

## **Assessment Plan – Geology Department:**

The Geology Department at Carleton aims to use geosciences content and skills to advance the liberal education of our students, to prepare geology majors to excel in earth-related careers in public service, the private sector and education, to prepare students for graduate school, and to develop skills that will help students in other careers of their choice. We believe that these specific student learning outcomes for majors meet these goals.

Students completing the geology major at Carleton should be able to:

1. Describe the characteristics of, and articulate clearly, a complex, open-ended geologic question or problem (such as a field problem, a thesis, a controversy, etc.).
2. Observe, measure, collect and interpret data from field study, databases, experiments, and other sources of information.
3. Describe the next steps in an investigation.
4. Explain the features and importance of the field setting, including specific outcrops, to a layperson and less-experienced geology student, teaching them observational skills in the process.
5. In projects, demonstrate their abilities to tackle a complex problem, and communicate in writing, orally, and visually. They should demonstrate an understanding of the research process and ownership of the project process.
6. Manipulate and describe geologic information in three dimensions.
7. Work with other students as part of a team.

The key to our assessment plan is to pay attention and to make (and record) systematic observations of student behavior and student work, without being overly rigid and formal. (Not too different from what we want the students to do, as a matter of course). Although we have a strong common language about the qualities of good student work among all faculty members, we are deeply divided about whether or not rubrics that characterize student work are a good idea or not. We have some draft rubrics for comps processes and products, and several of us use rubrics with our classes. For right now, we don't want the issue of rubrics to get in the way of quality assessment.

### **Outcomes 1-4 assessed in field work and class work**

Outcomes 1, 2, 3 and 4 are accomplished in geology classes and through non-class-related field experiences. The Geology Department explicitly seeks to maximize the field opportunities for each undergraduate major, because problems and questions defined and studied in the field are complex and open-ended in a manner particular to field sciences. Field problems help students deal with ambiguity and learn to make arguments from limited data. Field study is the “signature pedagogy” for the geosciences.

Assessment: a) spreadsheet of students' field experiences, including coursework, department field trips, field camps, field-related REUs, field comps projects, etc.

b) structured and systematic observation of students in the field, particularly during the fall and spring field trips (or equivalent experiences), on off-campus programs, and in field work connected to classes. Particular attention will be paid to senior geology majors during their senior year.

c) Faculty debriefing and observations and student comments post-field trips

### **Outcome 5 assessed through senior comps project**

Assessment: rubrics of a) comps process, b) written comps, and (eventually) c) oral and d) visual components of comps will guide annual faculty discussions of comps for each cohort of students

### **Outcome 6 assessed through spatial reasoning research project**

Assessment: Carleton is participating in a multi-institution research project to test how students develop spatial and three-dimensional reasoning. Two or three classes each year take pre- and post-tests. In addition, spatial and three-dimensional reasoning is assessed informally in introductory geology and through problem sets in mineralogy and structural geology. Sarah Titus is one of the P.I.s on this project, which has already yielded some interesting results. This is an example of an assessment protocol that we will probably do for a few more years and then substitute something related to another learning outcome.

### **Outcome 7 assessed through observation of students and student self-assessment in some classes**

We need to develop something for group work.

### **Other student learning outcomes:**

Each year, generally during discussion of comps projects and process, we identify one or two specific skills to work on during courses in the following few years. Past examples have included basics of oral presentation, constructing diagrams and maps, interpreting primary literature, locating and evaluating sources of information.

Assessment: informal, based on comps, and recorded at department discussion

### **Additional sources of program assessment information:**

- 1) Responses to questionnaires about graduate school. These are solicited from and submitted by geology majors who are in a variety of graduate programs (including, but not limited to geosciences). Specific questions that help us assess our program include:
  - a. Did you have to make up course deficiencies?
  - b. What qualities does your grad school seek in applicants? What type of person should be encouraged to apply?
- 2) Close reading of the news items geology majors send to the newsletter each year. The newsletter contains about 16 pages of news items and pictures submitted by alums and gives us a particularly good idea of the activities of the alums who do not go on in geology.

We all agree that we should augment these sources with a short survey that might go out yearly to alums who have graduated five years before that year asking a few Likert scale questions and a few open-ended questions about how well the geology major prepared them for what they are doing now.

- 3) Outcome measures for professional geologists:
  - a. Summary of responses to graduate school questionnaire on preparedness
  - b. Baccalaureate origins of Ph.D.s (NSF data)
  - c. Alumni publishing, e.g. in *GSA Bulletin* and *Geology*

These are easy to collect, readily available – but, except for some of the graduate school questionnaires, they do not sample those alums who go on in a field other than geosciences.

We do not have a complete timeline worked out for these assessment activities. Some are annual (review of comps), others more sporadic. In 2010-11, we will be preparing a self-study in preparation for internal and external reviews in 2011-2012. We expect the self-study will contain a robust section on assessment, summarizing our experiences with comps since the last self-study, the results of the spatial/3-D thinking analysis, and the start of observational language for field work.

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