I. Revisions to Assessment Plan

For 2008-2009, we made no significant changes to our evaluation plan, which still consists of four primary elements:

- Field camp grades
- Analysis of student writing using a common rubric
- Student knowledge inventory
- Geologic problem solving.

This year, we also participated in the first cohort of programs to use the new procedure for self-study as part of program review. As part of that process, we addressed three questions, listed below, along with the data collected to investigate each question:

- How well does the content and structure of our curriculum train students to solve geologic problems?
  - Field camp grades
  - Student survey
  - Focus group
  - Student Knowledge Inventory

- How well does the content and structure of our curriculum meet the workforce needs of California?
  - Comparison of our curriculum with Professional Geologist Exam
  - Comparison of our curriculum with other universities
  - Employment status of recent graduates
  - Focus group of professionals

- How well does the structure of our programs meet the needs of our faculty to maintain fulfilling professional lives?
  - Trends in faculty scholarly productivity
  - Faculty perceptions of workload and job satisfaction

Results of the self-study investigation are briefly discussed in this report; the full self-study report is attached.

II. Assessment Activities for 2008-2009

During this academic year, the Geology Department carried out three primary activities in program assessment:

- Collection and analysis of field camp grades
- Development and implementation of a student knowledge inventory
- Collection of writing rubric scores
The learning outcomes we addressed were:
1. Students will master a set of fundamental geologic concepts essential to understanding and solving geologic problems.
2. Students will be proficient in solving geologic problems.
3. Students will be proficient in geologic mapping.
4. Students will be proficient writers, skilled in the genres of scientific and technical writing.

Field Camp Grades:
Like most geology programs, we require B.S. students to complete field camp as a culminating experience. Like most small programs, we currently do not offer our own field camp, so we expect students to attend camps offered by other geology departments. We exert tight quality control on the camps we will allow our students to attend. To qualify, a camp must be 4-6 weeks long, address broad aspects of geology, require a written field report, and have a reputation as a challenging program. Students are permitted to attend one of four preselected field camps; they may petition to attend other camps, which are screened by our faculty on a case-by-case basis. Our geology program is much stronger than most in developing students’ field skills, so we want to ensure that our students attend camps that further develop their skills, rather than camps that are aimed at field novices.

We value field camp grades as a measure of students’ mapping skills, and as a holistic measure of mastery of geologic concepts and ability to solve geologic problems. Field camp is a culminating experience that truly taps all the skills and knowledge it takes to be a successful geologist. This assessment measure addresses all four of the learning outcomes listed above.

The average score of 3.3 is satisfactory evidence that our students on the whole are achieving mastery of geologic problem solving. This average compares favorably with other universities using this standard for assessment, including Minnesota State University (3.1, 2007)
The strength of this measure is that it gives a holistic measure of our students’ potential as geologists, and it allows us to calibrate our expectations of our students against an external standard. By that standard, we are doing very well as a department in preparing high quality geologists. The weakness is that it does not allow us to tease apart the components that lead to success in geology so that we can improve our program even further.

This year, we supplemented this data with a student survey of field camp experiences. From this we learned:

- Our students perceived themselves to be better prepared overall in field skills and Brunton compass use than the other students in the camps.
- Our students also perceived the students from other institutions as less mature in their behavior at camp.
- Our students felt underprepared in the use of aerial photos.

We conclude from this analysis that:

- Overall our program is achieving program goals I-V (see assessment plan) as measured through learning outcomes 1-4.
- We can safely put this assessment measure on a three-year collection cycle since we seem to be on-track now.
- We need a finer-grained metric to investigate our students’ mastery of specific areas of geologic practice.

Our response is to proceed with:

- Establishment of a procedure for analyzing field camp grades on a three-year cycle.
- Incorporate more use of aerial photos into our courses.
- Development of another assessment metric to measure mastery specific aspects of geologic problem-solving (see revised assessment plan).

**Writing Rubric:**

The use of a common writing rubric has become well-established practice since we adopted this assessment method in our initial assessment plan of 2000. The writing rubric is used in at least three upper division classes in the major. Our field classes use variations on the same rubric, as field reports have very specific requirements not found in other genres of scientific writing.

In 2007-2008, the Department devoted significant time to analysis of writing data collected over the previous five years. This year, we continued to collect data in this area, but we chose to defer analysis of the data for two years until we collect sufficient information to make analysis worthwhile.

