



Update on the Carl Wieman Science Education Initiative

Assessing Student Attitudes and Learning in Earth and Ocean Sciences

TIC: Sara Harris, Mary Lou Bevier, Jim Mortensen, Douw Steyn, Francis Jones, Brett Gilley, Ben Kennedy, Tom-Pierre Frappe, Peter Lelievre, Melissa Grey, Jamil Rhajjak (Phil Hammer, Greg Dipple, Stuart Sutherland)



Carl Wieman Science Education Initiative
at the University of British Columbia



Overview

- Define CWSEI
- Define EOSSEI
- What are we doing?
- Examples
- The future

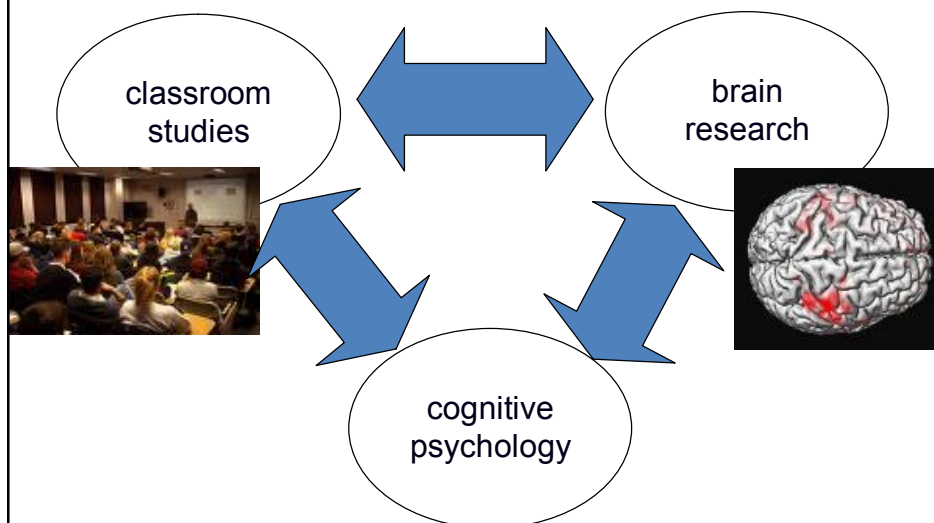


What is the CWSEI?

- 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 \Rightarrow Achieving learning



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.

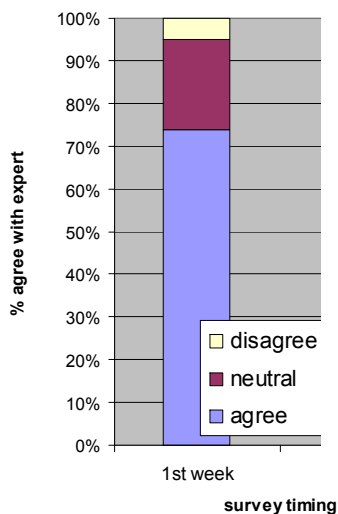
WHERE ? Originally developed at Colorado University for Physics and Chemistry. The negative shifts in student attitudes were hugely influential for driving educational reform at Colorado.

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



Results- Spring 08 Response comparisons Eg From category "Connection to real world"

