**ERTH Undergraduate Assessment Report**

**Department or Program:** Earth Sciences

**Academic Year of Report:** 2017-2018

**Department Contact Person for Assessment:** Josh Roering

**Report submitted:** 1 December 2018

**Section 1: Learning Objectives Assessed for this Report**

1. Students will be proficient with the measurement, mapping, analytical and/or modeling tools that are required to quantify and analyze important aspects of Earth materials, Earth processes and Earth history.
2. When confronted with the real-world problem of incomplete, inconsistent, and noisy geological data sets, students will be able to develop and test hypotheses in a systematic way. Students will become comfortable qualifying their answers to problems by stating assumptions, limitations, and caveats.
3. Students will use techniques from the traditional disciplines of mineralogy, petrology, geochemistry, structural geology, tectonics, stratigraphy, and field geology to solve complex problems across a diversity of scales through time and space that require consistent geological reasoning.

**Section 2: Assessment Activities**

*For each learning outcome, describe what information was collected, how it was analyzed and discussed, and the conclusions that were drawn from the analysis. In the narrative, reference all relevant means of collecting information about learning goals, including direct measures (e.g. assessment of student assignments), indirect measures (e.g. overall grade patterns in a particular course, student reflections on learning, SERU data), and qualitative information (e.g. faculty observations, student input). While the choice of which assessments are most meaningful is up to the department, a mix of direct and indirect measures is requested.*

Following the spring and summer terms of 2018, we collected and digitized assignment descriptions of 22 representative graded student projects from two courses: Geol 318 (Field Methods) and Geol 406 (Field Studies). Altogether, the assignments we sampled stem from five different instructors and thus represent a reasonable cross section of styles and approaches. In both courses, student grades ranged between C+ and A with the average grade being B/B+. Because students enrolled in these courses are ERTH majors and the field setting and small class size promote engagement, grades below C are seldom earned.

During fall 2018, ERTH faculty members assessed the assignment documents, graded projects, and student evaluations. The assessment was accomplished by independent faculty member review of the materials followed by group discussion. Before undertaking the assessment, faculty revisited the department’s learning outcomes.

Major themes that emerged during our discussion include the following:

* Student expectations: The expectations were clearly stated for each of the projects and most generally students appreciated knowing the end game for each exercise. Because our field-based projects have a lifespan of only a few days to ten days, it’s important for us to clearly communicate the product that we expect for each project. The emphasis on producing well-documented and clean maps can sometimes challenge students and most expressed an interest in having more ‘office time’ to polish their maps and analyses. Revisions to the current core ERTH curriculum will provide a more substantial foundation for computational aspects of field camp assignments. The format of field camp involves some camping time and some dorm-based work and switching between can pose logistical challenges. Our instructors can be a bit more thorough in anticipating gear, time, and monetary needs during different parts of field camp.
* Project context/motivation: The projects were balanced in the sense that some were motivated by a very specific scientific question that required students to independently formulate hypotheses, collect primary data, perform analyses, and generate interpretations. By contrast, others were based on traditional skills in geology, such as the generation of stratigraphic columns or geological maps that are common to many aspects of geologic analyses. In the case of question-based projects, students were generally aware that uncertainty in the data and observations that they generated could have a significant effect on their analyses. In most cases, their reports expressed awareness of the assumptions and limitations of their datasets. For example, many students recognized that given more time they might have been able to obtain a higher degree of confidence in their interpretations. In a small number of cases, the uncertainty of their datasets prevented students from grasping overarching concepts and project motivation.
* Student evaluations and feedback: During our assessment discussions, we discovered that our student evaluation questions tended to focus on logistical details and bypass project motivation and goals. In several cases, student evaluations for projects that were motivated by a very specific science question focused entirely on the actual mapping and not the broader question for which their observations were intended. In these cases, instructors could more consciously and frequently remind students of the project motivation or have check-ins that serve to show them how the data will be used for analyses. Some students also commented on a need for more hands-on instruction in order to complete project assignments.
* Curriculum and disciplinary integration: Our field camp course has a modular framework so students rotate through instructors who teach 1 to 2 week segments. Although the projects were generated individually by each instructor, students uniformly stated that the course was highly effective at pulling together the diverse concepts and skills that had composed their prior coursework. Our curriculum emphasizes this ‘capstone’ philosophy for field camp and the students saw the immersive experience as an ideal way to blend together and culminate their education.
* Technology in the field: Students expressed satisfaction with the integration of technology, specifically surveying and computational analysis, into field camp projects. While a small number of students sometimes struggled with the computation platform, the overwhelming response was positive and the faculty deemed the opportunity for students to collect their own field data for use in calculations and analysis as highly effective and worthy of the considerable logistical effort. Our revised curriculum will require computation for all majors starting in 2019-2020 and we anticipate that students will have increased comfort with these skills.

**Section 3: Actions Taken Based on Assessment Analysis**

*For each learning goal assessed for each major, describe any actions taken as a result of assessment information, or plans to take action during the next academic year. Describe how the actions or action plans are meant to address the issues arrived at through the assessment activities in Section 2.*

* Our assessment exercise encouraged us to revisit the learning outcomes in order to better emphasize the integrative nature of assignments. Our faculty will review the learning outcome wording in the coming academic year.
* We will revisit and revise our course evaluation questions to encourage feedback on project motivation and goals.
* In order to clearly connect overarching project themes and questions, we will work with instructors to reinforce project adherence to departmental learning objectives.

**Section 4: Other Efforts to Improve the Student Educational Experience**

*Briefly describe other continuous improvement efforts that are not directly related to the learning goals above. In other words, what activity has the department engaged in to improve the student educational experience? This might include changes such as curriculum revisions, new advising approaches, revised or new co-curricular activities, etc. Describe the rationale for the change(s) and any outcomes resulting from the change(s).*

* In the 2017-2018 academic year, our faculty conducted a thorough curriculum review and we completely overhauled our geophysics track and made several tweaks to our other three major tracks. In particular, we added a computational tools requirement for all of our majors, which is unique amongst our comparator institutions even though careers and research opportunities will increasingly depend on computational skills.
* We are also reviewing our advising structure because we currently use a tiered system whereby majors start with a lower-division advisor and transition to an upper-division advisor for the last 1-2 years in our program. While there are some efficiencies to this system, faculty expressed concern over the lack of continuity for students. We are exploring individual advisor schemes as well as peer and group advising activities to supplement our approach. Our advising process will also be heavily influenced by the on-going Tykeson Hall advising discussions.
* We are undergoing a review to increase the number of ERTH majors, as well as involvement of ERTH majors in research/professional development opportunities within the department.

**Section 5: Plans for Next Year**

*Briefly describe tentative assessment plans for the next academic year. Which goals will be assessed and how? What actions will be taken as a result of this years’ analysis of assessment information? What other plans does the department have to improve the student educational experience? What are the budgetary implications of any proposed actions? How will those be addressed?*

* Next year we plan to review our learning outcomes.
* We will present the assessment outcomes to faculty and use a faculty meeting to explore responses. We do not anticipate budgetary implications for the actions as they would amount to minor tweaks to our field-based curriculum that has been the backbone of geologic education for decades.
* We will continue to explore new ways to integrate technology (e.g., drones, shallow geophysics) into our field studies program although we are cautious that engagement with and observations of the natural world are central to our efforts.