**Student Knowledge Inventory**

As indicated in last year’s assessment report, we chose to invest most of our assessment effort this year into the development and implementation of an instrument to measure foundational geologic knowledge. Our goal is to track students’ mastery of the most important...
concepts in geology as they enter both the junior-level and senior-level courses. By assessing student understanding of these concepts, we can identify students who are not adequately prepared for advanced study, and track whether our courses are structured to help students retain mastery of this set of concepts.

Our process was this:

- Each faculty member was asked to identify the five most important domains of knowledge that students should understand as they leave the introductory courses and enter the respective upper division courses.
- As a group, we examined the list of domains and compiled a list of common domains of fundamental knowledge that all geology students should have mastered, such as rock identification and interpretation, geologic time, simple rock structures, etc.
- The next step was developing assessment items for each domain. We assigned responsibility for each domain to the faculty member teaching an upper division course most closely aligned to that domain. Each faculty member developed 5-10 questions (multiple-choice and constructed-response) for a test bank.
- As assessment coordinator, I assembled an eight-item test. We chose to administer the test in one junior-level course (Geology 111A) and one senior-level course (Geology 102A) so that we effectively sampled across most of our majors.
- We analyzed the results both by domain and by student. Both the test and the summarized results are attached.
- The results were discussed in a faculty meeting. We concluded that we need to give students in our introductory classes (Geology 10 and Geology 12) more experiences with rock identification and rock structures, and include more work with aerial photos in our field classes.

Self-Study results:
For detailed results of the Self-Study, please refer to our Self-Study Report (attached).

1. How well does the content and structure of our curriculum train students to solve geologic problems?
Most of the data collection for this question coincided with already-planned program assessment activities, which have been described above.

2. How well does the content and structure of our curriculum meet the workforce needs of California?
We found that while our curriculum generally aligns with the Geologist-In-Training portion of the Professional Geologist Exam, that specific content areas - such as aerial photographs and remote sensing – probably need more attention in our curriculum. When compared with other universities, both nationally and in California, we found that our program is more prescriptive than most, with a heavy emphasis in traditional geology – field and rock courses. We require some courses which tend to be treated as electives elsewhere. Our conclusion is that while our program is very rigorous, it may be overly restrictive. We are currently re-engineering the major to include fewer required courses and more electives, to give students better options for preparing for an ever-changing job market.
Our analysis of employment among recent graduates shows that our students are in general successful in finding employment in geological fields. We are planning a focus group of professional geologists to help us understand how to enhance the employability of our graduates.

3. How well does the structure of our programs meet the needs of our faculty to maintain fulfilling professional lives?

In our analysis of faculty roles and responsibilities, we found that faculty members value a wide range of scholarly activity, including advising graduate students, supervising undergraduate research, and work in the scholarship of teaching, as well as more traditional avenues of scholarship which result in published papers. In response, we revised our ARTP document to reflect the range of high-quality scholarship possible.

In our assessment of faculty perceptions of workload and satisfaction, we found that virtually all of us are not quite doing what we would like to be doing, but that collectively we have room to shift roles to lead to greater satisfaction. For example, some faculty members would like to teach more GE courses, while others would like to teach less. Our discussions were useful in revealing the choices we could be individually making without impacting the quality of instruction or advising in the Department.

III. Planned Assessment Activity for 2009-2010

During 2009-2010, the Geology Department will complete our program review. A few areas of data collection remain to be done. We were unable to conduct our focus groups, so those will be taking place at the very beginning of the Fall 2009 semester.

We will continue to collect field camp grades and writing rubrics for analysis in 2010-2011. For the coming year, our emphasis will be on refining measurement of student knowledge through the Student Knowledge Inventory, and through embedded assessments in specific courses. The SKI will be administered in Geology 101 and 110 at the beginning of the Fall semester to sample both the juniors and the seniors. We will administer it again in Geology 111 and Geology 120 in the Spring. In each case the test will be composed from the bank of test questions we assembled this year, so the students will answer new questions each time, all covering the essential knowledge domains.

We also will identify specific exam questions that tap geologic problem solving skills to collect for program assessment purposes. These questions will be administered in one junior level and one senior level class. We can test the same concepts in later years, allowing a longitudinal view of student learning. This issue will be worked out at the Department retreat before the Fall semester begins.