

What Do Students Learn in EOS Courses? (And how you can tell!)

Pre/Post Assessments

A Pre/Post Assessment is a short test given to students twice, often on both the first and last days of class. It is different than an exam in that students do not receive a grade from the Pre/Post Assessment, the methods of choosing and targeting questions differs, and you do not need to worry about the assessment “getting out.” The purpose of these assessments is to determine how much of the material students understand before the course and compare that with their level of mastery at the end of the course. These Assessments have several benefits:

- You can determine if the course objectives were met and whether the course is set at an appropriate level.
- It is easier to show that the students have learned something you think is important as a direct result of the course.
- And finally if you are trying out a new teaching method, you can use the Pre/Post Assessment results to determine whether a certain method has had an effect (and possibly compare it more easily to a control group).

Developing Pre/Post Assessments

The first step in developing a Pre/Post Assessment is to articulate the learning goals for the course. From these we select representative goals and specific common misconceptions. Using these as our guide we develop questions for the assessments. In some cases, we ask for written responses from the students and use the most common incorrect responses to develop multiple choice distractors for later versions of the assessment.

Some examples of Pre/Post Assessments in EOS

Several courses in the department are now using Pre/Post Assessments to help evaluate student understanding. These assessments are typically less than a half hour long and are given on the first and last days of class. Here are a few examples of questions and results:

EOSC 111: Fall 2008 Pre and Post Assessment

In the first week, students complete a pretest evaluating their knowledge on several aspects of the course. The week following each lab the students answer post assessment questions online. An example of one question is below. The results of this question are shown in Figure 1 and discussed below.

As waves approach the shore, which of the following happens?

- A) The waves speed up
- B) The wave height decreases
- C) The wave period decreases
- D) The wavelength decreases
- E) The wave frequency decreases

Lessons learned from this question:

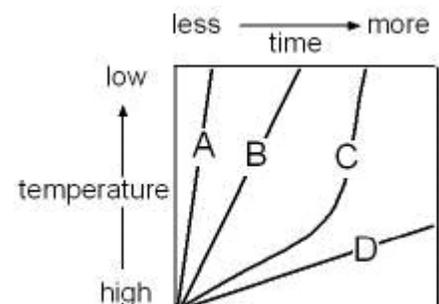
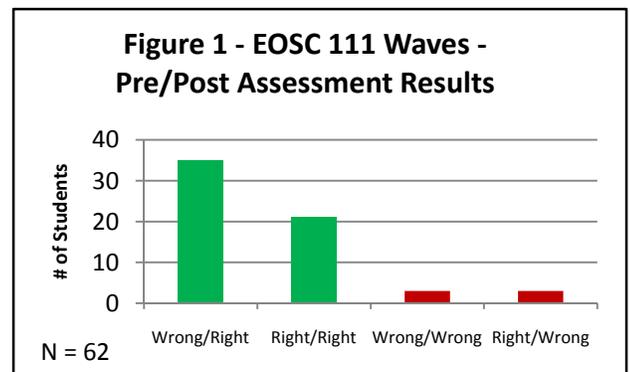
The majority of students entering EOSC 111 do not initially understand how waves interact with the shoreline. However the Waves Lab addresses initial student misconceptions successfully. As Figure 1 shows more than 50% of this group got the wrong answer in the Pre Assessment and the correct answer after completing the activities in the lab.

EOSC 221 Winter Term 2 2009 – Pre Assessment (Post Assessment to be completed at End of Term)

In EOSC 221 students completed Pre Assessment on the first day of class. An example question from the 221 Assessment is:

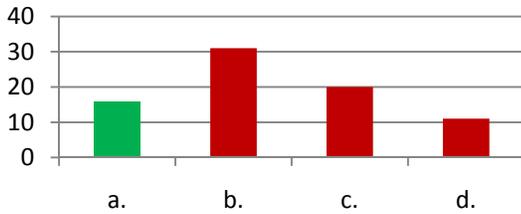
The lines on the graph to the right illustrate cooling histories for four different magmas lettered A-D (i.e., the lines show how magma temperature decreased with time). Which of the following rock types is most likely to form by cooling history C?

