1. Please describe your program’s learning-outcomes trajectory since 2006-07: Has there been a transformation of organizational culture regarding the establishment of learning outcomes and the capacity to assess progress toward their achievement? If so, during which academic year would you say the transformation became noticeable? What lies ahead; what is the next likely step in developing a learning-outcomes organizational culture within the program? [Please limit your response to 200 words or less]

Environmental Studies has experienced significant growth in students from 2006-2012, almost doubling from 110 to 195 students, despite the fact that the department has never had a full complement of ladder-track professors. Despite extremely high faculty-student ratios, we have accomplished major goals based on ongoing assessment. The B.S. degree and the free-standing B.A. degree were proposed and eventually approved in 2009 and 2010, respectively. Student interest in the program has substantially increased and the number of majors has grown. Six new courses were added to the core curriculum.

In 2009-2010, the department was actively engaged in discussion about assessment, and conducted an “Assessment Summit” retreat in spring semester 2010. Department faculty focused attention on whether and how our students are successfully becoming “rigorous scientific decision makers who are critical, inferential thinkers.” Direct summative assessments, administered as pre- and post- tests during the semester, are used to assess learning outcomes and ensure achievement of core environmental program goals. These assessments are being utilized to determine whether students achieved and understood core program learning goals at the post-assessment evaluation. The department has also administered exit questionnaires from the required capstone senior thesis since 2004. This data provides an excellent assessment tool to determine whether students can effectively implement more advanced synthetic thinking and research. Incorporation of formative assessments provided a direct method of adaptive management throughout the semester, ensuring the effective translation of course concepts and learning objectives.
2. Please list in prioritized order (or indicate no prioritization regarding) up to four desired learning outcomes (“takeaways” concerning such elements of curriculum as perspectives, specific content knowledge, skill sets, confidence levels) for students completing the program. For each stated outcome, please provide the reason that it was designated as desired by the faculty associated with the program. [Please limit your response per outcome to 300 words or less]

The department identified eleven primary learning outcomes for our department in 2001, and revised the learning outcomes to a total of eight at the 2010 departmental “Assessment Summit”. The following were prioritized by faculty as key learning outcomes:

a. Ability to assess environmental problems and solutions by applying scientific concepts. Summative assessment examples are provided from ENVS 10 “Introduction to Environmental Studies” and ENVS 11 “Environmental Issues and Critical Thinking” in the Appendix.

b. Ability to write and speak clearly and persuasively. To assess this high impact learning practice, the department developed a writing diagnostic pre- and post-test for ENVS 112 “International Environmental Problems” – example provided in the Appendix.

c. Ability to reason quantitatively. Pre- and post- summative assessments were developed for ENVS 120 “Quantitative Methods” and ENVS 121 “Field Methods in Environmental Studies”, and examples are provided in the Appendix.

d. Ability to carry out research tasks appropriate to analyzing environmental problems. In addition, a portfolio and reflective essays are required. This combination of materials enables both subjective and objective assessment. Exit questionnaires are administered at the end of the ENVS 190 “Senior Thesis” capstone course. The reflective essay guidelines and exit questionnaire are provided in the Appendix.

The following table is from our 2002 program review. The department has had a consistent list of key learning objectives in place since the program review process of 2001-2002, and we have annually assessed learning objectives based on this set of principles.
Program: Bachelor of Science, Environmental Studies

**OUTCOMES**

1) * Ability to write and speak clearly and persuasively
2) * Ability to reason quantitatively
3) * Ability to understand and use basic science concepts
4) * Ability to integrate social science and humanities concepts with scientific ideas and information in analyzing environmental problems
5) * Ability to work in groups in analyzing environmental problems and reaching agreement on solutions
6) * Ability to use economic tools to assess actions affecting the environment, including cost/benefit techniques
7) * Ability to use legal concepts in understanding environmental problems and legal approaches to them.
8) * Ability to describe and analyze environmental problems taking into account differing problems among nations and international interactions among nations regarding environmental matters.
9) * Ability to identify, understand, and evaluate competing perspectives and interests in environmental issues
10) * Ability to carry out research tasks appropriate to analyzing environmental problems
11) * Ability to use the concepts and methods of at least one academic discipline at a higher level of skill than may be implied by the above.
The following revised table of learning outcomes was formulated in May 2010, prior to the approval of the B.S. degree, as part of our annual assessment review. Specific language has changed, but the fundamental principles have remained the same over a period of decades.

**ENVS Upper Division Courses:**

The Department of Environmental Studies has identified eight key Student Learning Outcomes (SLOs), listed below. Upper division courses should be assessed using the outcomes indicated in the chart below. The four SLOs identified for this document are highlighted with an asterisk *.

1. *Ability to write and speak clearly and persuasively*
2. *Ability to reason quantitatively*
3. Ability to carry out research tasks appropriate to analyzing environmental problems
4. *Ability to assess environmental problems and solutions by applying scientific concepts*
5. Ability to assess environmental problems and solutions by applying economic and political concepts
6. Ability to assess environmental problems and solutions from the perspectives of ethics, justice, human rights, and cultural diversity
7. Ability to identify, understand, and critically evaluate competing perspectives on environmental issues
8. *Ability to integrate knowledge, research, and interpretation with substantially greater sophistication than commonly expected in coursework.

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3. *For undergraduate programs only,* in what ways are the set of desired learning outcomes described above aligned with the University’s Baccalaureate Learning Goals? Please be as specific as possible. [Please limit your response to 400 words or less]

In summary, the program learning goals relate to the CSUS Baccalaureate Learning Goals (1-5) as follows:

**a. Competence in the Disciplines**
The structure of the program reflects core, allied, and contextual disciplines. The core subject matter of the discipline pertains to the study of natural and physical processes as they pertain to human interaction with nature, including use, abuse, interpretation, valuation, and appreciation. The allied disciplines, such as biology, economics, chemistry, geography, government, engineering, etc., are those providing the theories and tools to analyze, address, and influence (i.e., through technology) human interactions with core environmental processes. The contextual disciplines, such as history, philosophy, sociology, anthropology, etc., are those that provide broad human and cultural perspectives on key environmental issues and phenomena.