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



800 students

11 classes

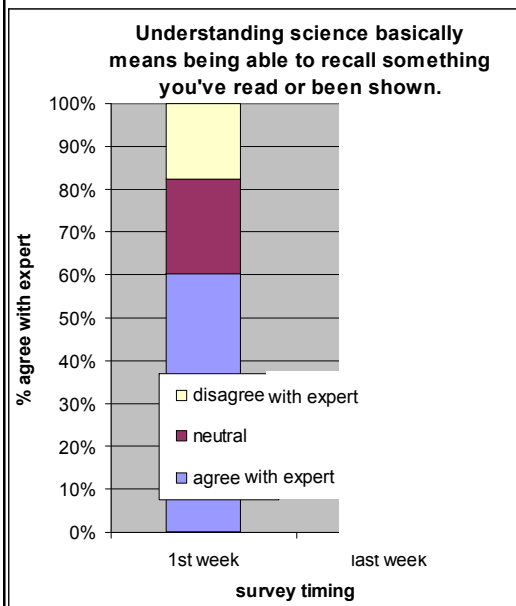
37 questions

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

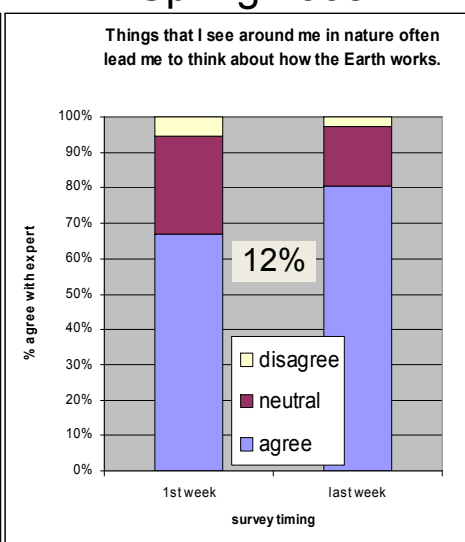
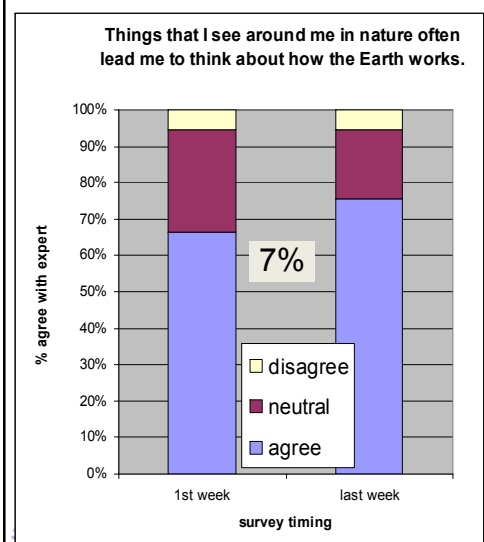


After a semester of Earth Science classes, how is this opinion affected ?