- a. andesite porphyry
- b. gabbro
- c. basalt
- d. obsidian



Results on page two...

Figure 2 - EOSC 221 - Cooling History Pre Assessment Results



Lessons learned from this question:

More than half the class did not answer this question correctly after taking first year courses (Figure 2). This question needs to be validated with student interviews to determine exactly where the difficulty is. Students could be confused in a number of ways: they may not know the names of the rocks, may not understand the effects of temperature and time on magma, or could have trouble reading the graph. This question will be revised once student difficulties are clarified.

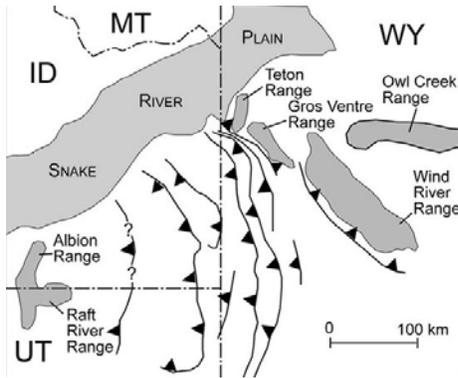
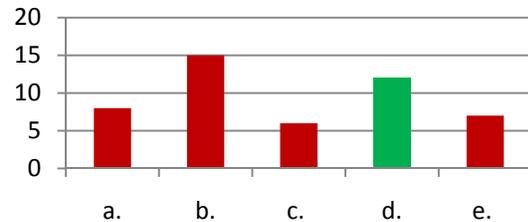


Figure 3 - EOSC 223 Map Symbols Pre Assessment Results



EOSC 223 – Winter Term 2 2009 – Pre Assessment (Post Assessment to be completed at End of Term)

In EOSC 223 Pre/Post assessments were administered on the first day of lecture. One question was:

On this map (above), the thick black line symbol (with filled triangles) indicates a series of which ONE type of geologic structure?

- a. strike-slip faults b. normal faults c. reverse faults d. thrust faults e. I don't know

Please explain your reasoning.

Lessons learned from this question:

Prior to the course most of the students were unable to identify a thrust fault on a geologic map (Figure 3). However, this is an expected result as EOSC 223 is the first mapping course in the program. How they answer this question on the post assessment will reveal whether their experiences during the term improved their understanding of map symbols. This question also has a written response asking students to explain their reasoning. Student thinking will be used to iterate the question, decipher the reasons they choose incorrect answers, and verify the reasons they choose correct answers.

Reacting to the results

After the Pre/Post Assessment has been completed and analyzed you can adjust your teaching to:

- better align with course goals,
- add active learning opportunities targeting misconceptions,
- modify existing activities,
- improve assignments and assessments

More information

Contact any of the Science Teaching and Learning Fellows (Josh Caulkins, Brett Gilley, Francis Jones, or Erin Lane) for examples of pre/post assessments and suggestions on using them in your courses.

Some useful references:

1. Gibbs, Graham, Claire Simpson (2005), "Conditions Under Which Assessment Supports Students' Learning", Learning and Teaching in Higher Education, Issue 1, 2004-05
2. Pelligrino, J. W., Chudowsky, N., AND Glaser, R. 2001. Knowing What Students Know: The Science and Design of Educational Assessment. National Academy Press, Washington, DC

Contact EOS-SEI: You are encouraged to talk about your course(s) or teaching and learning in general by dropping by EOS-South 361 or contacting Francis Jones (fjones@eos.ubc.ca), Brett Gilley (bgilley@eos.ubc.ca), Josh Caulkins (jcaulkins@eos.ubc.ca), Erin Lane (elane@eos.ubc.ca) or Sara Harris (sharris@eos.ubc.ca).

For more faculty resources and information, see <http://www.eos.ubc.ca/research/cwsei/>.

Also, please watch for Brown Bag discussion sessions roughly once a month in the Tuesday 12:30-1:30 time slot.