**b. Knowledge of Human Cultures and the Physical and Natural World**
Environmental issues, conflicts, and interventions arise fundamentally because of human interpretations, uses, and abuses of nature. Some of these arise because of limitations of natural resource extraction, such as energy, food, water, and materials. Others arise because of pollution or damage to natural resource systems, such as air water, and food supply. Almost all involve competition among users, especially with industrialization and economic advancement.

**c. Intellectual and Practical Skills**
The field of Environmental Studies arose in response to perceived emerging and intensifying problems associated with economic and technological development. Therefore the problem-analysis central in the field takes several forms: a. scientific inquiry leading to quantitative and theoretical hypothesis formation and testing; b. specification of rights, duties, and constraints with respect to the environment (e.g., animal rights, endangered species, “conservation”); c. forms of appreciation and reverence for nature as articulating fundamental values and commitments for problem-solving, including concepts of both human and natural “communities”; and d. individual, group, and collective experiences in classes, fieldwork, laboratory research, and community activities to learn professional standards in the pursuit of environmental problem-solving.

**d. Personal and Social Responsibility**
The program goal is to produce mature, critical-thinking citizens through ethical discussions, comparative studies, international and global perspectives on environmental analysis and problem-solving. Opportunities in this area include both
self-directed and collaborative research with faculty, internships, participation in public debates, and community service.

e. Integrative Learning
The Senior Thesis, as a fundamentally important capstone requirement of the program, embodies the goal of integrative learning. It requires independent research, organizational skills to manage a large and long-term project, analytical and logical expectations, writing proficiency, and deep personal commitment to a specific project. Environmental Studies is the only department at CSUS to require a senior thesis; Geology provides a senior thesis option.

4. For each desired outcome indicated in item 2 above, please:
   a) Describe the method(s) by which its ongoing pursuit is monitored and measured.
   b) Include a description of the sample of students (e.g., random sample of transfer students declaring the major; graduating seniors) from whom data were/will be collected and the frequency and schedule with which the data in question were/will be collected.
   c) Describe and append a sample (or samples) of the “instrument” (e.g., survey or test), “artifact” (e.g., writing sample and evaluative protocol, performance review sheet), or other device used to assess the status of the learning outcomes desired by the program.
   d) Explain how the program faculty analyzed and evaluated (will analyze and evaluate) the data to reach conclusions about each desired student learning outcome.

[Please limit your response to 200 words or less per learning outcome]

(If the requested data and/or analysis are not yet available for any of the learning outcomes, please explain why and describe the plan by which these will occur. Please limit your response to 500 words or less.)

4a) Methods by which Student Learning Outcomes are monitored and measured

The fundamental interdisciplinary nature of Environmental Studies as a field requires a focus on the integration of knowledge and skills at every level. We will address the approach to establishment of learning outcomes, monitoring and measuring summative assessment methodologies, and efficacy as an umbrella synergizing department SLOs in their entirety, and then break down the four prioritized learning outcomes. The overall methodology we are using for all learning outcomes is a pre- and post- summative assessment, administered in the beginning and ending of the course, then analyzed and evaluated. We met as a faculty to adopt a prototype assessment for ENVS 10 in 2010-
2011, and are continuing to refine and modify the sampling instrument upon reflection and evaluation.

We will address this question using techniques and measures which range from: 1) our most introductory course, ENVS 10 “Introduction to Environmental Science” (also a Freshman Seminar and Honors ENVS 10, building freshman learning communities through ENVS 21 “Freshman Seminar”, a high-impact learning practice); 2) ENVS 112 “International Environmental Studies” writing intensive course, and prequel to prepare students for our capstone course, 3) ENVS 120 “Quantitative Methods” and ENVS 121 “Field Methods”; and 4) ENVS 190 “Senior Thesis”. In each of these examples, it will be apparent how different learning goals appropriate for that course are assessed, the assessment evaluated, and the implications for curriculum addressed. We have not included all the information available about either the tools or the conclusions, but they are available in our annual assessment reports.

4b. Description of student sample – We sample all students within the class, so the sample represents the complete population of students in the class.

4c. Describe and append a sample of the “instrument” – these are included in the Appendix.

1. Ability to write and speak clearly and persuasively. To assess this high impact learning practice, the department developed a writing diagnostic pre and post test for ENVS 112 – example provided in Appendix.

2. Ability to reason quantitatively. Pre and post summative assessments were developed for test for ENVS 120 and 121, and examples are provided in Appendix.

3. Ability to carry out research tasks appropriate to analyzing environmental problems. Exit questionnaires were administered at the end of the ENVS 190 environmental capstone course, and examples are provided in Appendix.

4. Ability to assess environmental problems and solutions by applying scientific concepts. Examples of Summative Assessments are provided from introductory ENVS 10 and 11 classes in Appendix.

4d. Explain how the program faculty analyzed and evaluated (will analyze and evaluate) the data to reach conclusions about each desired student learning outcome.

a. Ability to assess environmental problems and solutions by applying scientific concepts. Summative assessment examples are provided from ENVS 10 “Introduction to Environmental Studies” and ENVS 11 “Environmental Issues and Critical Thinking” in the Appendix.

b. Ability to write and speak clearly and persuasively. To assess this high impact learning practice, the department developed a writing diagnostic pre- and post- test.
for ENVS 112 “International Environmental Problems” – example provided in the Appendix.

c. **Ability to reason quantitatively**  Pre- and post- summative assessments were developed for ENVS 120 “Quantitative Methods” and ENVS 121 “Field Methods in Environmental Studies”, and examples are provided in the Appendix.

d. **Ability to carry out research tasks appropriate to analyzing environmental problems.**
   In addition, a portfolio and reflective essays are required. This combination of materials enables both subjective and objective assessment. Exit questionnaires are administered at the end of the ENVS 190 “Senior Thesis” capstone course. The reflective essay guidelines and exit questionnaire are provided in the Appendix.

5. Regarding each outcome and method discussed in items 2 and 4 above, please provide examples of how findings from the learning outcomes process have been utilized to address decisions to revise or maintain elements of the curriculum (including decisions to alter the program’s desired outcomes). If such decision-making has not yet occurred, please describe the plan by which it will occur.

