DEPARTMENT OF ENVIRONMENTAL STUDIES

Annual Assessment for

Academic Year Fall 2010 – Spring 2011

Submitted June 29, 2011

to Dr. Charles Gossett, Dean

College of Social Sciences and Interdisciplinary Studies
DEPARTMENTAL ASSESSMENT

Our departmental curriculum and assessment have been affected by two main events:

1. Final approval at the Chancellor’s Office of the revised curriculum of the department, to include free-standing BS and BA degrees
2. The decision of Professor Virginia Matzek to go on leave for the 2011-2012 academic year in anticipation of accepting a competing permanent job offer.

In this context, we have continued to pursue the primary assessment goal, identified last year, of determining whether and how our students are successfully becoming rigorous scientific decision makers who are critical, inferential thinkers. Both departmental discussions and individual faculty assessment activities focused on this objective. The Chair had substantive conversations with each full-time and each part-time faculty member to emphasize the importance of learning goals, assessment, and quality interactions with students.

In spring 2011, Professor Michelle Stevens attended the Teaching and Learning Community and had the opportunity to learn more about assessment principles, strategies, importance, and comparisons with other programs on campus. As a result of this experience, we have included specific discussions of assessment of many of our departmental courses in the appendix (Appendices B, C, D, and E). We will also draw from this experience to work in the next academic year to make our assessment efforts more standardized, more consistent, and more coherent.

Our expectation for next year is to continue this process, though we will be hampered to some extent because there will be only two full-time faculty in the department.

A final note: at the end of spring 2010 semester when we provided our departmental assessment to Dean Charles Gossett, the number of majors for our Bachelor of Arts degree was 122 students. At the end of this academic year, spring 2011, we have 185 majors combined in the newly free-standing BA and in the newly approved BS (Bachelor of Science) degree. This expansion is with three full-time faculty members, one of whom, Professor Matzek, will be taking a Leave (Without Pay) next academic year with little expectation of returning. Therefore, we find it necessary to ask another kind of assessment question: How is an academic program expected to provide a quality experience for students with such limited faculty and space resources? Granted, there is a hiring process under way for a position to be shared between the Environmental Studies Department and Public Policy and Administration (PPA), but that position is to be “housed” in the other department, so there will be issues, if not disappointment, about that faculty person’s availability for advising and departmental community building, as well as teaching relevant to our academic program.

STUDENT EXIT ASSESSMENT

A key departmental assessment tool is a questionnaire we give to students enrolled in ENVS 190, the senior thesis capstone course. The fifty-question survey is included as Appendix A. The assessment data cannot be provided because although the assessment was delivered IRT’s Computing Center on May 25, the materials still have not been returned (as of over one month later).
All sections of our Critical Thinking class, ENVS 11, were taught by part-time lecturer Greg Popejoy. He reports:

“This semester I did a pre- and post-test in both classes. They were conducted as pop quizzes, with no preparation and little warning, so no studying or notes were involved. The quiz consisted of 10 questions, and the pre-test resulted in an average grade of 32%. The post-test given at the end of the semester yielded an average grade of 51%, a 19% improvement. I was hoping for more, especially since each point was covered in class, and sometimes even emphasized. Either the students are not retaining as much information as I expect, or I need to revisit my teaching techniques, or maybe a little bit of both. I will be cognizant of this as we enter the Fall term.”

Part-time lecturer Greg Popejoy provided the results of an informal evaluation given at the end of the post-test. The single responses are just that, single. Multiples of the same responses are indicated by a number enclosed in parentheses. These results are attached as Appendix B.

In the fall semester, Professor Dudley Burton taught two sections of ENVS 10 Introduction to Environmental Studies, the Freshman Seminar section, and a regular enrollment section, and taught ENVS/GOVT 171. In the spring, he taught ENVS 111 Environmental Ethics, and ENVS 190 Senior Thesis. Quantitative assessment materials for ENVS 10 and 11 are included here as Appendix C1, C2, and C3. The assessment activities for ENVS/GOVT 171 and ENVS 190 are much more specific and individual student-oriented, so it is not possible to construct similar quantitative data for those classes.