Year to year comparison EOSC 114

Fall 2007

Spring 2008



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



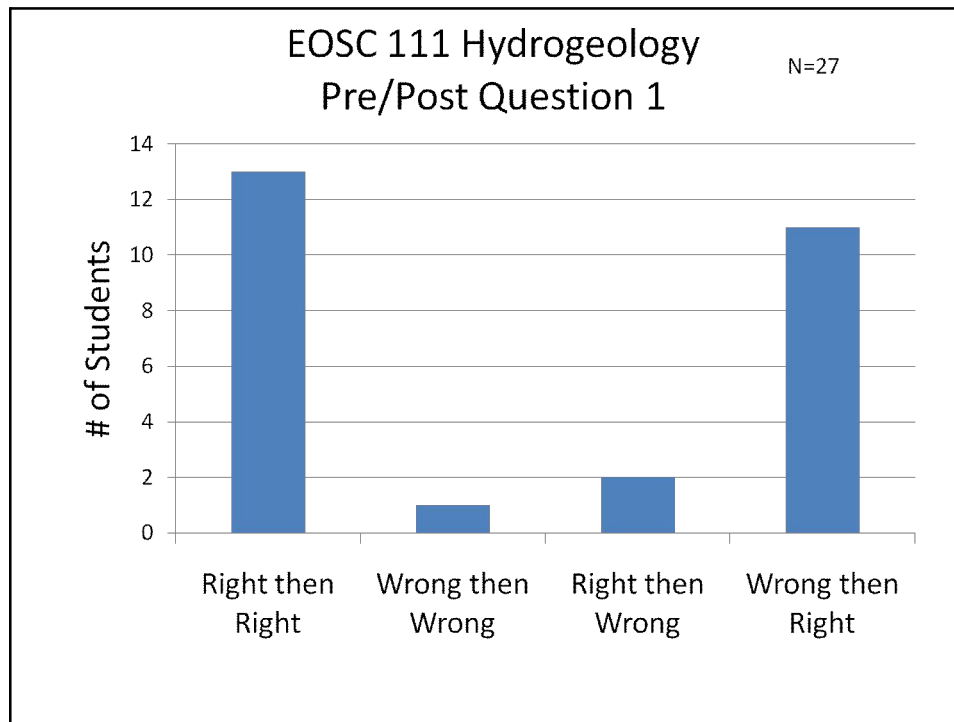
111 Lab Pre/Post Assessments

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

111 Lab Pre/Post Assessments

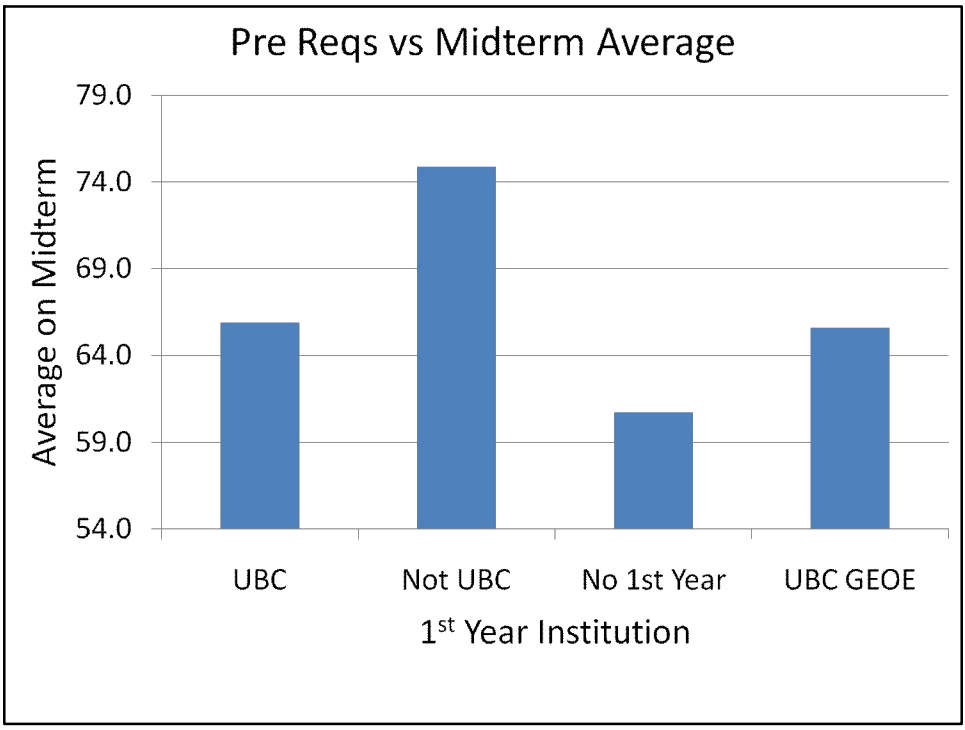
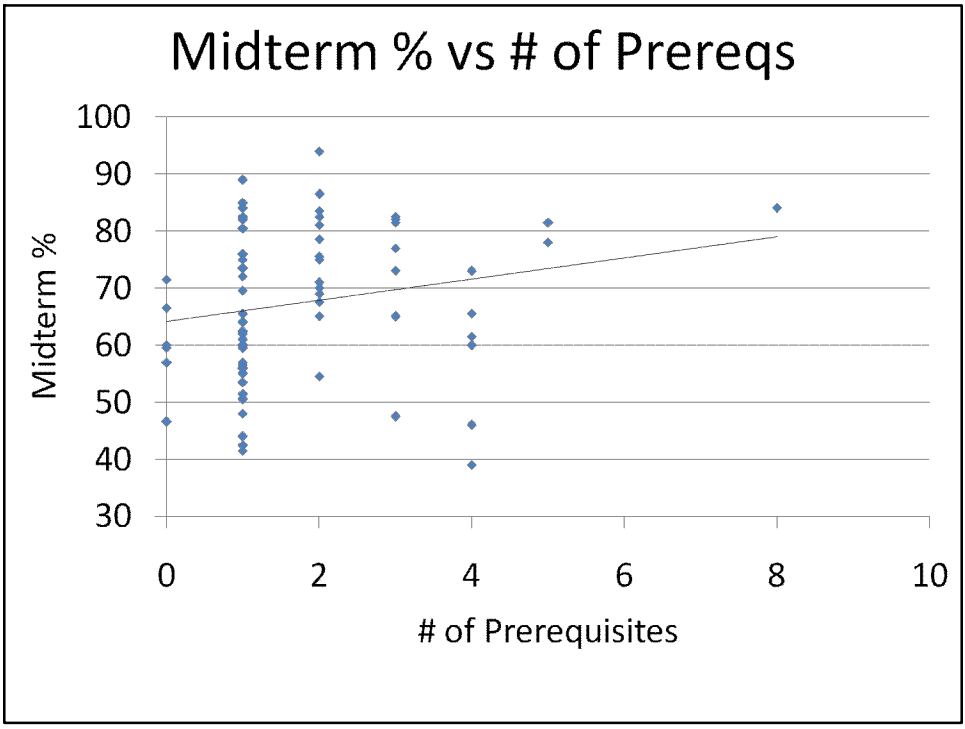
What is groundwater?

