**Department:** Geology

**Assessment coordinator:** Sue DeBari

During the 2009-2010 academic year, faculty and staff of the Geology Department engaged themselves in a review of our assessment procedures and materials, both at the program level, and at the level of individual courses. Our main targets of investigation were elements related to the core curriculum of the Geology BS major degree- the assessment plan and other related materials for this core program follow. Over the summer, the Geology Chair and interested faculty will work on assessment plans for the other degrees offered, for our graduate program, and for the concentration-related courses in the BS major.

As part of this process, we have identified three assessment “themes” that will be evaluated in detail for the 2010-2011 academic year. The first will be an evaluation of the goals and content for our two introductory-level geology courses, Geology 101 (Intro to Geology) and Geology 211 (Physical Geology). The second will be an assessment of our relatively new GIS content (Geology 213 and Geology 447) for its effectiveness, with a goal being to enable our faculty to determine if requiring Geol 213 as a prerequisite for several courses in the major is justified and feasible at this time, based on our assessment findings. The third will be to examine a set of longitudinal data spanning several courses to assess student learning of concepts regarding the interpretation and portrayal of 3-D spatial data, in the form of geological maps and associated cross-sections.

Finally, as part of this process we identified a clear need for better organization of assessment-related materials development, evaluations, and communications within our department. As a result, a curriculum and assessment committee, consisting of 3 faculty, has been formed. Professor Susan DeBari will chair this committee.

The details of the Geology Dept assessment plan, including program matrices and course-specific assessment information, can be found online here: (http://geology.wwu.edu/dept/visitors/mission.shtml)

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**Mission Statement**

The Geology Department at WWU is committed to excellence in both teaching and research. Our goal is to offer the highest possible quality education in the geological sciences at the undergraduate and graduate levels. The mission of our department is to serve three main populations: graduate students, undergraduate geology majors, and undergraduates from other departments for their general education courses. For all of these students we strive to create excitement about discovery and the process of geologic inquiry. We want to develop in all students an appreciation of how geological processes affect the earth and society so that they will be environmentally responsible, scientifically literate citizens. We strive to produce majors with an interdisciplinary content background in geology and the physical sciences who are competent in the field, who can work collaboratively, conduct original research, and effectively communicate their results.

**Program outcomes**

B.S. Geology Core (these are our learning goals for all students who complete a B.S. in Geology, regardless of their concentration. Specific learning goals for each of the three concentrations are currently being developed.)
A. List of program outcomes

Cognitive Outcomes (see Matrix A for details)
1. Students have mastered the essential concepts and facts of geology, and related math, physics, and chemistry
2. Students are critical thinkers (skeptical) and have developed their analytical skills
3. Students understand the important connections between geology and society

Behavioral Outcomes (Matrix B)
1. Students can implement the research process
2. Students are proficient in the basic field skills of geological inquiry
3. Students can communicate their ideas
4. Students are proficient users of Geographic Information Systems (GIS)
5. Students are proficient in the use of field and laboratory equipment
6. Students have basic computer literacy skills (use of basic software and discipline specific software, and can demonstrate troubleshooting skills)

Affective Outcomes (Matrix C)
1. Students can work with others to accomplish shared goals

Core course outcomes and objectives: Specific course outcomes and objectives and how they relate to the Program outcomes are presently available for these courses that form the core part of the Geology BS major degrees:

Geology 211 Physical Geology
Geology 212 Historical Geology
Geology 213 GIS in Geology
Geology 306 Mineralogy
Geology 310 Geomorphology
Geology 318 Structural Geology
Geology 352 Introduction to Geophysics
Geology 406 Igneous and Metamorphic Petrology
Geology 409/410 Field Methods/Geologic Mapping (capstone course)
Outcomes Assessment Framework

We have developed matrices of program outcomes (listed in IIA above) with relevance to core courses. These matrices show where Geology program outcomes are assessed across the curriculum.

Course outcomes and objectives (listed in IIB above and posted on the department’s outcomes website) provide the framework for the assessments listed in the matrices. The linkage of the matrices and the course outcomes and objectives will help us to streamline and focus our program.

B. Assessment data collection

1. Passing rate on the Association of State Boards of Geology (ASBOG) Exams (geology licensing exam). Some of our graduates take this exam, and it is an excellent assessment of Cognitive Outcome #1. The Geology Department will collect data on the number of students who pass the exam within 5 years after graduation. These data will be collected by a faculty member currently on the WA State licensing board, or the Chair. Anecdotal evidence suggests that our graduates have some of the highest rates of passing in the state. For our students who graduate with a BA in Education – Earth Science, the Washington State WEST-E exam can serve the same purpose.

2. Successful employment in a geology field or acceptance into graduate school. The chair will keep a record of the number of graduates employed in a geology field or accepted to graduate school. These data will be collected via the department newsletter. Employment in the field or acceptance to graduate school reflects the preparedness of our students to move on in their profession, signifying that cognitive, behavioral, and affective outcomes of the program have been met by these students.

3. Individual course assessments: The course outcomes and objectives described in Section IIB will be used by professors to assess their courses. The Department will decide the appropriate frequency of assessment of courses.

4. Checklists in a capstone course. Almost all of the behavioral and affective program outcomes can be assessed by use of a checklist (does not meet, meets, exceeds expectations) at field camp. Field camp (Geology 409/410) is the capstone course for the B.S. in Geology. Similar outcomes checklists will be developed for other core courses with behavioral and affective outcomes in the coming year.