   [Please limit your response to 200 words or less per item]

It was the department’s response to assessment information that led to repeated calls for a B.S. program, and with the hiring of new faculty in 2007, the department moved to propose the B.S. program. That program was eventually approved in fall 2010. We developed a program proposal for a new degree, the Bachelor of Science, which reflected departmental curriculum strategy for 40 years. As part of that program proposal and implementation, we developed new course proposals, formulated assessment strategies, anticipated student involvement, and strengthened community relations. This planning benefitted the existing B.A. program and the Environmental Studies minor, as well as the newly established B.S. program. Our newly approved courses were added in response to major environmental trajectories of federal and state governments that will allow our students to be at the top of their field.

We have these learning objectives embedded as requirements and included in the syllabi of the relevant courses. Since 2010, we have been giving pre-and post- assessments, and using normative assessments and cognitive maps. We work with incoming students in advising sessions. We do a comprehensive program evaluation by students as part of their senior thesis project. We try to keep in touch with graduates as much as possible. We provide a bi-annual newsletter to current and past students. We encourage students to tell us about themselves and their activities, and we work actively with agencies and businesses in the environmental community.

Every semester we modify courses to make them relevant and up-to-date on breaking environmental news. In order to make the course more contemporary, faculty have incorporated
Pearson’s *Mastering Environmental Science* on-line in addition to the ENVS 10 textbook, which outlines environmental news issues covered in the New York Times, virtual fieldtrips, and encourages on-line interactive assignments. We continue to incorporate state-of-the-art environmental videos and audio-visual media to our department library. Faculty are participating Center for Teaching and Learning and Writing Across the Curriculum faculty seminars. Formative assessments are incorporated throughout the semester, enabling both the student and instructor to “practice” and gain feedback on course learning objectives while there is time for self correction. One very successful form of formative assessment that significantly improves student writing is incorporation of peer editing prior to submission of final writing assignments. Concept maps provide a visual tool to help students diagram and integrate relationships among multiple sources of information.

We are developing more accessible assignments using and requiring quantitative reasoning in Field Methods and Quantitative Methods, Restoration Ecology, Agroecology, and Wetlands Ecology. Faculty have been collaborating between the “Field Methods” and “Quantitative Methods” classes, and the data collected in Field Methods provides real world examples of experimental design and statistical analysis, making the projects more meaningful and relevant.

Another aspect of course development is including contextualized and place-based learning in courses such as Field Methods, Wetlands Ecology, and Restoration. Students learn the application of scientific inquiry, observation, representative sampling, experimental design, and applied environmental problem solving through classroom exposure to the material, then experiential and contextualized learning during field trips. Incorporation of field trips into Environmental Studies classes involves translating this classroom knowledge into experiential learning.

Faculty meet as a committee of the whole to review student learning outcomes, to develop meaningful and relevant formative and summative assessment tools, and to follow up the assessment with course modification and fine tuning. We are actively modifying and standardizing our assessment tools so they are more consistent throughout the full and part time faculty pool. We initiated development of a more consistent pre- and post- summative assessment for ENVS 10 and 11, given by all faculty. This semester (spring 2012) we are in the process of collaborating and formulating revised and improved assessment tools to be taken for a test ride by the faculty pool.

We build into the program at all levels the expectation of students to undertake and complete a serious senior thesis that bears on real environmental problems and integrates not only academic but professional and community perspectives.

6. **Has the program systematically sought data from alumni to measure the longer-term effects of accomplishment of the program’s learning outcomes? If so, please describe the approach to this information-gathering and the ways in which the information will**
be applied to the program’s curriculum. If such activity has not yet occurred, please describe the plan by which it will occur.

[Please limit your response to 300 words or less]

The consistent message from Environmental Studies graduates and employers for many years has been that the program needed to have a Bachelor of Science degree option. Many job classifications in state and federal agencies require a B.S. degree. In most cases, applicants or faculty were able to convince employers that students had met their requirements through the combination of departmental and campus-wide courses.

The department derived two conclusions. First, the historic program focus on broad, inter-disciplinary training and a context of reading, writing, and speaking was valid. Second, establishing a new degree, the B.S., would go far in meeting the needs of those applicants seeking employment in more technical job categories and graduate programs in Environmental Science or seeking to work with biological, geological, chemical, and related data, but in a context where they need to know the relevant law, policies, community issues, etc.

The department learned that its overall orientation was, and continues to be, valid in terms of the knowledge and skills it provides to students. It appears that, relative to graduates of other programs, Environmental Studies graduates have had better success in being prepared for available jobs. The current “green” climate, AB32 mandating reduction of carbon emissions, development of green energy, increased state monitoring and regulation of wetland resources, limited statewide water resources, and a new flood management initiative have all created jobs for Environmental Studies majors.

7. Does the program pursue learning outcomes identified by an accrediting or other professional discipline-related organization as important? Does the set of outcomes pursued by your program exceed those identified as important by your accrediting or other professional discipline-related organization?

[Please limit your response to 300 words or less]

In 2008, the department participated in a national survey of environmental programs around the country. The survey included environmental science, engineering, policy, and other programs having the name “environment” or “environmental” in their title. The following figure (figure nine) shows that a factor analysis of this program survey defined interdisciplinary environmental programs in the United States around the categories of adaptive management, systems science, and policy and governance. The intersection of each of these factors is called “Problem Solving for Sustainability”. Our program defines itself as in the heart, or the intersection, of these factors and we believe the survey confirms the national validity of the curriculum strategy as well as its content. In these regards, the program utilizes its own small faculty, the resources of the campus,
and close working relationships with the government and community to mount a program that meets national standards. Our faculty serve on the Sustainability Committee and Recycling Committee on campus, adding to the network provided students campus-wide. They also serve on graduate committees for other departments, and work collaboratively across the campus. With such a small department, collaborative and networking initiatives are very important for the breadth and vitality of the program.

National Council for Science and the Environment, 2010
Furthermore, the State of California Personnel Board definition for “Environmental Scientist” closely reflects the content and skills we emphasize in the Environmental Studies Department. That position specification can be found at: http://www.spb.ca.gov/WorkArea/showcontent.aspx?id=5820. There are specific combinations of 49 skills identified that mirror closely the B.S. and B.A. structures of our program.

