Form E-1-A for Boston College Undergraduate Programs

Program: ENVIRONMENTAL GEOSCIENCE

We are beginning the process of a thorough review of our undergraduate curriculum, motivated by a broad-based national discussion regarding the future of geoscience education. In January 2016 our Department Chair, John Ebel, attended a national summit at UT Austin on developing a community vision for geoscience education. The summit addressed issues such as course content, teaching methods, and concepts and skills that the next generation of geoscience students will need to master. Reflecting on that summit was the impetus for us to review and reevaluate how we teach earth and environmental sciences. The department faculty met in January to begin that process, and we continued and expanded on that discussion at our annual full-day faculty retreat meeting, which was held this year on June 2.

Below is a summary of the status of our Assessment activities for the Environmental Geoscience major, as of our June 2, 2016 faculty meeting. Since we are in some ways ahead of the national trend in what is called for in the national modernization of geoscience education, much of what is described below will likely continue to be applicable as we move forward with this process of a thorough review of our undergraduate curriculum.

1) Have formal learning outcomes been developed? What are they? (What specific sets of skills and knowledge does the department expect its majors to have acquired before they graduate?)

Environmental Geoscience majors will be able to:

1. Describe and apply basic Earth and environmental scientific concepts and information.
2. Collect and interpret quantitative Earth and environmental scientific data.
3. Think critically about scientific aspects of challenges currently facing society.
4. If this is their goal, enter graduate or professional school in environmental science, policy, law, or other related fields.
5. If this is their goal, obtain a job or internship in a field related to the environmental sciences.

2) Where are these learning outcomes published? Be specific. (Where are the department’s learning expectations accessible to potential majors: on the web or in the catalog or in your department’s major handouts?)

These goals will be included in the description of the undergraduate curriculum on the Department of Earth and Environmental Sciences (EES) website.
Other than GPA, what data/evidence is used to determine whether graduates have achieved the stated outcomes for the degree? (What evidence and analytical approaches do you use to assess which of the student learning outcomes are being achieved more or less well?)

Starting with the 2013-14 academic year, Environmental Geoscience students began to take a new, year-long (4 credit) Senior Research Seminar sequence (EESC5582-583, 2 credits/semester). Two years ago, we decided to experiment with using performance of students in that Senior Research Seminar as an annual assessment of how well our students are learning to approach scientific research challenges and the extent to which they are achieving the Learning Goals listed above.

At our May 2015 assessment meeting of full-time faculty, we reviewed how well the Senior Research Seminar improved the students’ understanding and experience of research, and how well it serves as an assessment tool for evidence that our senior students have achieved our Learning Goals. The results of that review were presented in last year’s E-1-A report. This year’s assessment discussion focused on a more extensive review of how well the Senior Research Seminar serves as a both capstone experience and an assessment tool.

The faculty generally agreed that the Environmental Geoscience Research Seminar should include more guidance and direction for introducing the students to issues related to how to do research. This is directly related to Learning Goal #2 above: gathering, analyzing and interpreting data. This year’s version of the course involved a year-long research project, with the class dividing into groups to define the specifics of the project, identify components of the project, and identify data they needed to gather, analyze, and interpret. The students wrote research reports describing their study and the results. The students’ experience in this course and research project was mixed, with some students having a high-quality research experience, but others seeming to not really appreciate what science research is all about. In some other years of this course the student experience was better than it was for this year’s group, with a fairly high percentage of the students having a high-quality research experience. This variation is not surprising; a capstone research course like this is likely to vary in quality of experience based on variation in the population of students taking the course and the particular research topic.

Overall, the consensus of the faculty regarding the effectiveness of the Senior Research Seminar was that there was a wide range of the extent to which the students actually learned what it means to be a scientist. Some of the students clearly learned from this major how to think like a scientist and conduct authentic research, while others graduated without yet having a clear picture of what we hoped for them in our Learning Goals. This provides us with data for how we can improve our curriculum in the future.

We also discussed the extent to which we still think this Senior Research Seminar course can serve a good assessment tool for how well our Environmental Geoscience students are learning to approach scientific research challenges and how well they are achieving the Learning Goals listed above. At this point we have concluded that we will continue to use it as our assessment tool, but as part of our new review of our undergraduate curriculum, motivated by the national discussion.
regarding the future of geoscience education, we will also investigate other possible assessment tools for our Environmental Geoscience major.

Another question we considered regarding our Senior Research Seminar is that, as our number of majors continues to increase, it will be increasingly challenging to offer this course, in its present form, unless we can increase the number of full-time faculty. This is an issue that we will need to address as our department grows.

4) **Who interprets the evidence? What is the process? (Who in the department is responsible for interpreting the data and making recommendations for curriculum or assignment changes if appropriate? When does this occur?)**

The department full-time faculty meets annually to review all aspects of our majors programs, and to make recommendations to the whole department for improvement. The conclusions of those discussions are reviewed by all full-time faculty, and presented in department annual reports.

Other faculty meetings are held throughout the year in which we continuously work towards gathering and interpreting data for reviewing our majors programs and how well our curriculum is achieving our espoused Learning Goals.

We are still in the process of fine-tuning our Environmental Geoscience Learning Goals and designing ways to investigate evidence that changes we have made have resulted in improved learning outcomes. This will be an important part of our continuing review of our undergraduate curriculum.