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Effective Techniques for Introducing Scientific Literacy in Introductory Physical Geology

E. Campbell-Stone (1), J. D. Myers, (1), A. Newlin (2)

(1) Department of Geology and Geophysics, University of Wyoming, Wyoming USA (erincs@uwyo.edu / +001 307-766-6679) (2) Ellbogen Center for Teaching and Learning, University of Wyoming, Wyoming USA (auran@uwyo.edu / +001 307-766-6679)

Scientific literacies are the skills needed to address scientific problems in an effective and successful manner. Although different scientific disciplines have unique literacies, all share some common skills. These shared, or fundamental literacies are valuable not only to the scientist, but to the citizen as well, and consist of tasks that allow individuals to interpret and manipulate facts, data, and observations. The fundamental literacies include quantitative calculations; qualitative assessment; and reading graphs, charts and tables. In addition to these fundamental literacies, each science has a set of technical literacies specific to that discipline. For the geosciences, technical literacies include the ability to visualize in three dimensions, create and interpret maps, and conceptualize geologic changes over a variety of time scales. When combined, the fundamental and technical literacies allow an individual to take scientific knowledge and turn it unto scientific understanding.

As part of a project sponsored by the Ellbogen Center for Teaching and Learning at the University of Wyoming, the instructors of the introductory geology course, Physical Geology, have gone beyond teaching the course content to include review of the fundamental and technical literacies. For the past four semesters, over 200 students per semester have completed pre and post surveys on their backgrounds, their confidence in their skills, and their ability to answer skill-based questions correctly. One set of surveys was administered prior to the implementation of the literacy focus, and three survey sets gathered data after the course was revised.

In response to the survey results, the course was redesigned to address students' needs by 1) informing the students of the literacy project; 2) revising the lab manual to

include exercises that involve literacies as well as content; 3) increasing the difficulty of the literacy exercises as the semester progresses; 4) adding a matrix at the beginning of each lab explaining which literacies will be used and at what level; 5) labeling each image presented in lecture to assist with 3-D visualization; and 6) changing the attitude of the TA's and instructors to one of helping student to learn the literacies rather than expecting that they already know them. While results from the pre-revision survey showed no improvement in the literacies, surveys from the following three semesters showed a 10% increase in the mean scores. This increase in score suggests that the revisions were successful in helping students master the fundamental and technical literacies.