

Academic Assessment Plan for the Undergraduate Curriculum
Department of Geoscience
May 10, 2013

Overview of the Program

The Department of Geoscience received notice that proposed changes to our undergraduate curriculum had been approved for implementation in Fall, 2011. Our new curriculum represents the culmination of two years of review, discussion, and analysis, including:

- A survey of department alumni, including those who graduated under our current curriculum (≤ 10 years from graduation) and those who graduated under a previous curriculum (> 10 years since graduation)
- A survey of current undergraduate majors
- A survey of current graduate students
- Review of curriculum materials and information on recruitment success received from three departments with unusually high numbers of undergraduate geoscience majors (Univ. of California – Berkeley; Univ. of California – Santa Cruz; and Univ. of Colorado – Boulder)
- A departmental retreat focused on curricular needs

The announcement of curricular changes, which had been unanimously approved by our faculty, was met with enthusiasm by both current undergraduate majors and alumni. For example, our Board of Visitors voted to formally commend the Curriculum Committee for their efforts and positive results. The new curriculum is still firmly rooted in traditional courses that cover basic fundamentals and concepts of the geosciences, but it is structured to give majors greater flexibility in selecting upper-level geoscience courses and specialization in one of the following disciplinary tracks: Geology, General Geoscience, Environmental Geoscience, or Geophysics and Engineering Geology.

The number of undergraduate geoscience majors has increased markedly since the implementation of our new curriculum during the 2011-2012 academic year (Fig. 1), and this increase in majors/enrollment is projected to continue in the coming years. In addition, undergraduate students majoring in the Geological Engineering program (GLE), which falls under the umbrella of the College of Engineering, may earn a degree in Geoscience with no additional course work. The destinations of GLE majors divide into following categories: graduate school and academia, state and federal government agencies, construction, and private consulting firms. Thus, several factors have likely contributed to the overall increase in our number of majors.

Post-Graduate Careers for Geoscience Majors

The destinations of geoscience majors divide into three primary categories: (1) graduate study in geology and related fields involving research and education, (2) employment in the private sector (energy industry and environmental consulting firms), and (3)

placement within various state and federal government agencies. Since May 2010, 62 students have graduated from our program over the past three years. Of the 29 students for whom we have current information, 62% (18) have gone on to graduate school, 21% (6) are working in geology-related jobs, and 17% (5) were seeking employment.

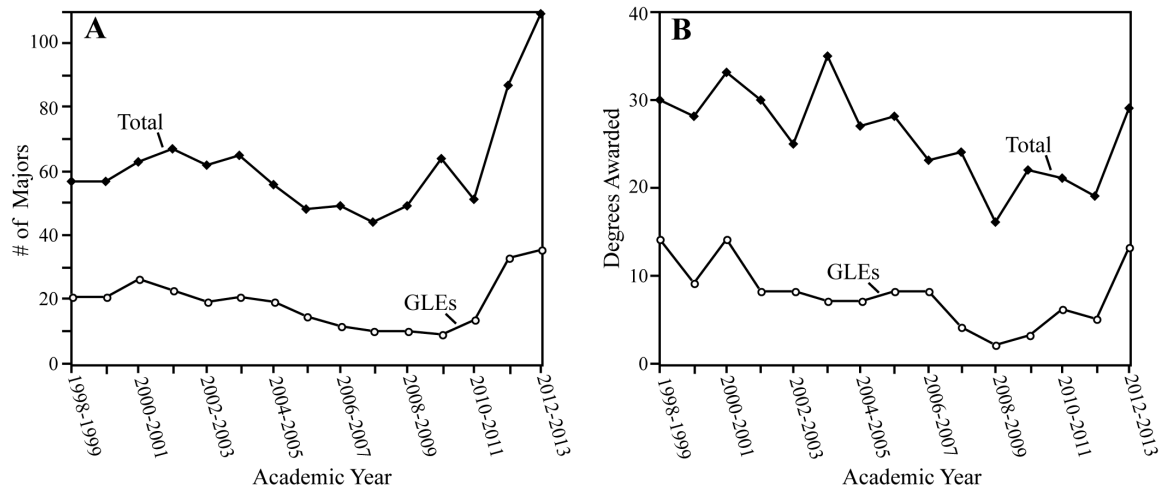


Figure 1. (A) Total number of undergraduate geoscience majors and geological engineering majors (GLEs) over the past 15 years. (B) Total number of undergraduate geoscience degrees and GLE degrees awarded over the past 15 years.

Summary of Program Learning Objectives

The department aims to provide an integrated curriculum in the field of earth science for undergraduate majors as preparation for graduate study and/or scientific careers. This curriculum includes traditional geology majors in L&S, and the interdisciplinary Geological Engineering undergraduates from the College of Engineering.

The earth sciences draw from a variety of scientific fields, including biology, chemistry, physics, engineering, and computer science. We want all of our majors to be grounded in certain general skills and knowledge, even as they begin the process of specialization.

