

Reform of Introductory Science Courses ACS/Keck Mini-Grant Interim Report

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Title of Project: *Assessment of Conceptest Questioning and Electronic Student Response Technology in the Small School Introductory Geosciences Classroom: Do these Methods Really Help Non-Science Students Learn?*

Project Funding Period: June 1, 2006 to June 1, 2007

Amount Awarded: \$10,000

Original Goals and Objectives:

This proposal requested funding to support an assessment of the effectiveness of Student Response Technology (SRT) in a non-science major introductory Earth Science course at Washington and Lee University (Geology 100: General Geology). The key objective of this work will be to assess whether SRT Conceptest questioning helps non-science majors; 1) master and retain basic scientific concepts and principles, 2) distinguish between 'good' and 'bad' science, and 3) understand the importance of science in multiple real-world contexts. The primary focus of this work will be to *quantitatively assess* whether SRT Conceptest pedagogy truly helps non-science students learn and retain scientific concepts and principles.

Changes to Date/Unanticipated Delays:

There have been no major changes to the plan outlined in the original proposal and every task is on track thus far. It is important to note, however, that the tasks outlined for Spring 2007 will not be completed by March 31, the date of the final report. The semester in which I will be teaching Geology 100 does not end until June. The tasks outlined in the proposal should be completed before June 1 (the project end date).

Activities Completed and in Progress:

The specific goals outlined in the ACS/Keck proposal are listed below with details of progress.

Summer and Fall 2006

- ***Development and refinement of assessment protocol and format***

Two Washington and Lee students (Kelly Hishta (07) and Matthew Paulino (08)) began working with me in fall 2006 on this project. Together, we developed a detailed plan for accomplishing the goals of the proposal. We performed a literature search related to assessment protocol and determined a course of action and implementation of SRT in Geology 100.

- ***Identification of all focus areas and question categories***

Specific focus areas critical to course curricula have been identified. Each focus area highlights a particular concept-driven aspect of the geosciences. Focus areas include:

- *Plate Tectonics, Earth Materials, Igneous Processes, Sedimentary Processes, Metamorphic Processes, Geologic Time, Whole Earth Processes, Structural Geology, Geochemistry, Hydrology, Ocean Processes, Current and Future Problems*

- ***Compilation/creation of Conceptest questions for each focus area and question category***

With help from students, I have compiled a database of over 300 multiple choice questions that can be used during the course. Approximately half of these questions may not be sufficiently ‘concept-driven’ for this experiment (they are more ‘fact-based’). A subset of 30 questions has been selected and refined for the standardized post-course assessment exam that will be given each of the next three years to test the effectiveness of the three concept delivery methods outlined in the proposal (lecture only, multiple choice with SRT, and multiple choice without SRT).

- ***Development of 3 year map of focus area delivery by presentation method***

This task is in progress and will be completed in January.

- ***Consultation with SRT users from diverse academic environments***

This task is in progress and will continue throughout and after the project period. Kathy Surpress (Trinity University) has been contacted and we have tentatively scheduled reciprocal visits to share SRT data and assessment techniques.

Spring 2007 (the following goals have not been completed and/or are in progress)

- Integration of SRT technology in Geology 100 at Washington and Lee University
- Compilation and detailed analysis of all SRT data gathered during the course (including correlation of correct and incorrect responses by student profile)
- Internal assessment of student perception of SRT (as outlined in Greer and Heaney, 2004)
- Evaluation by, and collaboration with fellow ACS faculty member Kathleen Surpress (Trinity University) who will visit Washington and Lee
- Development and implementation of end of term standardized examination of all focus areas and question categories (to be applied in all subsequent years)
- Compilation of SRT ‘manual’ for distribution and dissemination of initial results
- Preparation of presentation of initial results (for Geological Society of America Meeting)

Approved Budget and Accounting:

Greer salary	\$5000	<u>This money has been spent as of Nov 29, 2006</u>
Greer travel costs	\$700	*
Surpress stipend	\$600	*
Surpress travel expenses	\$700	*
Undergraduate stipend	\$3000	*

** The additional money will be spent in Winter 2007*

Additional Information:

This project will continue (without ACS funding) for 3 years. A student will be paid an undergraduate stipend in Winter 2007 but will continue to work on the project through summer 2007.