Sustaining Student Enthusiasm for Research Beyond the Classroom Introduction

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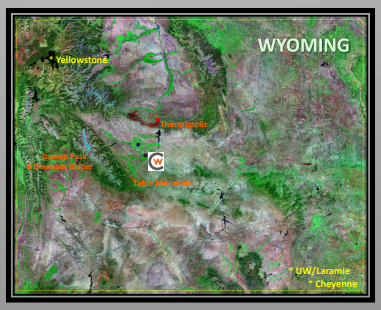
ABSTRACT

Great strides have been made in recent years to integrate research into the undergraduate classroom, especially in the early undergraduate and community college years. Bringing research experiences to students in the classroom has the benefit of using hands-on, real-life, and/or guided-inquiry experiences, to develop students' critical thinking skills early in their academic career. For first-generation and under-represented students, this can be a life-changing experience. A benefit for the instructor is finding new students with the aptitude to take on a smaller roll in long-term projects. However, often the students get excited to take on a project when they see only the short-term gain. The process of developing their skills over a process longer than a few class periods, or even a full term, can lead to frustration and disinterest when the going gets tough. Using more experienced students to mentor the newer students can help keep the enthusiasm going forward. In the geosciences, field-based research is the draw for many students. The struggle for them comes when data processing and report writing must be completed in order to take the next step in the research process. This presentation will showcase some examples of field-based geoscience research projects taking place at a small rural community college, and describe the state-wide connections being made to help maintain the enthusiasm of our two-year students as they transfer on to 4-year institutions and beyond.

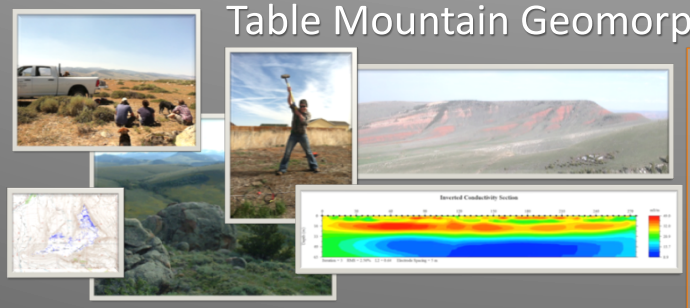


EARTH EDUCATORS' RENDEZVOUS

Boulder, Colorado July, 2015

INDEX MAP: Wyoming State Map showing the location of the main campus in Riverton (Cw), notable locations (yellow) and field study locations.

Table Mountain Geomorphology, Glaciology & Geophysics



INDEPENDENT RESEARCH PROJECTS

Table Mountain is an anomalously tall and flat surface at the southern end of the Wind River Basin. The project began with a failed soil assessment in 2002 (the surface is much too hard); continued as an extreme boulder distribution study, which was presented by a student at the 2006 GSA meetin; was followed up by a regional study of similar (but smaller) landforms around the basin at the same altitude; and recently included an electric resistivity study, presented by students at the 2013 GSA, that was able to determine depth to bedrock. Initial funding of this study was provided by the Wyoming NASA Space Grant Consortium (WSGC) and Wyoming EPSCoR (Experimental Program to Stimulate Competitive Research) program. The geophysical study was supported by the new EPSCoR-funded Wyoming Center for Environmental Hydrology (Wy-CEHG) and Geophysics. Since 2003, this project provided 10 students the opportunity to get their "hands-on" to real field research. Several of these students have now graduated with BS in Geology and gone on to work in a geoscience field. Others have completed their AS degrees (in a variety of fields) and have found employment in trade fields. With continued funding from Wy-CEHG, we will study this feature with 2D and 3D seismic, and cosmogenic isotopes of the boulder surface.

ICCE – Interdisciplinary Climate Change Expedition

COURSE INITIATED RESEARCH PROJECTS

The ICCE grew out of our Environmental Science course, taught at our residential field station, and populated by Outdoor Education & Leadership (OEL) majors. Instructor, Jacki Klancher used the film *Chasing Ice* as a course supplement. The students in our OEL program attend CWC from around the country because of our proximity to the Wind River Mountains. With instructors Darran Wells and Jake Urban, a mountaineering expedition to Wyoming's highest mountain, Gannett Peak (13,809 ft/4,209 m) is taken evry other summer. The Wind River glaciers have been retreating at an increased rate for at least 50 years. Since the students were already planning on completing this expedition, they got excited to study the glaciers that they would be crossing on their way to the peak. One great idea led to more, and soon Jacki and the students were writing proposals to the WSGC and Wy-CEHG for fundin;, recruiting the archeology students and their instructor, Todd Guenther, to look for signs of ancient civilizatio;, a film crew consisting of instructor Jeremy Nielsen and PBS producer Kyle Nicholoff; math instructor Mike Bostick and assistant librarian Louisa Hunker. Horse packers brought in the GPR equipment, loaned by Wy-CEHG, to image ice thickness. Water chemistry, insect ecology, archeology and mountaineering were combined into a successful expedition – a capstone course extraordinaire! They applied for funding again this year and will be adding a "black carbon" study on top of the other disciplines, in late August, 2015.

Geochemistry and Microbial Genomics of Thermopolis Hot Springs

INTEGRATED LAB COURSE & INDEPENDENT RESEARCH PROJECTS

The study of the microbial community at Thermopolis has be ongoing since 2004. Water chemistry and microbial mat morphology was the first step in the research. Over the years, less water chemistry has been done as there is very little geographic, diurnal or seasonal variation in composition. Hydrogen sulfide is greater at the source but the rest of the chemistry indicates a deep, well-mixed source. The microbial community has proven to be a challenge to decipher. We found that the best method for DNA extraction of the thermophiles is a chemical soil kit. Sequencing of the 16S rRNA gene was done by a professional laboratory. SEM micrographs of some source microbial mate revealed carbonate precipitation among the microbial filaments. Tens of microbial genera have been identified, some unknown elsewhere in the world. We are know learning to manipulate and interpret the genetic sequences. Each aspect of this project was begun as individual or team projects,often as a term project for a sophomore-level Earth system science course, and have been scripted into scaffolded lab exercises now included in other lab courses. More than a dozen students have benefited from this project, all of whom have presented their research at either the state Undergraduate Research Day or GSA, or both. A more detailed history and evolution of this project is described in Smaglik, 2015.

A FEW REFERENCES ON UNDERGRADUATE RESEARCH

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CCURI Community College Undergraduate Research Initiative

NSF

Wyoming INBRE IDeA Networks for Biomedical Research Excellence

EPSCoR Wyoming

WyCEHG Wyoming Center for Environmental Hydrology and Geophysics www.uwyo.edu/wycehg

Wyoming NASA Space Grant Consortium