Enhanced Learning through Field Research Experiences in Stratigraphy

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Abstract

Field experiences are an important part of a geology major’s undergraduate academic experience. When field studies are combined with research the experience can become more enriching with both cognitive and metacognitive improvements. Stratigraphy students participate in field studies as a component of the curriculum to assist in the application and comprehension of course material. These learning experiences are designed to investigate the ancient depositional environments that existed in western Pennsylvania during the middle to late Pennsylvanian Period, approximately 325 – 310 million years ago. These projects include the production of a detailed measured stratigraphic column with comprehensive lithologic descriptions and an interpretation of the paleoenvironments. The research projects are designed to target cognitive skills such as comprehension, analysis, synthesis and interpretation as well as building on metacognition as the student becomes aware of their learning. Results of this approach demonstrate that students engaged in this type of research in the curriculum have improved motivation, attitudes, and perceptions. These students tend to become involved in individual student/faculty research, perform better in geology field schools and have a tendency to seek out other field experiences. While completing the field research projects may be difficult for some students for a variety of reasons (e.g. lack of self-confidence, fear, and possibly social barriers) the positive affective aspects (e.g. curiosity, interest, self-motivation) result in a majority that demonstrate a higher rate of success on the range of metrics both in the course and in later classes. The transformational nature of the undergraduate field experiences incorporated into the curriculum motivates students to become an active participant in the learning process translating experiencing concepts learned into knowledge.

Best Practices for Research in Stratigraphy Curriculum

Preconditions for success:
• Campus and department culture that values undergraduate research.
• Financial and logistic support of travel by department and college.
• Infrastructure (lab space and equipment) to sustain projects.

Curricular development considerations:
• Curriculum must be designed to teach both content and field techniques.
• Curriculum must be designed to provide opportunities for the students to practice field skills prior to the research project.
• Design course outline that promotes a community of learners.

Research project considerations:
• Select a field site that is nearby and easily accessible.
• Provide clear project guidelines to keep students on task while in the field.
• Assign students to teams to maximize efficiency in the field.
• Provide a rubric with clear assessment goals.
• Assign project deadlines and schedule individualized meetings.
• Provide frequent individualized instruction and feedback.

Field Research in Stratigraphy

Practice stratigraphic field techniques

Final research project

Presentation of independent research

Outcomes

Conducting research is often perceived as difficult and intimidating by many undergraduate students. Working on collaborative research projects completed with the course can help students overcome these anxieties. After completing the course students demonstrate:
• improved cognition and metacognition,
• improved written and oral communication skills,
• improved technical proficiency in the field,
• and increased confidence in their own abilities.

Following completion of the course students that previously showed little interest in post-graduate studies have applied to graduate programs.

The structure of the course also results in the:
• creation of a community of scholars that persists through subsequent courses,
• improvement in student performance in other courses, in particular summer geologic field camp,
• improved satisfaction and voluntary promotion of department programs,
• and an opportunity for students to gain professional experience by presenting at society meetings.

Incorporating research projects into the curriculum benefits both students and faculty. Some of these benefits include:
• integration of teaching and active research to promote scholarship at teaching intensive universities,
• promotes a community of learners that creates collaboration among students with varying academic abilities,
• direct application of concepts learned in the classroom,
• and increased confidence in their own abilities.

Selected References:


