minute paper -- summarize a topic explored during the class
- “Muddiest Point” -- What concept or idea in today’s class is the most unclear to you? What question do you have about it?
Robust Exams

- Multiple choice can be good!
- Reasoning
- Solve problems
- Interpret graphs and diagrams
- Rapid feedback on answers
- Foster Interaction
- Ability to re-take
Example:
Robust Exam Questions

In the situation illustrated in the diagram, what will happen over time?
A) Sand will accumulate at locations 1 and 2.
B) Sand will erode from locations 1 and 2.
C) Sand will accumulate at location 1 and erode at location 2.
D) Sand will erode at location 1 and accumulate at location 2.

- Synthesis
- Evaluation
Robust Exams:
Two-stage Cooperative ("Pyramid") Exams

- **Goal:** Encourage higher-order reasoning during exams
- **Goal:** Make exams a better learning experience
- **Goal:** Reinforce the value of collaboration

- **Stage 1:** traditional multiple choice
- **Stage 2:** exam done a second time with collaboration (some additional questions)
Two-stage Cooperative Exams
Rubrics

- Provide clear-cut criteria
- Improve consistency in assigning grades
- Lets students know what is important
- Basis for “Primary Trait Analysis”

GEO 415: SCORING RUBRIC FOR WRITTEN QUESTIONS

<table>
<thead>
<tr>
<th>grade</th>
<th>criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>questions answered completely; logic of solution is clear; factual information is correct; all calculations are free of errors; conclusions are accurate</td>
</tr>
<tr>
<td>4</td>
<td>questions answered with some supporting documentation; logic of solution may have minor lapses; factual information is essentially correct, although not always clear; calculations may have minor errors; conclusions are essentially correct within a reasonable deviation</td>
</tr>
<tr>
<td>3</td>
<td>questions answered; logic of solution may have large uncertain components; some factual information is missing; calculations show some errors; conclusions deviate from the desired path</td>
</tr>
<tr>
<td>2</td>
<td>questions not answered completely; logic of solution difficult to follow; factual information not always correct or shown; calculations have large errors; conclusions not always within the realm of reasonable deductions</td>
</tr>
<tr>
<td>1</td>
<td>questions are mostly not solved; logic of solution is unclear; information is missing or incorrect; calculations have large errors; conclusions are unreasonable</td>
</tr>
</tbody>
</table>

Criteria Analysis

- Logic
- Information
- Calculations
- Conclusions

Comments: Need help in building a rubric?

http://rubistar.4teachers.org/index.php
Other Active-Learning Techniques

- Oral or poster reports of projects
- Structured debates
- “Town meeting” forum
- Gallery Walks
- Concept Maps
Concept Maps

Active-learning method that enables students to reflect upon relationships in complex systems and ideas.