Designing Engaging Web-based General Science Courses for Undergraduate Education

Understanding how science is learned is of major national interest through the STEM initiatives. Astronomy learning falls in that category. Specifically, in undergraduate education at Penn State University, introductory Astronomy courses are offered as general education courses to promote an understanding of science and to provoke students’ interests and pursuing of a related career. While in the past, the introductory astronomy courses with large enrollments were offered face-to-face and with large enrollment, recent efforts had been devoted to redesigning the courses for web-based delivery that maximize student access. The course involved in this proposed presentation is one that has been redesigned into a fully web-based course. However, one concern is that web-based delivery can sacrifice the interaction between the instructors and students, and the interaction among students. In this case, students interact mostly with the instructional materials. As a team of educational researchers, astronomers/astronomy educators, and instructional designers, we have been evaluating the design of the introductory astronomy course materials from Spring 2008 in terms of their level of engagement with the intent to predict students’ motivation and attitude toward astronomy while using the course materials.

In our evaluation, we employed Keller’s (1987, 1993) Instructional Materials Motivation Survey (IMMS) to measure students’ motivational reactions to the instructional materials. As this course is divided into five units, the students responded to the IMMS survey after they completed each unit but before they took the unit exam. We also administered Zeilick’s (2003) Survey of Attitudes Toward Astronomy before the beginning and during the last week of the semester to measure any change in attitude toward astronomy as a result of using the course materials. In this presentation, we will summarize the students’ reactions to the five units in terms of their attending to the materials, perceived relevance, confidence in learning astronomy, and satisfaction with the learning materials. We will also describe the relationship between attitudes and motivational reactions to the instructional materials. We will then share our recommendations for revising the course materials based on the findings to improve the motivational aspects of the course materials. Implications for designing engaging web-based courses with large enrollment will also be drawn.

Reference: