Climbing the Technological Mountain to Success in an Introductory Science Based Laboratory Course: Technology Enhances a College Learning Experience

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Abstract: Educational technology enhances course content. An introductory science laboratory course partners perfectly with technology to achieve real-time instruction and learning. Technology is useful for tracking and inquiry about specific current events on a local and global scale. It is an important tool for instructors and students to view and analyze real-time data and experience updated course content.

Introduction

Extended technology is a positive addition to assist learning in an introductory science based laboratory course. In remote localities or a teaching environment with time and/or weather constraints, it is vital that both instructor and student are comfortable with extended learning tools. Technology promotes efficient learning. It is imperative that we provide all learners with a choice of optimal learning styles applicable to individual partnering to promote student success. The visual or text based learner uses a book and lab manual. The experiential learner equates laboratory and field trip as optimal learning styles. Learners are categorized as diverse: active/reflective, sensing/intuitive, visual/verbal, and sequential/global learners (*Felder, 1993*) connected to a continuum of learning styles not one category. A student's preferential learning style also varies over time, life stage, subject or learning environments.

In this laboratory based science class a learner benefits from a course that utilizes digital, online and assistive technology to provide supplemental information necessary for course enhancement to maximize learning.

A Technologically Enhanced Classroom and Laboratory Environment

A technologically savvy laboratory course promotes a learning centered environment among instructor and students. A Taiwan based study illustrates students' strongly preferred Internet-based learning environments that could connect scientific knowledge with real-life situations (*Tsai,* 2005). Tsai notes students place high emphases on the connection between relevant real-life situations and scientific knowledge via the web-based learning environment.

Motivation for use of digital resources include: ease of use, high quality resources and matching the academic needs of students. Adaptations for use of online resources are facilitated by easily downloadable, current and accurate information for use by teachers of science (*Recker*, *et al.,* 2004). Educational digital libraries, such as the National Science Digital Library, the National Science Foundation's free online library link technology, engineering, and mathematics resources for education and research information. The instructor pilots the course with specific links to an instructor supplemented Learning Management System (e.g. Blackboard) with online text chapter reviews, streaming videos, animations, quizzes, topical and real-time data website links, and learner assisted CD-based texts. Lectures and class viewing of topical media include examination of real-time data, video and DVD.

Once the instructor and student are knowledgeable and utilizing the assistive technology within the course environment the last link is to promote independent student use. There is an increased use of technology popular with course constituents once these areas are promoted by other students in the cohort.

Technology facilitates the teaching and learning aspects of linking a course with learning technology by broadening the learning options. A college equipped with media and projection centers in each classroom, wireless classrooms, a hardwired library, computer technology laboratories and a learning center provide an ideal setting for an assistive technology environment.

This learning idea can be extended to many science based courses. Although each learning environment is different, many may be similar with students of broadly varying backgrounds. This fishing based, Coast-Guard community has a variety of students in different ages and stages within the town population. An initial class questionnaire shows reasons for course enrollment often vary. Students cite general interest or fulfillment of the general education requirement for natural sciences with a laboratory.

This introductory Physical Geology class taught by the author includes a study of the Earth, its materials, and processes affecting changes on and within it. The laboratory training in conjunction with course concepts uses applications of topographic maps and recognition of common rocks and minerals. Students are from a variety of backgrounds from first-time science enrollees to science enthusiasts.

As witnessed at the beginning of this semester, the first-time science student or veteran science student in Physical Geology learns to track an active Alaska Volcano 'webicorder' with real time volcanic eruption data and trajectories of current ashfall in their own backyard *http://www.avo.alaska.edu* in class and from home. Students view a media clip of hot material descending the flanks of an active island-volcano, Mt. Augustine. It is 75 times faster than real time in a time lapse sequence by D. Sentman of the University of Alaska Fairbanks Geophysical Institute, and Celso Reyes of the University of Alaska Geophysical Institute, Alaska Volcano Observatory.

Other exciting real-time data include the most recent earthquakes and magnitudes available on (http://earthquake.usgs.gov/recenteqsww/Quakes/quakes_all.html) from the United States Geological Survey and Smithsonian Institution sites. Earthquake simulation models, groundwater modeling and virtual oil well games provide interactive learning tools.

To accompany a hands-on mineral identification laboratory a student can always compare selections with museum quality collections. The inclined student can connect their future with the volcanologist, seismologist, paleontologist, oceanographer, or mineralogist upon viewing prospective geoscience career options at (http://www.earthscienceworld.org/careers/) by the American Geological Institute. These technologies stimulate learning opportunities linking students to internships, summer jobs in current or ideas of future work environments.

The emerging technologies are easily accessible and impact the learner on distinct local and global scales. The instructor can take field trips and/or travel direct routes with the aid of technology. Problems encountered in the larger learner based arenas are solved when the cohort is divided into multiple learning based groups.

Student resources are frequently limited and college costs can be high. Technological enhancements provided by learner institutions exist at a minimal cost. Textbook manufacturers now provide instructors accompanying Blackboard course cartridges downloadable with adoption of course materials. Additional course materials are available online upon request at the inception of the course. For the student the text and laboratory manual access codes are portals to additional resources through computer use at the learning institution. Home computer or internet access is no longer an inhibiting factor for students when the home institution is providing an equitable resource. Virtual software enables experiences that could otherwise be too dangerous, expensive, long in duration, or removed from the learner in time and/or space (*Placing and Fernandez*, 2001; *Wighting*, 2005). Use of these technological tools in higher education provides a more comprehensive and engaging education.

Conclusion

Exciting technological updates and an improved student environment provide valuable tools to learners. It is imperative we promote technological tools as part of the enhanced college curriculum. Multimedia use and application is an important part of teaching (*Srinivasan and Crooks,* 2005). College environments equipped with updated computer libraries, laboratories and equal access to course material are best suited to provide a student with a comfortable learning atmosphere. Live lectures and hands-on lab exercises linked with the enhanced instructive technology provide learning strategies and opportunities for a student to climb the mountain to a successful learning experience.

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