Our general educational goals include:

- An understanding and appreciation of the magnitude of geologic time.
- An understanding of the chemical, physical, and biological bases of earth systems.
- Familiarity with the variety of size scales of geologic features.
- An understanding of and facility with the principles and methods of mapping.
- The ability to acquire scientific data in the field and laboratory.
- The ability to store, manipulate, reduce, and model data in a quantitative fashion.
- The ability to read and evaluate primary scientific literature.

Metrics for Evaluating Educational Objectives and Student Outcomes

In keeping with the work leading to the development of our new curriculum, we anticipate incorporating both student and alumni feedback into our assessment plan. The Department has designed a set of tools to assess and evaluate the program's educational objectives and student outcomes:

- The Department will continue to use a questionnaire that is distributed to our graduating senior majors. In this questionnaire, students are asked to evaluate our undergraduate curriculum, departmental strengths and weaknesses, advising procedures, and to describe their educational and career plans.
- The Department will participate in a newly designed National Geoscience Student Exit Survey managed by the American Geosciences Institute (AGI). AGI is a nonprofit federation of 50 different geoscientific and professional associations that represents the majority of the geosciences community. This is the first major study of its kind for geoscience majors, and 46 geoscience departments from around the U.S., including U.W.-Madison, participated in a pilot study. AGI reports the responses of our students as well as a statistical summary of student responses from other participating geoscience departments. With this information, the Department will be able to perform a self-study that evaluates the effectiveness of our newly revised undergraduate curriculum, and compare the responses of our graduating seniors to the national averages.
- The Department will continue to seek input and feedback from our alumni. Over the years, this metric has been greatly enhanced by biannually hosting the Board of Visitors, which is a committee consisting of 10 alumni. Members of the Board of Visitors have many years of experience in the workplace, and are representatives from governmental agencies, the private sector, and academia. In addition, the Department routinely circulates alumni and employer surveys requesting feedback about (1) their own employment status, (2) how their U.W.-Madison undergraduate experience helped prepare them for post-graduation life and employment, (3) the status of the job market in their particular field of employment, and (4) criteria and qualifications they consider most useful to graduating seniors entering the work force.

Summary of Preliminary Results

Implementation of our newly overhauled undergraduate curriculum, in conjunction with rising class enrollments and number of majors, places a premium on monitoring the overall quality of our academic program and undergraduate experience. However, at this early stage there is little in the way of statistically meaningful results to report given that our new undergraduate curriculum has been in existence for only 2 years. Based on direct feedback from students, it is clear that their overall assessment of the new program is very positive. In general, the students report that the faculty are generally approachable and concerned with undergraduate learning, the Department provides an

environment that is conducive to learning, greatly appreciate opportunities to be involved in ongoing research, and that the quality of TAs in the Department is excellent. That said, the students responses also indicate a need for more “hands on” experience in the form of field trips, increased mentorship with respect to critical reading of the scientific literature and science writing, better career advice, and more TAs to help teach lab sections that are integral parts of their learning experience.

Timetable for Assessment

The Department will continue its ongoing efforts to collect/assess feedback from undergraduate majors and alumni on an annual basis. Given the recent implementation of our restructured undergraduate curriculum, it will take time for sufficient numbers of students to graduate under the newly established guidelines. Moreover, our alumni surveys are designed to map program educational objectives at a horizon of five years after graduation; hence, statistically robust results for a rigorous assessment of our undergraduate curriculum will not be available for several years.

Future Steps: Administration, Reporting and Follow-Through

- As part of the Madison Initiative for Undergraduates (MIU), the Department will be sharing a “POD” Academic/Career Advisor with several other departments (Physics, Astronomy, AOS, Environmental Science) aligned under the College of Letters & Science. The addition of a POD advisor will provide our undergraduate majors with one, common point source of information pertaining to curricular matters and career counseling. The POD undergraduate advisory position will provide crucial assistance in meeting three college-wide goals: 1) improving access to academic and career advising; 2) ensuring all L&S students have access to robust, holistic advising services; and 3) building toward full integration of academic and career advising. In short, the POD advisory position will complement our faculty in their roles as educators/mentors, and make the task of navigating our new “track-system” curriculum less confusing to the students. **We look forward to working with the POD advisor to enrich the undergraduate experience, help compile responses (data) to our various assessment tools, refine and improve our assessment metrics, and assist with reporting the results of our academic assessment plan in the future.**
- We anticipate that our participation in the AGI exit survey, which is being made available to all geoscience departments nation-wide beginning this year (2013), will greatly enhance our ability to evaluate student outcomes. This national database for geoscience education will provide a baseline to which we will compare the responses of our majors.
- Strongly encourage student and alumni participation in all future assessment surveys.
- Finally, the approaches we use will be informed by approaches developed by

similar programs with demonstrated success. For example, the University of California – Berkeley has tripled the number of undergraduate majors in its program since implementing a curriculum with tracks defined by student needs and department strengths. We have documentation of Berkeley’s assessment plan, from which we can glean approaches appropriate to our own program. Similar information is available from a wide range of programs on the website of Carleton College’s Science Education Resource Center (SERC). SERC makes available a wide range of resources for program assessment (<http://serc.carleton.edu/departments/assessment/index.html>) as well as specific assessment instruments, such as those we have obtained from Berkeley (<http://serc.carleton.edu/departments/assessment/instruments.html>).