Update on the Carl Wieman Science Education Initiative
Assessing Student Attitudes and Learning in Earth and Ocean Sciences

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Overview

• Define CWSEI
• Define EOSSEI
• What are we doing?
• Examples
• The future
What is the CWSEI?

- Carl Wieman Science Education Initiative
- In a nutshell
  - Using the tools of Science to improve Science education

Major advances past 1-2 decades
Consistent picture ⇒ Achieving learning

classroom studies

brain research

cognitive psychology
What is the CWSEI?

- Under the CWSEI funds have been granted to:
  - Earth and Ocean Sciences, Life Sciences, Physics,
  - Smaller grants to Statistics, Computer Science and Chemistry

What is the EOS SEI?

- Earth and Ocean Sciences Science Education Initiative
- UBC EOS has been granted funds for a 5 year project
  - Now starting year 2
- By September we will have 4 Science Teaching and Learning Fellows (STLFs)
What are we doing?

• Developing clear learning goals for ALL EOS COURSES and the EOS curriculum
• Assess and address student learning and attitudes toward Earth and Ocean Sciences
• Involving a high percentage of faculty members & students (sustainability)
• Set up systems to SHARE RESOURCES and keep this work evolving in the future.

What are we doing?

• Mostly course-based
  – Assemble a working group
  – Articulate course-level learning goals
  – Identify appropriate pedagogy to achieve learning goals
  – Implement pedagogy
  – Assess/evaluate efforts and results
  – Rinse and repeat (usually a 3 semester cycle)
What we’ve done so far: Courses

- Draft learning goals for at least 13 courses:
  - EOSC 111, EOSC 114, EOSC 221, EOSC 112, EOSC 210, EOSC 212, EOSC 220, EOSC 223, EOSC 310, EOSC 449, EOSC 324, ENVR 200, ENVR 300
- Data collection:
  - Quantitative: pre-post tests of student abilities
  - Qualitative: surveys, focus groups, interviews (students, grads, alumni, faculty, and employers)

What else have we been doing?

- Student Attitudes about Earth Science Survey (SAESS)
  - Comparisons among courses
  - Comparisons with other disciplines
- TA training
  - Improving (ie offering) professional development for grad students
  - Leading to improved education for undergrads
What else have we been doing?

- Developing expertise
  - STLFs have two weekly meetings with CWSEI
- Dissemination & discussion of ideas:
  - Seminars, Brown bags, Tips, informal chats, etc.
  - *Looking for ideas/discussion leaders (if you are in town... or maybe we could bring you in. We’ll talk.)*
- Archiving/Sharing resources
  - CWSEI central has developed a web based course archiving system - looks interesting...

Example 1

- Attitude Survey
**Student Attitudes in Earth and Ocean Science**

**WHY?** Students beliefs and attitudes are a better predictor of performance in science than the amount of previous science classes.

**WHAT?** An online survey for assessing the impact our classes have on students beliefs and attitudes relative to an expert.

**HOW?** By comparison of answers on identical surveys at the beginning and end of the semester.

**WHERE?** Originally developed at Colorado University for Physics and Chemistry. The negative shifts in student attitudes were hugely influential for driving educational reform at Colorado.

**NOW-** Earth and Ocean Sciences and other departments at UBC fall 07 and spring 08

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**Results- Spring 08 Response comparisons**

**Eg From category “Connection to real world”**

800 students
11 classes
37 questions
6 question categories

Plotted as “Agreement with expert opinion”

Initially high belief in the real world connection of geology
Results - Spring 08 Response comparisons
Memorization and thinking

After a semester of Earth Science classes, how is this opinion affected?

Year to year comparison EOSC 114

Fall 2007

Spring 2008

Things that I see around me in nature often lead me to think about how the Earth works.

% agree with expert

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

1st week last week

survey timing

7% 12%
Attitude Survey Summary

• Student attitudes and beliefs towards EOS showed a 0-2% positive shift which differs from initial published results from Physics and Chemistry at Colorado that showed a 5-10% negative shift.

• We should be aiming for large positive shifts in student attitudes in all categories.

• The survey
  – Highlighted attitudes we can be concentrated upon for course improvement.
  – Highlights courses that are effective and ineffective in changing student attitudes.
  – Highlights changes in courses over time.

Example 2

• Assessments
111 Lab Pre/Post Assessments

- Intro lab course (very odd)
- Assessments of learning goals
- For EOSC 111
  - Pre assessment on first day
  - Post assessment after each lab

What is groundwater?

A) All liquid water that resides beneath the Earth’s surface
B) Muddy mixture of water and dirt that lies beneath the Earth’s surface
C) Only the water found in underground lakes and rivers that is clean enough to drink
D) Only water that is moving beneath the Earth's surface
E) Only water that is stationary beneath the Earth's surface
221 Prior Learning Assessment

- Comparison of midterm grades to prerequisites
Example 3

• Interviews and Focus Groups

Examples of interview / focus group work

• Work study undergraduate student
  EG: When asking about what students did not enjoy:

  “…and with me I thought I could just do the readings because the lectures were so similar to them and there wasn’t much new stuff in class that I couldn’t have just studied on my own at home.”

• What are things you really like about this course?

  “PRS and how 2 instructors would go over confusing aspects at the beginning of each of the classes.”

and

  “the enthusiasm of the teachers and the way they took feedback and responded the next class.”
Plans for the future

- Continue work on course transformations
- Serious effort toward examining curricula
- Integrate curricular decisions with course transformations
- Greater dissemination of our results
Summary

- Big project
- Odd job (STLF)
- Excellent opportunity for EOS
- And for you!
  - If you are interested in including your course(s) in the Student Attitudes Survey (or other aspects) let me know