



For the EOS-SEI alumni newsletter, 2013

The EOAS Science Education Initiative: Accomplishments and Keys to Success

The EOS Science Education Initiative (EOS-SEI) is a 7-year departmental project carried out under the auspices of UBC's Carl Wieman Science Education Initiative (CWSEI). The aim has been to dramatically improve undergraduate science education in all courses offered by our Department. The EOS-SEI will conclude in its present form in early 2014, so we are currently evaluating our successes and the implications for teaching and learning within our Department. The project is already being considered a model for transformative change at the department level, as expressed by UBC's Dean of Science, Simon Peacock, who was quoted in the April 19, 2013 edition of *Science*ⁱ: *"We've hit it out of the park with Earth and Ocean Sciences, one of seven departments that are part of the university-funded initiative", Peacock says. 'I will declare them to be a success.'"*

One primary key to success has been use of the CWSEI model of hiring full time "Science Teaching and Learning Fellows" (STLFs) who have a combined expertise in the specific Departmental discipline as well as knowledge in relevant science education methodology and research. EOAS has had five full time STLFs at various stages of the project, two of whom have been involved since mid-2007. As knowledge transfer agents, they assist faculty members to implement evidence-based education improvement models. Another key to success has been the presence of local, accessible expertise on the theory and practicalities of post-secondary science education. Carl Wieman and the CWSEI staff have been instrumental in helping all UBC science education initiatives unfold in productive, sustainable directions. There has also emerged a community of experts across Faculty of Science departments who meet regularly to learn from each other and discuss challenges. Two more crucial aspects of the EOAS effort have been highly supportive leadership, and an enthusiastic, collegial attitude among faculty members (more on this below!).

The changes to our teaching practices have affected the courses we teach, our programs, instructors themselves and teaching assistants. Twenty three courses have officially undergone 2-3 year "transformations". In these courses, active learning is now the norm (including increased and varied peer-to-peer interaction), skills development and critical thinking are emphasized, formative and summative assessments have been improved, and there are many more opportunities for expert instructors to engage in meaningful ways with students. At least 14 other courses have also been "unofficially" improved using a consulting model developed in-house that fosters productive STLF / faculty / graduate student collaboration. This model also involves garnering supporting funds for small projects from the various opportunities at UBC.

Over 77% of EOAS faculty and over half of our sessional instructors have received direct support to adjust their courses and teaching. Many faculty continue to iterate on improvements either on their own or with consulting help. There has also been excellent progress towards the overarching goal of the EOS-SEI, which was to promote cultural change in our approach to teaching and learning and establish sustainable processes to continue and improve on EOS-SEI work. In Wieman, Perkins and Gilbert, 2010ⁱⁱ, EOAS was the UBC department used to describe a highly successful implementation of the CWSEI model for implementing transformative change in science education. Authors stated that *"Without exception, the more the department as a whole has been involved and seen this as a general departmental priority, the more successful and dramatic have been the improvements in teaching."* This describes perfectly the EOAS attitude to improving education.

Our graduate students have benefited from, as well as contributed towards, these changes. There is now a graduate course on geoscience education, TAs receive support to improve their own teaching, and their enthusiasm and energy have been instrumental in generating and testing effective learning activities and

teaching strategies at all levels of EOAS courses. Grad students are commonly the most frequent face that undergraduates see, so it is important to support these TAs in their growth as future experts.

Finally, EOAS has gained significant experience at geoscience education research itself. We have supervised three undergraduate honors theses, published (or have in press) seven articles in peer reviewed science and geoscience journals (with several more in the works), delivered at least 38 presentations or posters at scholarly conferences and facilitated many workshops on campus, across the continent and beyond. A complete scholarly communications list is onlineⁱⁱⁱ, as well as outlines of 25 past or current research projects^{iv}. Not bad for a group who were basically science education “novices” back in 2007!

Now that EOS-SEI is winding down, the big question is what’s next? We are highly optimistic that the Department will continue to set the standards for excellence in development and delivery of education by applying our experiences and expertise in new projects being articulated at the University level as well as at the Faculty and Departmental levels. One proposal has already been submitted for a major project targeting enhancement of distance education and the synergies between distance and face to face aspects of our courses. For more information on EOS-SEI see <http://www.eos.ubc.ca/research/cwsei/>, and details of UBC’s CWSEI can be found at <http://www.cwsei.ubc.ca>.

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Stuart Sutherland checks in with one of roughly 30 groups of students working on a 50-minute activity in his course EOSC326: Earth & Life Through Time. This activity, which replaces one lecture, serves as follow-up to a hands-on lab experience in this elective course for up to 150 3rd and 4th year science students.

ⁱ Mervis, Jeffrey; “Transformation Is Possible if a University Really Cares”, in **Science**, 19 April 2013: Vol. 340 no. 6130 pp. 292-296.

ⁱⁱ Wieman, Carl, Katherine Perkins and Sarah Gilbert, “Transforming Science Education at Large Research Universities: A Case Study in Progress”, **Change, The Magazine for Higher Education**, pp. 7-14 (March/April 2010).

ⁱⁱⁱ <http://www.eos.ubc.ca/research/cwsei/resources/research/eossei-ResearchList.pdf>

^{iv} <http://www.eos.ubc.ca/research/cwsei/research.html>.