The numbers for ENVS 10 and ENVS 111 reflect grades on a five point scale of weekly or topical assignments. These assignments focused on a combination of writing proficiency and substantive understanding. In the case of ENVS 10, there was one assignment (letter C) which covered basic understanding of resources, population, and environmental impact, and assignment L which was a re-do of the letter C topic. This exercise provided an opportunity to see more precisely what students had incorporated in their understanding and reporting of the content of the class. It is apparent that the numbers are somewhat better in the letter L assignment, but more importantly, the standards for evaluating writing and content had changed substantially during the semester. Professor Burton reports, “I was pleased with the different levels of sophistication and knowledge that were reflected in L relative to C, and these differences demonstrate that students were taking the issues of the class more seriously and learning about the details of the issues addressed in the class.”

ENVS 111 is somewhat different from ENVS 10 in that the material is not cumulative, but each of the specific topics represents a substantive issue having fundamental environmental ethical implications. In this class, students wrote weekly responses to the reading and class discussions, in addition to a major topical presentation and term paper. Exams and a final exam were also given. Students complained somewhat about the amount of writing but the fact of weekly assignments forced students to take the issues seriously and cumulatively enable them to develop a comprehensive view of the field and the explanation of different responses to the issues. These matters were assessed on mid-term and final exams and I was comfortable that we had covered the appropriate critical material and that students had, generally speaking, grasped what they should have grasped. I can identify particular general questions (exam and final) if needed.

Professor Burton’s other two classes, ENVS/GOVT 171 and ENVS 190, are advanced courses in our program where the expectations are for faculty to engage students at a more advanced and knowledgeable level. In the Environmental Policy class, students were expected to learn about the form and content of key national environmental legislation, as well as to address a substantive environmental policy of their own choosing. Professor Burton reports, “I know of no real way to
assess this other than the evaluation of students’ participation, papers, and examinations as demonstrated in their final grades.” In a sense, assessment is done in every interaction with each student.

Similarly, the expectation for the senior thesis is for students to, in fact, write a thesis. The existence of the thesis provided evidence of students capacity to choose a topic, formulate an argument, do research, and write a readable treatise. I will say that several students had difficulty doing this and three students failed the class as a result. However, they will take the class again when they are either better prepared or have more time available to carry out this very large-scale project.
APPENDIX A: Departmental Assessment Given to Seniors Enrolled in Capstone Thesis Class

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
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
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
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
   d) fair
   e) poor

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
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) not very important
   d) who are these people?
RESULTS OF INFORMAL EVALUATION GIVEN AT THE END OF SEMESTER

“Describe your most favorite/least favorite aspects of the class”

<table>
<thead>
<tr>
<th>MOST FAVORITE</th>
<th>LEAST FAVORITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Videos/movies</td>
<td>Pop Quizzes</td>
</tr>
<tr>
<td>Everything</td>
<td>Critical Grading (Punctuation)</td>
</tr>
<tr>
<td>Learning About The Environment</td>
<td>(I don’t grade punctuation)</td>
</tr>
<tr>
<td>“Awesome rat tail”</td>
<td>Nothing</td>
</tr>
<tr>
<td>Very Informative</td>
<td>Tests</td>
</tr>
<tr>
<td>Field Trips</td>
<td>No field trip to greenhouses</td>
</tr>
<tr>
<td>“Great Class”</td>
<td>Depressing movies</td>
</tr>
<tr>
<td>Variety of Assignments</td>
<td>Not attending enough</td>
</tr>
<tr>
<td>“Fun”</td>
<td>Hard to figure what’s important</td>
</tr>
<tr>
<td>“Interesting”</td>
<td>Recycle Center Field Trip</td>
</tr>
<tr>
<td>Community Activity</td>
<td>Assignments</td>
</tr>
<tr>
<td>Open Discussions</td>
<td>Not Enough Detail</td>
</tr>
<tr>
<td>“Favorite Class”</td>
<td>Debates</td>
</tr>
<tr>
<td>Teaching Method/Personality</td>
<td>Research/Research Paper</td>
</tr>
<tr>
<td>“Popejoy!”</td>
<td>Extra Projects (?)</td>
</tr>
<tr>
<td>Treated as an Adult</td>
<td>Public Speaking</td>
</tr>
<tr>
<td>“An educated class”</td>
<td>Flaky DVD player (once)</td>
</tr>
<tr>
<td>“Learned a lot”</td>
<td>Couldn’t keep up with assignments</td>
</tr>
<tr>
<td>Lectures</td>
<td>I (student) did everything last minute</td>
</tr>
<tr>
<td>Instructor’s knowledge/enthusiasm</td>
<td>Too many videos</td>
</tr>
<tr>
<td>Instructor’s credibility</td>
<td></td>
</tr>
<tr>
<td>“Favorite way to learn”</td>
<td></td>
</tr>
<tr>
<td>“Learned life lessons every day”</td>
<td></td>
</tr>
<tr>
<td>“Liked coming to class every day”</td>
<td></td>
</tr>
<tr>
<td>Casino Project</td>
<td></td>
</tr>
<tr>
<td>Learning how to improve the environment</td>
<td></td>
</tr>
<tr>
<td>Learning the history of the environmental movement</td>
<td></td>
</tr>
<tr>
<td>No book</td>
<td></td>
</tr>
<tr>
<td>Projects</td>
<td></td>
</tr>
<tr>
<td>Debates</td>
<td>(3)</td>
</tr>
<tr>
<td>Fun and Creative</td>
<td></td>
</tr>
<tr>
<td>Instructor’s political opinions</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C1: ENVS 10 Assessment – Discussion of assignments: the following are the topics that students were asked to write short weekly assignments in response to:

A. Your ecological footprint
B. Ecological description of a place you know well
C. Your current understanding of relationships among resources, populations, and environment
D. Extra credit using the Gulf Oil spill or an article about Chinese population policy
E. Where your water at home comes from and where it goes
F. Experience at the Farmer’s Market
G. Your personal pattern of energy consumption
H. Description/discussion of a renewable energy technology
I. Personal choices about hazardous behavior
J. Air and water pollution experiences
K. Your willingness to change your behavior
L. Restatement of the topic in C, concepts about resources, populations, environment.

It is apparent that the papers in L are significantly better than those papers in C. This is reflective partly of increasing writing skills and better response to writing expectations, but since these review papers were evaluated on content as well as writing, they demonstrate a more sophisticated understanding of key concepts of the class.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
<td>3.5</td>
<td>8</td>
<td>4.5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4.5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4</td>
<td>3.5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td></td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>4.5</td>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4.5</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>4.5</td>
<td>4</td>
<td>2</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>4.5</td>
<td>4</td>
<td>5</td>
<td>3.5</td>
<td>3</td>
<td>5</td>
<td>4.5</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>4</td>
<td></td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td></td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>4.5</td>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2.5</td>
<td>3</td>
<td>4</td>
<td>2.5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.5</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.5</td>
<td>3</td>
<td>7.5</td>
<td>3</td>
<td>3</td>
<td>2.5</td>
<td>4</td>
<td>3.5</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>4.5</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>4.5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.5</td>
<td>3.5</td>
<td>4</td>
<td>4</td>
<td>2.5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>4.5</td>
<td></td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>4</td>
<td>14</td>
<td>2</td>
<td>3.5</td>
<td>5</td>
<td>4.5</td>
<td>2.5</td>
<td>3.5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>4</td>
<td>15</td>
<td>4</td>
<td>5</td>
<td>3.5</td>
<td>3.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>3.5</td>
<td>9.5</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2.5</td>
<td></td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>3.5</td>
<td>3</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td></td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4.5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2.5</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C2: ENVS 10 Freshmen Seminar Assessment – Discussion of assignments: the following are the topics that students were asked to write short weekly assignments in response to:

A. Your ecological footprint  
B. Ecological description of a place you know well  
C. Your current understanding of relationships among resources, populations, and environment  
D. Extra credit using the Gulf Oil spill or an article about Chinese population policy  
E. Where your water at home comes from and where it goes  
F. Experience at the Farmer’s Market  
G. Your personal pattern of energy consumption  
H. Description/discussion of a renewable energy technology  
I. Personal choices about hazardous behavior  
J. Air and water pollution experiences  
K. Your willingness to change your behavior  
L. Restatement of the topic in C, concepts about resources, populations, environment.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>15</td>
<td>4</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>3.5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>14</td>
<td>5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>4.5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4.5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>14</td>
<td>5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>4.5</td>
<td>4</td>
<td>5</td>
<td>4.5</td>
<td>4.5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3.5</td>
<td>3</td>
<td>4</td>
<td>9.5</td>
<td>4</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>7.5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>13</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>7.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3.5</td>
<td>2.5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>7.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>3.5</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>4.5</td>
<td>4</td>
<td>14</td>
<td>2</td>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>13</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4</td>
<td>9</td>
<td>4</td>
<td>3.5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>3.5</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4.5</td>
<td>3.5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>4</td>
<td>4.5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

15
APPENDIX C3: ENVS 111 Environmental Ethics -- In the following chart, the primary substantive topics are as follows:

- A. Sustainability as an ethical issue
- B. Pricing of environmental resources and amenities
- C. Environmental racism
- D. Trading of environmental pollutants
- E. Global warming as an ethical issue
- F. Nuclear power as an ethical issue
- G. Genetic engineering of foods
- H. DDT in historical ethical perspective
- I. Environmental hormones—preferences vs. impacts
- J. Ethical dimensions of animal rights
- K. Organic food issues
- L. Immigration as an ethical dilemma

The numbered columns are the discussion and student commentary on the relevant substantive topic. The quality of students' discussions, class presentations, writing for weekly assignments, and term papers are expected to improve throughout the semester. Arguments are expected to become more focused and clearer, and people doing presentations at the end of the semester are held at a higher standard than people doing presentations earlier in the semester. The quantitative assessment of these categories of performance are captured within the numbers.

<table>
<thead>
<tr>
<th>A</th>
<th>#1</th>
<th>#2</th>
<th>C</th>
<th>#3</th>
<th>D</th>
<th>#4</th>
<th>E</th>
<th>#5</th>
<th>F</th>
<th>#6</th>
<th>G</th>
<th>#7</th>
<th>H</th>
<th>#8</th>
<th>I</th>
<th>#9</th>
<th>J</th>
<th>#10</th>
<th>K</th>
<th>#11</th>
<th>L</th>
<th>End</th>
<th>S</th>
<th>#12</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>4.5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>4.5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>5</td>
<td>4.5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4.5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3.5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3.5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3.5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3.5</td>
<td>5</td>
<td>3.5</td>
<td>3</td>
<td>3.5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3.5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16
| 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3.5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 |
| 4 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 5 | 4 |
| 5 | 3.5 | 4 | 4 | 3 | 5 | | 5 | 3 | | | | | | | | | | | | |
| 5 | 5 | 5 | 3 | 5 | 5 | 5 | 3 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 4 |
| 5 | 5 | 5 | 5 | 4 | 5 | 3 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 |
| 4.5 | 2 | 5 | 3 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 4.5 | 5 | 4 | 3 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4|
| 5 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 4 | 4 | 5 | 5 | 5 | 4.5 | 5 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 4 | 4 | 3 | 5 | 5 |
| 4 | 5 | 4 | 5 | 4 | 5 | 4 | 4.5 | 4 | 4 | 5 | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 |
| 4.5 | 3 | 3.5 | 5 | 5 | 4.5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | 5 | 5 |
APPENDIX D1: ENVS 10 Mid-term given by Part-time Lecturer James Reede, Jr. Pre- and Post- test questions were contained within the mid-term for assessment purposes.

1. Environmental science is a
   A. narrowly defined set of physical, life, and social sciences.
   B. theoretical approach in interpreting the environment.
   C. way to see the world in scientific terms.
   D. systematic approach learning about the environment.
   E. special set of problem-solving skills.

2. Most environmental problems result from
   A. excessive pollution.
   B. complex, interrelated problems.
   C. technological development problems.
   D. global warming.
   E. urban degradation.

3. Ideally, science
   A. is correct most of the time.
   C. tells us what we expected to find.
   B. uses new technology.
   D. is orderly and methodical.
   E. proves that our hypotheses are correct.

