EOSC 210 Earth Science for Engineers

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Introduction

EOSC 210 is a required course for all 2nd year civil, mining and geological engineers and (hopefully) instills a broad overview of Earth materials and processes. The course is delivered in a large lecture (~200 student) format with an accompanying 2 hour lab each week.. Optimization of this course began in January 2008 and several changes were implemented in the Fall 2008 offering of the course.

Challenges

Prior to optimization this course presented several challenges:

•The majority of the students are civil engineers many of whom believe the course is not necessary for their career (they are incorrect in this belief of course, see the Vaiont Dam photo below)

•Initial content was not geared towards engineering students

•The course is scheduled at a difficult time; 8:30 am Tuesday and Thursday mornings (after Pit Night!). As the term wears on, attendance can be a problem.

•The large lecture format can make it difficult to introduce active learning and group work

•The lecture room is long and thin with poor acoustics

•Extremely dated lab material (in some cases using activities that are more than 30 years old)

•Curriculum changes in an accredited program must be considered carefully

What we've changed so far

Developing explicit learning goals

Course Level goals for lecture and lab have been developed and agreed upon by the working group. Examples of course level goals are:

•*Recognize and differentiate the adverse effects that Earth processes can have on site conditions, engineering designs and vice versa.*

•*Observe our planet from a more enthusiastic and informed perspective to aid in the process of becoming a responsible professional.*

Draft lecture level goals have been developed for all lectures. This summer we will be revisiting these goals for next year's offering. Examples of course level goals are:

•*Compare and contrast the two most important types of volcanoes*

•*Predict which type of convergent boundary will develop as a function of age, rock type and plate margin*

Students found the learning goals useful for studying, but tended not to pay attention if they were read out during lecture. As part of the process of developing learning goals we also removed course materials that were superfluous or obliquely related to the goals.

Clickers and In Class Discussions

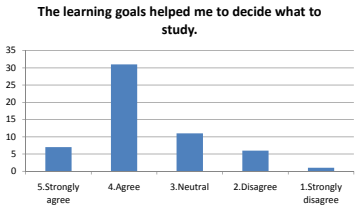
As part of the effort to encourage active learning by the students, use of clickers tied to group discussion have become a regular part of each lecture. Questions such as:

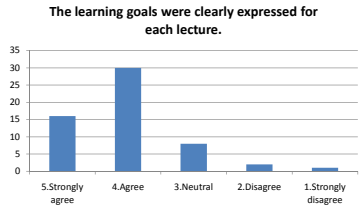
Tensioning a rock anchor helps to stabilize a slope by:
a) reducing gravity
b) preventing rainwater from infiltrating into the slope and reducing the effective stresses
c) breaking the rock, allowing it to be removed
d) increasing the normal stress and thus the frictional strength
e) using the strength of the steel to hold up the rock

In addition to regular clicker discussions class discussions are used. Many of these discussions revolve around case studies related to engineering. For example the Vaiont Dam Disaster (a compelling engineering disaster that occurred in Italy - see photo to left) is discussed in several Lectures throughout the term.

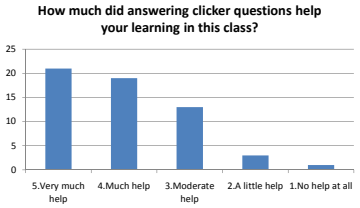
Course Evaluation

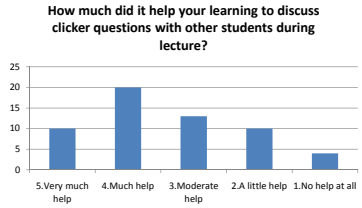
As part of the evaluation we implemented an extensive End of Term Course evaluation. In general students found the learning goals clear and helpful for studying, though during lecture many students did not pay attention when the goals were read out.



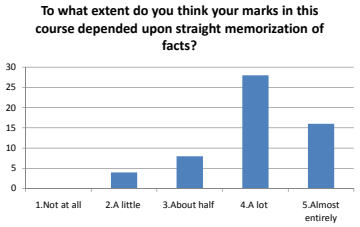


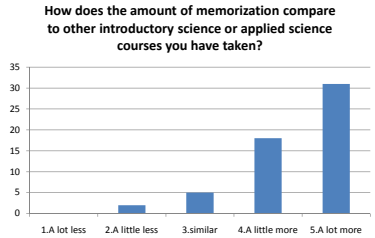
Students felt answering clicker questions and clicker discussions with other student enhanced their learning and were effective uses of time.





On the other hand students still felt much of the course was about memorization.





Future Plans (Fall 2009)

Next fall we plan to make two major changes to the course:

PeerWise

PeerWise is an online tool where students write, share, read and evaluate multiple choice questions with the whole class. There are several aspects of PeerWise designed to encourage students to participate in the process, and students in next year's course will be required to submit questions before the midterm and the final. For information about PeerWise visit: http://peerwise.cs.auckland.ac.nz/ (or look for the developer, Paul Denny. He may be around today)

New labs

Several labs for this are being redesigned from the ground up. Jason McAlister (a graduate student in EOS) has been redeveloping the labs for the course this semester. One of the key design philosophies has been to make the labs relevant to engineering, last year some of the labs were simply first year geology labs that had been repurposed.