5. Longitudinal studies. We will assess one of the cognitive course outcomes “Students will understand how information about Earth can be presented on maps and cross sections” over the duration of the major. A simple assessment will be given in Geology 211 (and 211a) each year, another more complicated one in Geology 318, and another in 409/410. The percent of students successful on these assessments will be recorded and evaluated by the chair. We will develop a similar assessment for GIS once this becomes established in all of our core courses.

6. Course Linkage: In addition to course outcomes and objectives, professors who teach courses for which there is a geology prerequisite will make a brief list of subjects they would like their students to have a working knowledge of when they come into their class. We encourage feedback between professors, e.g. tell a professor of a prerequisite class that students are (or are not) remembering how to identify rocks.
How will the assessment data be used

1. The assessment data collected through individual course assessments will be the evidence used for course revision. Each professor will submit, as part of their annual report, the outcome(s) assessed for their courses in that academic year and a summary of any changes made as a result of their assessment.

2. The Chair will collect annual course assessments and program assessments as described above and consult with the Geology Department Curriculum & Assessment committee. This group will submit an annual report to the Chair, who will include it in his/her annual report to the Dean and Provost.

3. The Chair will work together with the Curriculum & Assessment Committee to make changes in the program or allocate resources based on analysis of the data collected. This may involve request for resources from the college, changes in resource use, change in number of course offerings, changes in course structure, etc.

Program outcomes: B.A. in Geology in progress

Program outcomes: B.A. in Education

A. List of program outcomes

1. Students will gain an understanding of the content of Earth Science at a level sufficient to teach K-12 students.
2. Students will understand appropriate pedagogy for teaching science
3. Students can communicate their ideas
4. Students can implement the research process
5. Students understand the important connections between geology and society
6. Students can work with others to accomplish shared goals
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<th>Outcome Assessment Activities</th>
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<td><strong>This is a course-level example, from Geol 316 (Research in Marine Paleoecology), taught by Thor Hansen:</strong> Engage in paleontological research and communicate results in writing</td>
<td>In Fall 2009, I assigned four research papers, each of which followed the scientific format of Introduction, Methods, Results, Discussion and Conclusion. I assessed Outcome 3 (&quot;Engage in paleontological research and communicate results in writing.&quot;) using metrics for objectives 3.2 and 3.3 tabulating their scores on specific parts of their class projects. Project 2 had a heavy emphasis on literature review and I used their discussion score on this project to assess Objective 3.2 (&quot;Write a thorough review of the literature.&quot;). The students averaged 12.8 out of 15 points on this metric or 85%. I used their overall score on Project 3 to assess Objective 3.3 (&quot;Persuasively discuss a hypothesis with supporting evidence.&quot;). I chose this project for the assessment tool because it is the only one that they work on alone (the other projects involve teamwork) and create their own hypothesis to test. The students averaged 10.9 out of 12 points on this metric or 91%.</td>
<td>Although both of these assessments are highly satisfactory, I found a problem that was not addressed by my current assessment tools. In most cases the students were not reading the background literature thoroughly enough before collecting data for their projects. Instead they glanced over the literature, collected data, and then went back and read the literature more thoroughly while writing their discussion. This somewhat backwards approach meant they often neglected to collect data that would have been useful to their project had they been better prepared before the data collection phase. I am going to change the way I teach the class next year by reducing the number of projects from four to three and including structured classroom discussions of readings.</td>
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<td>At the program level, in 2008 we examined the possible need and curricular role of Geographic Information Systems (GIS) content in geology</td>
<td>Through alumni and employer surveys, student interviews, and informal surveys of other geology programs, we identified additional GIS training and experience, and the ability to utilize GIS as a tool in a range of geology-related problems, as the most important drawback in our department’s geology major degrees</td>
<td>We developed a new course (Geol 213, Intro to GIS) in 2008-2009, and taught several sections of 213 for the first time during the 2009-2010 year. One of our assessment activities for 2010-2011 will be to evaluate the effectiveness of the resources committed to this additional aspect of our program, and to determine if student understanding of GIS concepts is sufficient to enable GIS content taught in 213 to be prerequisite for other courses in the major. Student proficiency in GIS is now embodied as a Behavioral Outcome in our department’s assessment matrix</td>
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| As part of our first Program Outcome: | This past year, Liz Schermer evaluated this in her Geol 318 course:  
Students have mastered the essential concepts and facts of geology, and related math, physics, and chemistry.  
One of our core courses, Geol 318, has a course-outcome that is used to assess part of this larger program outcome:  
Understand how information about Earth can be presented on maps and cross sections (aka 2D representations of 3D features) |  
I assessed the objective SWBAT “construct a geologically viable cross section across a geologic map” in two recent versions of my 318 class. In fall 2009, which was the field version of the class, the average grade on the cross section lab was 70%, while in Fall 2008, a classroom version of the course, the average grade was 84%. The difference in format of these two classes allows for more time to be spent on cross sections in the classroom version, where they complete two cross section labs and a peer-review process, compared to the field version, where they only complete one cross section lab (identical to the second lab in the classroom version). The students who have difficulty with cross sections get to improve their skills by relearning the technique in Geology 409/410, but it would be better if they could come to the field course already proficient at cross sections. | I plan to improve my teaching of cross sections in the next instance of the field course (2011) by spending more time practicing the technique, giving students two smaller assignments instead of one larger one, and providing opportunity for peer review after the first assignment. |