- 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



EOS-SEI LONG-TERM PLAN UPDATED DRAFT, STILL FLEXIBLE

P1 = first planning term; P2 = second planning term; T1 = first teaching term, etc.

TARGETED COURSES	2007		2008			2009			2010			2011	
	Fall07	Spr08	Sum08	Fall08	Spr09	Sum09	Fall09	Spr10	Sum10	Fall10	Spr11	Sum11	Fall11
STARTED	EOSC 114	P2&T1	P3&T2	P3	T3	T4							
	EOSC 111	P2&T1	P3&T2	P3	T3	T4							
	EOSC 221	P1	T1	P2	P2	T2	P3	P3	T3				
	EOSC 324	MLB											
	ENVR 200	DS&SH											
	EOSC 112		P1	P1	P2&T1	P3&T2	P3	T3	T3	T3			
	EOSC 220		P1	P1	T1	P2	P2	T2	T2	T2			
	EOSC 212		P1	P1	T1	P2	P2	T2	T2	T2			
	EOSC 210		P1	P1	T1	P2	P2	T2	T2	T2			
	EOSC 116		SS										
ENVR 300		DS&KC											
Below this line, course sequence is under discussion. Are you involved in the courses on this list?													
332 (JM)				P1	T1	P2	P2	T2	P3	P3	T3		
322 (GD)				P1	T1	P2	P2	T2	P3	T3			
EOSC 449				MLB									
ENVR 449				KO									
EOSC 211 (RP)					P1	P1	T1	P2	P2	T2	P3	P3	T3
ATSC 201?					P1	P1	T1	P2	P2	T2	P3	P3	T3
EOSC 370 (SA)					P1	P1	T1	P2	P2	T2	P3	P3	T3
EOSC 371 (KO)								P1	T1	P2	P2	T2	P3
EOSC 250? 252? (FH)								P1	T1	P2	P2	T2	P3
EOSC 222 (PS&SS)								P1	T1	P2	P2	T2	P3
EOSC 320?								P1	T1	P2	P2	T2	P3
EOSC 321 (MK)								P1	P1	T1	P2	P2	T2
EOSC 323? 327?								P1	P1	T1	P2	P2	T2
EOSC 329								P1	P1	T1	P2	P2	T2
EOSC 311???								P1	P1	T1	P2	P2	T2
EOSC 270? (MM)								P1	P1	T1	P2	P2	T2

This draft involves ~60% of faculty as primary instructors & potentially 100% in course working groups

Courses undergoing transformation w/o specific STLF help

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