8. Finally, what additional information would you like to share with the Senate Committee on Instructional Program Priorities regarding the program’s desired learning outcomes and assessment of their accomplishment? [Please limit your response to 200 words or less]

The program has labored since its founding under moderate to severe resource constraints. In order to make the assessment process symmetrical, the University’s contribution to the resource questions must also be examined. Every program review and every annual assessment report has emphasized the need for additional faculty, laboratories and field support to enhance teaching and research activities. The university’s inability to meet these
needs has been a significant factor in the program’s loss of faculty. Since 2005, out of a maximum full-time faculty of 3.5, two junior faculty in good standing have resigned and a third is currently on leave, pending a decision to leave permanently. This dynamic should be read both as a statement about the academic opportunities elsewhere and about junior faculty’s assessment of the university’s support for their work. The growth in majors and student interest in our classes confirm that this is an important dimension of the University’s mission. The long term inclusion of a Master’s program would greatly expand the ability of faculty to effectively publish research and involve students in research learning opportunities.
Appendix Item A

Sample for 4C Learning Outcome One: Pre- and Post-test Given to Students in an ENVS 10 “Introduction to Environmental Science” Class

I. ENVS 10 Pre and Post Test Fall 2010

A pre and post 7 word test was administered at the beginning and end of ENVS 10 in Fall 2010. The learning outcomes tested Learning Outcome #3 – Ability to understand and use basic science concepts.

- **Meets/exceeds standard:** Student understands question and answers thoroughly
- **Approaches standard:** Student has a basic grasp of the concept, but an incomplete understanding
- **Fails standard:** Student does not understand concept, says they don’t know or fails to answer question

1. **Difference between weather and climate.** To meet the standard students would define long term patterns of temperature and precipitation, and weather as shorter term phenomenon. To approach the standard students would understand one or the other term. The data suggest that the majority of the students understood the concept.
   - Pre Test – Meets Standard – 46%; Approaches – 27%; Fails – 27%
   - Post Test – Meets Standard – 85%; Approaches – 4%; Fails – 11%

2. **What is global warming?** To meet the standard students would define global warming as a long term pattern of oceanic and atmospheric temperature increases that correspond to increased levels of carbon dioxide and methane. Data indicates the source is anthropogenic. To approach the standard students would understand patterns of warming, but not the long term nature or potential causes of climate change. The data suggest that the majority of the students understood the concept.
   - Pre Test – Meets Standard – 33%; Approaches – 30%; Fails – 38%
   - Post Test – Meets Standard – 82%; Approaches – 14%; Fails – 4%

3. **What is biodiversity?** To meet the standard students would define biological diversity, or biodiversity, refers to the variety of life on Earth. As defined by the United Nations Convention on Biological Diversity, it includes diversity of ecosystems, species and genes, and the ecological processes that support them. To approach the standard, students understand species richness, but do not include genetic or ecosystem diversity, or the ecosystem processes provided by diversity. The data suggest most students understand the concept. I don’t understand, given the amount of time spent on this topic, why 15% failed to understand the concept.
   - Pre Test – Meets Standard – 41%; Approaches – 28%; Fails – 30%
   - Post Test – Meets Standard – 78%; Approaches – 7%; Fails – 15%

4. **What river runs by campus?**
   This is a question they all should have known before they come to class, it’s pretty basic. To meet the standard, students simply had to say the American River. To approach the standard, they
could say Sacramento River, as the American River is a tributary of the larger drainage. This is something all students should have known coming into the class. I’m shocked 30% didn’t know at the end of class, particularly because we walked out to Guy West Bridge and talked about riverine ecology and water and drinking water management.

- Pre Test – Meets Standard – 63%; Approaches – 0%; Fails – 37%
- Post Test – Meets Standard – 70%; Approaches –0%; Fails – 30%

5. Where does the drinking water come from on campus, and how good of water quality do we have? To meet the standard students would understand our drinking water comes from the American River and is high quality. To approach the standard students would understand the water comes from the American River, but not understand it is high quality water. There was some improvement in the answers but disappointing that 27% of the students still failed the answer.

Pre Test – Meets Standard – 12%; Approaches – 51%; Fails – 37%
Post Test – Meets Standard – 41%; Approaches –42%; Fails – 27%

6. How does the BP oil spill in the Gulf adversely affect marine life? This question was too open ended, so the answers were difficult to assess. To meet the standard, students would be able to describe impacts on the food chain including plankton up to larger mammals, marine turtles, manatees, sea birds such as pelicans, and fisheries. To approach the standard, students would be able to at least describe impact on higher level organisms such as fish, birds and mammals. The majority of students were able to at least approach the standard.

Pre Test – Meets Standard – 51%; Approaches – 32%; Fails – 17%
Post Test – Meets Standard –67%; Approaches –29%; Fails – 4%

7. What animal would make you sad if it went extinct? This was a fun one. In the beginning of the class 22 people said dogs. One person said “I couldn’t care less, I mostly want cows for burgers”, and three other students said cows, pigs and chickens for food. By the end of the class 7 people still said dogs, but there was a lot more sophistication of endangered species. Students had written a biodiversity paper, so the animals mentioned indicated to me a bit more sophistication in their consideration of species.

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Program: Bachelor of Science, Environmental Studies
II. Formative Assessment ENVS 10 – Spring 2011

Delta Jeopardy is an exercise where student teams research different perspectives on the Sacramento-San Joaquin Delta. Department learning outcomes from Delta Jeopardy include #1, ability to speak clearly and persuasively; #3 – Ability to understand and use basic science concepts; #4 – ability to integrate social science and humanities concepts with scientific ideas; #5 – ability to work in groups analyzing environmental problems; and especially #9 – ability to identify, understand and evaluate competing perspectives. GE criteria D2/C, G, and H – to define and understand various perspectives on how to interpret and act upon these issues are also evaluated.

The activity is very popular, and students are very engaged in the activity. From outside observation, one would think that they were able to analyze and synthesize a rather complex environmental and social issue facing our state. To assess their understanding of the information in the game, I administered a formative assessment the class after playing Delta Jeopardy to test their overall comprehension of the material.

Formative Assessment of Delta Jeopardy Activity

1. What are the two or three major rivers running into the Delta? To meet this standard, students must say the Sacramento and San Joaquin Rivers. To approach this standard, the Sacramento River plus American, Cosumnes or Feather Rivers.
   a. Meet the standard – 30%; Approaches the standard - 70% : Failed the standard – 0%

2. Name an important water quality problem in the Delta. To meet the standard, students must say mercury, ammonia or salinity. To approach the standard, students may say some other water quality impairment.
   a. Meets the standard – 51%; Approaches the standard – 29%; Fails standard – 10%

3. Write a short paragraph and tell me what you think of the problems of supplying water to the State of California, and why the Delta is such an environmental and political problem. To meet the standard, students must understand that water moves through the Delta from northern CA to southern CA; that the Delta ecosystem is collapsing; that water quality in the Delta is impaired from salt water intrusion; and that there is a limited water supply available. To approach the standard need to have a concept of the difficulty of moving limited water supply from northern to southern CA and the instability of the Delta infrastructure. Most students failed to meet the standard.
   a. Meets the standard –17 %; Approaches the standard – 43%; Fails standard – 40%

The benefit of administering this formative assessment is that the instructor then modified the exercise to better achieve the student learning goals.
Appendix Item B:

Sample for 4C Learning Outcome Two: Pre- and Post- Test Given in ENVS 112

ENVS 112 Writing Diagnostic Pre and Post Test  (Assessment Given 2010-2011)

This assessment on writing and research skills was administered at the beginning and ending of the class. Five students were not there for the final assessment, so the student sample is smaller (pre test had a sample size of 29, post test a sample size of 24).

1. Suppose a professor assigned you a 5,000 word research paper on a topic of your choosing. What steps in what order – would you go through to complete this assignment? How much time would you commit to each step? Meets Expectation 1. Determine thesis or topic of paper 2. Do primary and secondary literature search 3. Write paper 4. Edit and review Approaches expectation – does not include literature review OR editing and rewriting portion. Fails expectation – does not include more than one of above. Student needs to understand primary literature research search and editing/ review to meet expectation

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<tr>
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<th>Pre (n=29)</th>
<th>Post (n=24)</th>
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<tbody>
<tr>
<td>a. Meets Expectation</td>
<td>9 31%</td>
<td>12 50%</td>
</tr>
<tr>
<td>b. Approaches Expectation</td>
<td>18 62%</td>
<td>15 42%</td>
</tr>
<tr>
<td>c. Fails to meet expectation</td>
<td>2 2%</td>
<td>2 2%</td>
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2. What does it mean to plagiarize? Can you give an example or two of how students unintentionally commit plagiarism? What do you personally do to avoid it? To meet expectation, student needs to understand the subtlety of paraphrasing, use of quotations, limitations of extent of quotations in a paper, and citation of sources.

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<th>Pre (n=29)</th>
<th>Post (n=24)</th>
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<tbody>
<tr>
<td>a. Meets Expectation</td>
<td>22 76%</td>
<td>17 71%</td>
</tr>
<tr>
<td>b. Approaches Expectation</td>
<td>4 14%</td>
<td>6 25%</td>
</tr>
<tr>
<td>c. Fails to meet expectation</td>
<td>3 10%</td>
<td>1 1%</td>
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</table>

3. What is the difference between a primary source and a secondary? Suppose you wanted to know something about the rate of deforestation in Costa Rica. Where would you look for a primary source, and how would you know it was primary? What kinds of things might qualify as secondary sources, and where would you be likely to find them? To meet expectation, students need to understand the primary literature is original research and peer reviewed. To approach expectation the student understands that primary literature is original research but does not understand peer review process. To fail to meet expectation, the student does not understand the difference between primary and secondary literature.

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<tr>
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<tbody>
<tr>
<td>a. Meets Expectation</td>
<td>2 7%</td>
<td>10 42%</td>
</tr>
<tr>
<td>b. Approaches Expectation</td>
<td>4 14%</td>
<td>8 33%</td>
</tr>
</tbody>
</table>
4. Self assessment: Rate your writing skills based on past experience:

A. Resource/ Source material: _______great _______good _______fair _______poor
B. Organization: _______great _______good _______fair _______poor
C. Clarity: _______great _______good _______fair _______poor
D. Style/polish/readability: _______great _______good _______fair _______poor
E. Spelling/grammar: _______great _______good _______fair _______poor

Formative Assessment  At the end of the first paper introducing the concepts of research, use of primary and secondary literature, citations and using scientific citations, I gave the class a formative assessment with the following questions.

1. What surprised you?
2. What confused you?
3. What do you need further explanation of to be successful in writing a scientific paper?

a. Model United Nations Exercise  Formative Assessment This exercise provides a model to evaluate student’s ability to critically evaluate complex international environmental issues, specifically an international agreement on climate change referred to as the Kyoto Protocol. This exercise specifically addresses the following student learning objectives:

- To better understand international environmental problems as a set of social issues
- To better understand how these international environmental problems pose domestic issues that confront and divide America today. (GE criteria D2/A)
- Because we are involved in a global economy, a global culture, and a global political system, thousands of acts we all perform have environmental ramifications around the world. Our third objective is to better understand the consequences of our acts for the global environment. (GE criteria D2/B)
- To better understand how corporations, governments, cultural groups, non-governmental organizations, and international organizations inter-relate with respect to international environmental problems. This includes a consideration of the diversity of human society as an aspect of understanding and dealing with international environmental problems. (GE criteria D2/B)
- To define and understand various perspectives on how to interpret and act upon these issues. (GE criteria D2/C,G,H)
- To sharpen analytical skills (GE criteria D2/F)
- To improve reading and writing skills (GE criteria D2/I)
- To improve skills of speaking and persuasion.
I did a ten word formative assessment test before and after the Model United Nations exercise. These words were integral to understanding the basic scientific and polity elements of the Kyoto Protocol exercise. 1 = Meets expectation ; 2 = Approaches expectation; 3 = Fails expectation

**10 Word Test**

1. Developing Country –
2. Annex 1 Country
3. Stance.
4. Greenhouse Gas
5. Carbon Sink
6. Kyoto Protocol
8. Ozone
9. Emissions Trading
10. Clean Development

<table>
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<th>Post(%)</th>
<th>Pre(%)</th>
<th>Post(%)</th>
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<tr>
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<td>Meets</td>
<td>Approach</td>
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<td>Fails</td>
<td>Fails</td>
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<td>7</td>
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<td>60</td>
<td>45</td>
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</table>
Model UN Pre and Post Assessment

Percent Correct Response


10 Word Test

- Pre(%) Meets
- Post Meets
- Pre Approaches
- Post Approaches
- Pre Fails
- Post Fails

Program: Bachelor of Science, Environmental Studies
### Appendix Item C:

#### Sample for 4C Learning Outcome Three: Pre- and Post- Test Given in ENVS 121

**I. ENVS 121 Quantitative Assessment Spring 2011, Dr. Michelle Stevens**

ENVS 121, a field methods course, teaches students the fundamentals of field research and experimental design. In this course, each student conducts their own research project on restoration of native plants. This test satisfied department goals of quantitative assessment and developing critical scientific thinking skills. Each student was required to go through the scientific process of experimental design. Their final research paper required them to do the following: a) clearly state hypothesis; b) describe experimental methods; c) analyze experimental results statistically; d) provide a discussion/ conclusion of what their experiment meant. There were 15 students in the class.

**F. Clearly state hypothesis and null hypothesis.** This experiment is designed to observe the effect that the presence of mycorrhizae has on the growth of the host plant species. The addition of the mycorrhizal fungi should result in plants which exhibit more plant growth in both above and belowground biomass than plants that did not have the mycorrhizal amendment. The null hypothesis is that there is not difference between mycorrhizal and non mycorrhizal treatments.

- **1. Meets Expectation** 9 56%
- **2. Approaches Expectation. State hypothesis but not null hypothesis** 5 31%
- **3. Fails Expectation** 11 Failed to state hypothesis 2 13%

**G. Methods**

1. Meets expectation of successfully describing methods, including experimental setup, confounding factors in the greenhouse, and measurement of variables 14 88%
2. Approaches expectation 2 12%
3. Fails expectation 0

**H. Results**

a. **Make a time plot curve of the variables you measures**
   - 1. Meets Expectation 15 94%
   - 2. Approaches Expectation
   - 3. Fails Expectation 1 6%

b. **Perform a T test or anova comparing your variables at the end of experiment.**
   - 1. Meets Expectation 10 63%
   - 2. Approaches Expectation
   - 3. Fails Expectation 5 31%

**I. Conclusion – what are the results of your data? Is the mycorrhizal treatment more effective at stimulating plant growth than the non-mycorrhizal treatment?**

- a. Meets expectation 12 75%
- b. Approaches Expectation 1 6%
- c. Fails Expectation 3 19%
Assessment was done by rating student responses to exemplary final exam questions, as well as aspects of the final research project, according to the rubric: 1 = meeting/exceeding outcome standard, 2 = approaching outcome standard, 3 = failing outcome standard.

Fifteen students took the class (including one enrolled in independent study who did not do the same final research project, but did take the final exam). Students had a choice of questions on the final exam, and so not all students answered all the assessment questions.

Learning outcome #2: Ability to reason quantitatively

1. Water quality

Construct a calibration curve for the following data and plot it with a trendline. Is the $R^2$ high enough to assume that your instrument is still functioning linearly? What is the equation of the best fit line? Use the best fit equation to tell the "true" value of the unknown whose reading on the instrument is 79.8.

<table>
<thead>
<tr>
<th>ng/mL</th>
<th>0.1</th>
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<tbody>
<tr>
<td>10 ng/mL</td>
<td>10.3</td>
</tr>
<tr>
<td>50 ng/mL</td>
<td>51.2</td>
</tr>
<tr>
<td>100 ng/mL</td>
<td>104</td>
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</table>

1 = 2/11 = 18%  
2 = 5/11 = 45%  
3 = 4/11 = 36%

2. EH&S

The OSHA permissible exposure limit for carbon monoxide is 50 ppm for an 8-hour time weighted average (for industrial workers) and 200 ppm as a ceiling. If a worker is exposed to 50 ppm for 2 hours, 0 ppm for 1 hour, 100 ppm for 15 minutes, 90 ppm for 45 minutes, and 40 ppm for 4 hours, what is the 8-hour TWA for the worker, and has she exceeded her PEL or the ceiling?

1 = 8/13 = 62%  
2 = 2/13 = 15%  
3 = 3/13 = 23%

3. Analysis of final project data

1 = 7/14 = 50%  
2 = 2/14 = 14%  
3 = 5/14 = 36%
Learning outcome #3: Ability to carry out research tasks appropriate to analyzing environmental problems

1. Biodiversity Indices

Find a journal article from the last ten years that uses Simpson's, Shannon's, or both biodiversity indices. Summarize the article in a paragraph or two. Why were they measuring biodiversity? What argument, if any, did they give for using Simpson's or Shannon's index? What did they find?

1 = 10/14 = 72%  
2 = 2/14 = 14%  
3 = 2/14 = 14%

2. Appropriate and adequate references in final project

1 = 7/14 = 50%  
2 = 2/14 = 14%  
3 = 5/14 = 36%

3. Appropriate and adequate methods in final project

1 = 8/14 = 57%  
2 = 5/14 = 36%  
3 = 1/14 = 7%

Learning outcome #4: Ability to assess environmental problems and solutions by applying scientific concepts

1. Vegetation surveys

What are the tradeoffs (pros and cons) of a line transect vs. an area-based method? Why would someone choose to use a point-quarter method rather than delineate particular plots or quadrats?

1 = 6/11 = 54%  
2 = 4/11 = 36%  
3 = 1/11 = 9%

2. Mark and recapture

What are the assumptions and possible biases of the mark and recapture method—i.e., the premises that, if they are not true, would lead to an inaccurate estimation of the population size? What are some ways that these assumptions might be invalidated in the real world?

1 = 8/14 = 57%  
2 = 4/14 = 28%  
3 = 2/14 = 14%
Summary:

“Reason quantitatively”: 45% met or exceeded standard, 24% approached standard, 31% failed standard

“Use research skills”: 60% met or exceeded standard, 21% approached standard, 19% failed standard

“Apply scientific concepts”: 56% met or exceeded standard, 32% approached standard, 12% failed standard
Assessment was done by rating student responses to exemplary final exam questions according to the rubric: 1 = meeting/exceeding outcome standard, 2= approaching outcome standard, 3 = failing outcome standard.

For short answer and essay questions, students were rated according to the accuracy and thoroughness of their written responses. Multiple choice questions have more than one possible answer, so a rating of 1 was given for completely or mostly correct answers, 2 for partly correct answers, and 3 if the answer given was the worst choice.

One hundred seventeen students took the final exam, but students had a choice of what questions to answer and so not every student answered every assessment question.

**Outcome: Demonstrate a knowledge and understanding of natural phenomena.**

1. Define the term “biological control” and give its relevance to an environmental issue discussed in class.
   
   $1 = \frac{80}{89} = 90\%$ \quad $2 = \frac{0}{89} = 0\%$ \quad $3 = \frac{9}{89} = 10\%$

2. What four components are necessary for the production of ozone (photochemical smog)? Which one of these do we focus on in trying to control ozone pollution, and why? What produces this chemical compound and how do we control it?
   
   $1 = \frac{70}{78} = 90\%$ \quad $2 = \frac{8}{78} = 10\%$ \quad $3 = \frac{0}{78} = 0\%$

3. What is DNA mutation? How common is this phenomenon, what kinds of things cause it, and what are the possible consequences?
   
   $1 = \frac{77}{81} = 95\%$ \quad $2 = \frac{4}{81} = 5\%$ \quad $3 = \frac{0}{81} = 0\%$

**SUMMARY:** 92% met or exceeded standard in “understanding natural phenomena.”
Outcome: Apply the methodologies of science when approaching a scientific problem.

1. The phenomenon shown in this graph occurred because:
   a. the DDT also killed off the natural predators of the pests, which reproduce more slowly than the pests themselves
   b. DDT effectively controlled the pest, while untreated plants performed so poorly that they suffered economic injury
   c. DDT bioaccumulated in birds and caused their eggshells to be weak
   d. repeated application of the pesticide led to evolution of resistance in the red scale population

   (Answering B resulted in a 3; answering C along with at least one of the correct answers resulted in a 2; answering A&D or just one of the two resulted in a 1.)

   1 = 54/64 = 84%
   2 = 9/64 = 14%
   3 = 1/64 = 2%
2. The phenomenon in the graph shown above:

a. is an example of a toxicological approach to experimentation

b. shows that when females were given a chemical to control their testosterone, it had the same effect as treating males with atrazine, but this chemical did not control testosterone in males

c. shows a feminizing effect of atrazine in males

d. is only relevant if the study were conducted in humans, because the human endocrine systems is unlike that of any other animal

(Answering B resulted in a 3; answering D resulted in a 2; answering only A or C or both resulted in a 1.)

1 = 86/92 = 93%  2 = 0/92 = 0%  3 = 6/92 = 7%

SUMMARY: 90% met or exceeded standard in "applying methodology of science"

Outcome: Explain the limitations of scientific inquiry.

1. Multiple choice: An epidemiological approach to understanding the connection between a disease and the environment could include:

a) overlaying maps of malaria incidence with maps of rivers, wetlands, marshes, and other places mosquitoes breed
b) comparing the rate of "blue-baby syndrome" in rural areas served by wells and in urban areas served by city water supplies

c) exposing rats to different doses of bisphenol A and then comparing their rates of breast and prostate cancer

d) mutating the genes of bacteria with UV radiation in order to make them more resistant to antibiotics

Answering ABC, ABD, or ABCD resulted in a 3; just CD resulted in a 2; just A or B or both resulted in a 1.

1 = 62/75 = 83%  
2 = 1/75 = 1%  
3 = 12/75 = 16%

2. T/F: The EPA requires thorough testing of new synthetic chemicals before they can be released, but only in single-chemical experiments, because it is impractical to do experiments that test exposure to several chemicals at once. *If true, write "true"; if false, write "false" and explain WHY it is false.*

1 = 34/40 = 85%  
2 = 6/40 = 15%  
3 = 0/40 = 0%

3. Short answer: The EPA and environmental organizations have been arguing over whether the EPA has authority under the Clean Air Act to regulate greenhouse gases like carbon dioxide. Give both sides of the argument and tell who is arguing what.

1 = 94/101 = 93%  
2 = 6/101 = 6%  
3 = 1/101 = 1%

SUMMARY: 88% met or exceeded the standard in "explaining limits of scientific inquiry"

OVERALL SUMMARY: Out of 620 total responses, 557 (90%) were rated as 1, meeting or exceeding standard; 34 (5%) were rated as 2, approaching standard; and 29 (5%) were rated as 3, or failing standard.
Appendix D

Sample for 4C learning Outcome 4:

Departmental Assessment Given to Seniors Enrolled in Capstone Thesis Class

Reflective Statement

You should write this statement as it feels most appropriate for you. The following are the types of questions you should consider:

• What are your overall career or professional objectives?
• How has your academic program supported the achievement of your overall goals?
• What specific courses are critical to your overall educational path?
• Is there employment, travel, or other experiences that supported your educational activities?
• What major constraints hindered your educational activities?
• How have you matured during your college years?
• What advice would you give to new students?
• How would you undertake your college experience differently, if you had the opportunity to do it again?

Department of Environmental Studies Assessment Questionnaire

The Environmental Studies Department has identified specific educational outcomes for its graduates.

Instructions: The following questionnaire provides a standardized framework for asking two kinds of questions: first, about your perceptions of your performance, and second, about the goals of the department. Please answer the following questions using the scales provided so we can get quantitative information for comparison across students and over time. The results will be used to guide departmental curriculum development and teaching strategies. Part III of the questionnaire enables you to elaborate on any of your answers, or to provide additional comments. We will be happy to receive your qualitative statements—short or long, just as in course evaluation forms.

