EOSC 210
Introduction to Earth Science for Engineers
Background

• EOSC 210 is a required 2\textsuperscript{nd} year course for engineers in Civil (~60\%), Mining (~20\%), and Geological (~20) specializations

• Approximately 220 students each Fall

• Students participate in two 80 minute lectures and one 3-hour lab each week
Features

• Clickers to drive discussion in lectures (not for attendance!)
• Other activities and discussions in lectures
• Learner focused lab activities
• Course level learning goals
• Lecture level learning goals for all lectures (Used to guide lectures, develop activities, and to create clicker and exam questions)
• Emphasis on relevance to society and engineering
Major Changes for 2009

• Labs rewritten with learning goals and new activities
• Use of PeerWise - Students required to create, review, and answer Multiple Choice Questions
• More examples related to student lives and engineering practice in lectures and labs
Assessing learning with clickers and exams

• One applied multiple choice question was delivered to the students in several successive assessments throughout the term.

• This question (next slide) is difficult because
  – It relies on several different but interrelated concepts (Groundwater, permeability, properties of sediment, depositional environment, the nature of tunneling, etc.)
  – There are several “red herrings” in the diagram and text that can easily distract students

• Question difficulty is mitigated slightly as there are multiple ways to arrive at the correct answer
There are plans to excavate a 20-m deep NW-SE tunnel across the area shown in the map to the right. The same materials found on surface extend to a depth of 50 m. Which of the following factors may be problematic?

(a) Large water inflows.
(b) **Buried erratics/boulders.**
(c) Tunnel collapse in weak sands.
(d) Sub-horizontal faults.
(e) a) and c).
Chart 1
Midterm 2 (Early November)
Chart 2
Clicker Review (Late November)
Chart 3
Final (December)
Assessing Learning with Clickers

- Students had great difficulty with this question on midterm II (Chart 1 ~20% correct) – students possibly missing some content (permeability?)
- It was highlighted after the midterm, but by the final review students still had trouble (Chart 2 ~50% correct)
- Intervention in lecture: Discussion on how to approach questions with multiple overlapping concepts
- By the final exam the majority of students got the answer correct (Chart 3 ~70%)
This year we used PeerWise software that helps students create, review, and answer Multiple choice questions.

Students were required to create 1 question, and answer and review 5 in the week before each exam.

- Students who contributed questions: 213
- Students who answered questions: 223 (more than completed the class)
- Total number of questions submitted: 773 (more than required by assignment (should be ~600)
- Total number of answers: 43645 (far more than required average of ~200 Qs per student, requirement was 15)
Chart 4
How much did using PeerWise help your learning?

- Very Much-Much Help: 20
- Moderate Help: 15
- Little-no help: 5
Chart 5
How much did using PeerWise help your studying for the exam?
PeerWise

- On average students in EOSC 210 answered far more questions than their counterparts at other institutions – we are investigating this with Paul Denny (creator of PeerWise)
- Student comments on PeerWise are shown in Charts 4 and 5. In general, students appreciate this tool.
- We believe it can be better utilized and will improve the implementation for next year
Interest

• Part of the changes in this course were an effort to create linkages between students and the course material

• Case studies, lecture examples, and labs were redesigned to be more relevant both to students but also to engineering in general

• Stated student interest in the course has increased
Chart 6
Relative to other courses you have taken at UBC, how does your interest in this course compare? Fall 2008

- More interesting
- Roughly the same
- Less interesting
Chart 7
Relative to other courses you have taken at UBC, how does your interest in this course compare? Fall 2009

More interesting
Roughly the same
Less interesting
Persistent Challenges

- 8:00 am Lecture Slot – Student attendance
- Lecture and lab linkages
- Convincing Civil Engineering students of relevance (~60% of students)
- Textbook – many students do not find it useful (most did not read)
- Students still perceive much material to be memorization based (this is perhaps a fair assessment)