ENVIRONMENTAL SCIENCE

Mission and Structure

The program is designed to offer students an interdisciplinary degree program in environmental science. The major emphasizes breadth in both the sciences and humanities, preparing students for a variety of career options from those requiring an intensive science background such as toxicology or wildlife management to more policy-oriented careers in environmental advocacy.

The environmental science program draws from various sciences (biology, chemistry, physics) and mathematics, as well as politics, economics, ethics, and communication. The major also emphasizes experimentation and the scientific method where appropriate to defining and/or solving environmental problems, while not neglecting an understan ding and appreciation of social, political, and economic influences on the decision-making process.

The structure of the curriculum is as follows:

1. A required introductory environmental science course with discussion periods.
2. A required sequence of nine math and science courses (with labs) including three in biology and three in chemistry.
3. A required array of six courses in the social sciences and humanities.
4. Science seminar.
5. Senior research.

The environmental science major complements the mission and purposes of the College in a variety of ways. The major prepares students for professions in the broad field of environmental science and policy by teaching fundamental concepts in the sciences and humanities, field and laboratory skills, and offering electives for greater specialization in either science or policy. Intellectual inquiry and critical analysis are progressively promoted in the program. In their science courses, students begin by interpreting experimental results and their validity. In more advanced courses, greater emphasis is placed on the design of experiments and data analysis. In policy courses, critical thinking and analysis of texts and/or arguments is commonplace. A capstone senior research project may be experimental in nature or more oriented toward critical analysis of published data and/or arguments (e.g. a book review). Both require a background literature search and critical analysis of published data and/or their own data gathered by experimentation or observation.

The program promotes leadership through group projects including discussions, lab experiments, debates, and reports. Lab assistants have opportunities to direct and design lab activities. The Biology department supports the Monmouth College Environmental Club and the College supports Students Organized for Service (SOS). Both extracurricular organizations offer leadership and service opportunities in environmental policy.

The major is a natural at fostering connections among disparate disciplines both within and beyond traditional math and science. Math and physics skills are integrated throughout the curriculum and the overlap between environmental issues, biology, and chemistry is unavoidable at all levels. Required courses in seven departments and eight programs lead the student to make connections beyond science to economics, politics, and sociology. Knowledge in the sciences and humanities can help environmental science students make informed choices in a free society. Facts can also inform values, but we appreciate the limits of their utility. Philosophical, religious, and political viewpoints can clearly merge to form environmental values. Should you eat meat? What are the practical, economic, social, ecological, and ethical considerations involved in your choice? What is the best way or ways to implement population control? Is it even necessary? Science can offer technological solutions to some environmental problems, but do we have the wisdom, fortitude, or discipline to implement them? These questions and others are integrated at various levels in the environmental science program.

Assessment of Major Goals

Program Objectives / Outcomes	Most Relevant Courses	Means of Assessment
1. Understand fundamental concepts and learn basic facts in various disciplines related to environmental science.	Biol 111, 112, 307 Chem 130, 140, 220 Math 106, 151 Envi 103, 218 Econ 200, 380 Soci 343, Scat 306 Govt 101/103/200, 375	Unit and final exams
2. Become proficient in the use of standard laboratory equipment.	Biol 307 Chem 130, 140, 220	Lab reports/notebooks, instructor observations
3. Retrieve, synthesize, and critically evaluate literature relevant to environmental science.	Biol 307, Envi 103, Econ 380, Scat 306, Soci 343	Research papers, class discussion, case studies,oral presentations, analysis papers.
4. Communicate, orally and in writing, results and interpretation of scientific research.	Chem/Biol 350 Senior research, Scat 306, Envi 218	Oral presentations, research papers, essay exams
5. Design and implement experiments that test hypotheses. Analyze data, report results, and interpret their signficance.	Biol 307 Senior research	Lab reports, research papers
6. Integrate knowledge from various disciplines and use critical thinking skills to evaluate options for environmentally sustainable resource use.	Envi 103, 218, Econ 380, Soci 343, Scat 306	Class discussion, unit exams, lab reports, research papers, argument analysis.

Assessment of Student Learning in the Major

Currently, we assess achievement of the program's goals primarily through course assessment (exams, papers, presentations, etc.). Professors also evaluate student progress in less formal ways, for example, by observing their lab skills, participation in group discussions, and originality in research design. In the immediate future we would like to implement some additional methods of assessing outcomes including the following:

1. GRE general - During the spring semester of their senior year, environmental science students will take the Graduate Record Examination (general) to assess and compare to national norms their communication, quantitative, and analytical skills.
2. GRE advanced biology - During the fall or spring semester of their senior year, biolgoy students will take the advanced biology test of the GRE to assess the breadth and depth of their biological understanding in two subscore areas: organismal and population.
3. Graduate school acceptance rates - The department will keep records of application and success rates for students planning to attend graduate school.
4. Alumni surveys - The department will conduct 2, 5, and 10-year surveys of biology alumni to determine their job or graduate school placement and advancement, and their perception of the preparation they received from the biology program.
5. Standardized entrance and exit exam - Faculty teaching required courses in the major will design an exam to test for knowledge of basic content and concepts in the various fields of environmental science. To provide a measure of progress through the four-year program, all entering majors will be administered the exam during their first semester, probably during one class period in Botany. The same exam will be administered during the spring semester of the senior year.

These assessment methods will be used to provide feedback to the department on an annual basis. We will review the content of our courses and the pedagogy used to deliver it. As a hypothetical example, particularly weak scores in the verbal subscore of the GRE might encourage us to require more writing assignments in various courses. Feedback from alumni in graduate schools or government agencies can point out weaknesses, for example, a lack of GIS (Geographic Information Systems) training. What resources would be necessary to address this shortcoming? If the GRE advanced biology population subscores are low compared to national averages, how can the Ecology and Population courses be modified to address the problem? Is it a problem of missing content, or if we do cover those areas, how is it that students aren't "getting" it? The standardized entrance and exit exam will be based upon what we currently teach and expect our students to retain from our program. If they do not do well, we should examine our teaching methods, or perhaps our grading criteria, and ask how we can better deliver the information and evaluate student performance.