MARK YOUR ANSWERS ON THE SCANTRON (50 questions)

Part I. Please rate your perceptions about your achievements in the Department of Environmental Studies.

How would you assess yourself in terms of the following abilities?
1. ability to write and speak clearly and persuasively
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
2. ability to reason quantitatively
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
3. ability to understand and use basic science concepts
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
4. ability to integrate social science and humanities concepts with scientific ideas and information in analyzing environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
5. ability to work in groups in analyzing environmental problems and reaching agreement on solutions
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
6. ability to use economic tools to assess actions affecting the environment, including cost/benefit analysis
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
7. ability to use legal concepts in understanding environmental problems and legal approaches to them
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
8. ability to describe and analyze environmental problems taking into account differing problems among nations and international interactions among nations regarding environmental issues
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

9. ability to identify, understand, and evaluate competing perspectives and interests in environmental issues
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

10. ability to carry out research tasks appropriate to analyzing environmental problems
    a) excellent
    b) very good
    c) good
    d) fair
    e) poor

11. ability to use the concepts and methods of at least one academic discipline at a higher level of skill than may be implied by the above questions
    a) excellent
    b) very good
    c) good
    d) fair
    e) poor

12. ability to identify and discuss the origins of a significant sub-set of the specific major environmental problems facing society at present
    a) excellent
    b) very good
    c) good
    d) fair
    e) poor

13. ability to apply the basic principles of ecology and other relevant sciences to the analysis of environmental problems
    a) excellent
    b) very good
    c) good
    d) fair
    e) poor

14. ability to think politically in terms of strategies and tactics in dealing with environmental problems
    a) excellent
b) very good
c) good
d) fair
e) poor
15. ability to intelligently anticipate and discuss sources of new environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
16. ability to work with people of many personal backgrounds and professional qualifications in analyzing and dealing with environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
17. ability to continue to learn new information, skills, and concepts as needed in dealing with environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
18. ability to identify and deal intelligently with ethical choices as a professional, as a parent, as a citizen, and as a person regarding environmental issues
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
19. ability to define simple research tasks as required for professional work in the environmental field
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
20. ability to find placement in graduate and professional schools, if desired
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
Part II. From the departmental point of view, how would you assess the effort placed by the department on helping students to develop the following abilities?

21. ability to write and speak clearly and persuasively
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

22. ability to reason quantitatively
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

23. ability to understand and use basic science concepts
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

24. ability to integrate social science and humanities concepts with scientific ideas and information in analyzing environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

25. ability to work in groups in analyzing environmental problems and reaching agreement on solutions
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

26. ability to use economic tools to assess actions affecting the environment, including cost/benefit analysis
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

27. ability to use legal concepts in understanding environmental problems and legal approaches to them
   a) excellent
   b) very good
c) good
d) fair
e) poor

28. ability to describe and analyze environmental problems taking into account differing problems among nations and international interactions among nations regarding environmental issues
   a) excellent
   b) very good
c) good
d) fair
e) poor

29. ability to identify, understand, and evaluate competing perspectives and interests in environmental issues
   a) excellent
   b) very good
c) good
d) fair
e) poor

30. ability to carry out research tasks appropriate to analyzing environmental problems
   a) excellent
   b) very good
c) good
d) fair
e) poor

31. ability to use the concepts and methods of at least one academic discipline at a higher level of skill than may be implied by the above questions
   a) excellent
   b) very good
c) good
d) fair
e) poor

32. ability to identify and discuss the origins of a significant sub-set of the specific major environmental problems facing society at present
   a) excellent
   b) very good
c) good
d) fair
e) poor

33. ability to apply the basic principles of ecology and other relevant sciences to the analysis of environmental problems
   a) excellent
   b) very good
c) good
d) fair
e) poor
34. ability to think politically in terms of strategies and tactics in dealing with environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

35. ability to intelligently anticipate and discuss sources of new environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

36. ability to work with people of many personal backgrounds and professional qualifications in analyzing and dealing with environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

37. ability to continue to learn new information, skills, and concepts as needed in dealing with environmental problems
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

38. ability to identify and deal intelligently with ethical choices as a professional, as a parent, as a citizen, and as a person regarding environmental issues
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

39. ability to define simple research tasks as required for professional work in the environmental field
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

40. ability to find placement in graduate and professional schools, if desired
   a) excellent
   b) very good
   c) good
Part III. General Questions: These will help the department in future planning.

Rate the program’s success at providing:

41. …an interdisciplinary approach to the study of the environment
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
42. …accessible faculty
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
43. …opportunities to learn to think critically
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor
44. …a logical sequence of courses
   a) excellent
   b) very good
   c) good
   d) fair
   e) poor

The Dugal Scholarship is awarded each spring to a junior ENVS major who will graduate the following year. The requirements are to have a 3.0 GPA overall and to write a short essay.

45. If you DID NOT apply for the Dugal Scholarship, which of the following reasons best describes why you didn’t?
   a) I didn’t meet the eligibility requirements
   b) I didn’t know the department offered a scholarship for which I was eligible
   c) I intended to, but I missed the deadline
   d) I didn’t think I would win, so I didn’t bother applying
   e) None of these reasons is relevant
We are interested in how students get information about departmental requirements and deadlines, as well as department-sponsored events and faculty news. Please rate the following ways that the department gives out information in terms of their importance to you:

46. E-mails from ESS-Listserv that go out to all ENVS majors
   a) very important
   b) somewhat important
   c) not very important
   d) I didn’t know it existed

47. Departmental handbook given out when declaring the major
   a) very important
   b) somewhat important
   c) not very important
   d) I didn’t know it existed

48. Departmental newsletter printed 2x annually and distributed by e-mail & website
   a) very important
   b) somewhat important
   c) not very important
   d) I didn’t know it existed

49. Departmental website
   a) very important
   b) somewhat important
   c) not very important
   d) I didn’t know it existed

50. Conversations with individual faculty or administrative assistant
   a) very important
   b) somewhat important
   c)
   d) not very important
   e) who are these people?