

Environmental Science and Resource Management Program Learning Outcomes Assessment Project 2005-2006

The Environmental Science and Resource Management (ESRM) Program is CSUCI's interdisciplinary major focused on providing solutions to our environmental challenges. ESRM offers an undergraduate major and minor in environmental science and management by leveraging faculty strengths throughout the university into a coherent and rigorous curriculum. Students' freshman and sophomore years are primarily spent taking non-ESRM courses to gain the breadth needed to fully understand the challenges facing our planet, state, and region. Junior- and senior-level courses maintain our interdisciplinary philosophy but are ESRM-focused and designed to give students the depth required to document, analyze, and provide effective solutions to today's resource management challenges. ESRM is a demanding major with the largest number of interdisciplinary courses of any interdisciplinary program at CSUCI.

ESRM Program Goals and Student Learning Outcomes

Our Environmental Science and Resource Management Program seeks to produce students who are well-skilled in various aspects of environmental science useful for today's modern resource management professionals. In addition to acquiring particular skill sets (GIS, water quality assessment, *etc.*) all of our graduates will appreciate, be able to interpret, and offer effective solutions to resource management challenges. In particular, graduates will be able to:

- Identify the scientific, social scientific and humanistic aspects of environmental issues.
- Identify, locate, evaluate, synthesize and present current research and information on environmental issues.
- Define environmental problems from the perspectives of both environmental science and resource management.
- Identify possible causes and propose solutions to environmental problems from the perspectives of both environmental science and resource management.
- Evaluate proposed solutions to environmental problems from the perspectives of both environmental science and resource management.
- Use the methodologies of the natural and social sciences to formulate testable hypotheses concerning environmental problems and issues.
- Collect, organize, analyze, interpret and present quantitative and qualitative data

The interdisciplinary nature of our program requires our students to spend much of their coursework in non-ESRM courses (Physics, Biology, Chemistry, Economics, *etc.*). As such, we feel the most appropriate point to assess student outcomes of our ESRM program is at the culmination of their time at CSUCI: their senior capstone project. This first year we decided to assess our program's success in preparing students ability to conduct

independent research. *Specifically, we asked if our students acquired an ability to collect, organize, analyze, interpret, and present quantitative and qualitative data.*

Our capstone curriculum consists of two courses: a guided semester of basic literature reading and an independent research class. Students present their independent research at the conclusion of the capstone to an invited campus audience. We conduct a peer-reviewed assessment of their final presentations in a seminar format. Reviewers include all ESRM faculty plus various ESRM-affiliated faculty from other disciplines such as Biology, Chemistry, English, and Political Science. Judges evaluate communication skills, the caliber of the research itself, and the student's overall demonstration of his or her knowledge of the project and related disciplines. Judges score students independently and then produce a consensus report of each student (the individual assessment). Following all student presentations, the reviewers also provide an overall summary of the entirety of the capstone presentations (aggregate assessment). While the individual student assessments are directed primarily at evaluating a particular student's success at meeting the program objectives, the aggregate assessment is directed at specific gaps or weaknesses in ESRM curricula.

Data and Analysis

Six students enrolled in our 2006 Capstone course. ESRM and ESRM-affiliated faculty independently scored student presentations (for a total of 38 assessments) at the end of the Spring 2006 semester. Both the printed poster and student responses to reviewers' questions were considered in this evaluation and given an aggregate score from 1 (unacceptable) to 5 (excellent). Aggregate program assessments (grand mean=4.64, SD=0.45) averaged between "Very Good" (4) and "Excellent" (5) and statistically significantly ($p < 0.00$) exceeded the neutral point (3).

Conclusions and Implications for Program Modification

Students performed quite well. Project components that the students had spent the most time revising (research topics, methodologies, analysis *etc.*) were uniformly given top marks. The greatest shortcomings identified for improvement were aspects of the final technical presentation. In particular, students could improve their extemporaneous and visual communication skills (poster design, graph layouts, oral response to audience questions, *etc.*). Conveying potentially confusing data in an elegant and aesthetically pleasing manner is a necessary skill set for all environmental professionals. Developing a robust technical communication skill set requires continual exposure and practice.

In response to these findings we have begun to modify course offering and content. Due to CSUCI course modification logistics, many of these changes will take a few semesters to be fully implemented. Current program modifications include:

- more student presentations and student-lead discussions of basic and applied research leading in existing ESRM courses (*i.e.* ESRM 482 Issues in Environmental Planning and Resource Management offered Fall 2006).

- modifying ESRM graduation requirements for composition. We will shift from requiring students to take a general composition course (ENGL 330 Writing in the Disciplines) to requiring students to take a technical writing course (ENGL 482 Technical Writing) and/or (ENGL 483 Visual Technical Communication).
- new course offerings. We are modifying our Capstone preparation class from an independent study course to ESRM 491 that maintains the directed readings component but also overlays individual and groups exercises designed to help refine various components of each student's proposed research (problem statements, methods, *etc.*). By forcing the students to spend the prior semester working on these aspects of their work, the hope is they will have more time in the Spring semester to spend on refining presentation components.
- new course offerings. We are collaborating with the Communications Program to offer a new interdisciplinary course: ESRM/COMM 443 Environmental Communication. This new class along with the new COMM 101 (Introduction to Communication) will expose our students to more formal communication skills and styles.
- extra-curricular activities to foster technical communication skills. We have received external funding to take up to 20 undergraduates to a Professional Training Seminar (primarily designed for working engineers and Silicon Valley CEOs) by Dr. Edward Tufte in December 2006 in San Francisco. In addition to the training our funding will also be supplying each student with three of Dr. Tufte's textbooks on communicating technical data.

Your assessment instrument and scoring rubrics go here.

Spring 2006 ESRM Capstone Scoring Rubric:

Grading Rubric For ESRM "Data" Educational Program Objective

Educational Program Objective: **Collect, organize, analyze, interpret, and present quantitative and qualitative data**

5. Student use of data was appropriate for the project. Data was organized and presented graphically on the poster. Analysis and interpretation of the data reflects thoughtful integration with stated research hypotheses.

4. Student provides most of level 5 but one characteristic is missing or unclear.

3. Student has collected appropriate data. Organization of the data is clear using appropriate graphs but there is a lack of thoughtful analysis and interpretation to integrate the data with stated hypotheses.

2. Student has collected appropriate or less relevant data but organization of the data is not clear and there is no attempt at analysis and/or interpretation.

1. Data is missing or is inappropriate to stated hypotheses. Erroneous data is reported out of context and there is no attempt at integration with stated hypotheses.