4. The best definition of a hypothesis is a(n)
   A. proof of a proposed theory.
   B. proposed theory that has been tested numerous times.
   C. theory based on experiments.
   D. argument based on acute intuition.
   E. proposed explanation based on observation.

5. Of the following statements and questions, which is the best example of deductive reasoning?
   A. If all insects have six legs, then butterflies have six legs.
   B. In repeated tosses of a coin, there is a 50/50 chance of each toss resulting in a “head.”
   C. How many times will the toss of coins turn “heads-up” if 100 people each toss a coin?
   D. Since every insect I have examined so far has six legs, I conclude that all insects must have six legs.
   E. All of these are examples of deductive reasoning.

6. The statement, “Since every insect I have examined so far has six legs, I conclude that all insects must have six legs.” is an example of
   A. inductive reasoning.
   B. deductive reasoning.
   C. hypothesis testing.
   D. reductive reasoning.
   E. parsimony.

7. Proof in science is always
   A. firmly established.
   C. beyond question.
   B. an impossible goal.
   D. changing very quickly.
   E. open to question or new evidence.
8. At the end of the twentieth century, ________________ has/have been added to environmental thinking.
   A. global concerns
   B. urban problems
   C. water supply and pollution problems
   D. human population growth
   E. air pollution problems

9. The point of critical thinking is to learn to
   A. weigh evidence and draw your own conclusions.
   B. distrust all opinions other than your own.
   C. trust only your own experimental results.
   D. learn to accept the views of real authorities.
   E. identify true experts in a field.

10. In reading a claim by an atmospheric scientist that ozone depletion is not an actual environmental problem, a critical thinker would
   A. ignore the claim because it does not align with his/her opinions.
   B. feel relieved because ozone depletion was such an overwhelming problem.
   C. look for evidence that is in line with past experience.
   D. look for evidence of the source’s reliability.
   E. acknowledge the claim because an atmospheric scientist is an expert.

11. One of the first steps in critical thinking is to
   A. decide whether conclusions follow premises.
   B. decide if premises are true.
   C. identify premises and conclusions.
   D. identify whether premises are facts or values.
   E. approach a problem in new and innovative ways.

12. Proponents of sustainable development argue that
   A. all development has environmental costs.
   B. development is less important than the environment.
   C. development can proceed with minimal costs to the environment.
   D. the environment is less important than development.
   E. development does not cause environmental damage.

   True/False

13. Sustainable development differs from traditional economic development in that it emphasizes economic development in the short term.
   Answer:

14. Places in the world where indigenous people live tend to have high biodiversity.
   Answer:

15. The relationship among atoms, elements, and compounds is most like the relationship among
   A. bricks, brick houses, and large brick buildings.
   B. grains of sand, rocks, and continents.
   C. bricks, sidewalks, and paved roads.
   D. ponds, lakes, and oceans.
   E. grains of sugar, sugar, and sweetened iced tea.
16. Energy is the ability to
A. move objects.
B. become heated.
C. transfer heat from one object to another.
D. All of these are true.
E. Both move objects and transfer heat from one object to another are true.

17. Potential energy is _______ energy.
A. electrical
B. motion
C. stored
D. heat
E. latent

18. The motion of a rock rolling downhill is known as __________ energy.
A. kinetic
B. latent
C. potential
D. electrical
E. mechanical

19. The law of conservation of matter tells us that matter
A. can never be reused.
B. needs to be conserved or it will not be available for future generations.
C. can be destroyed.
D. can be conserved by some adaptive strategies.
E. is used repeatedly.

20. What implication(s) does the law of conservation of matter have for humans?
A. We cannot create energy because it is neither created nor destroyed.
B. As matter is recycled it loses some of its integrity so we need to be careful when we dispose of goods.
C. Natural resources are unlimited because they are used and reused by living organisms.
D. Disposable goods are not going “away” when we throw them out.
E. All of these are implications of the law of conservation of matter.

21. The first law of thermodynamics and the law of conservation of matter are similar in that
A. under normal circumstances neither energy nor matter is created nor destroyed.
B. both energy and matter are recycled through biological systems.
C. both energy and matter flow in a one-way path through biological systems.
D. under normal circumstances energy and matter are destroyed as they pass through biological systems.
E. The first law of thermodynamics and the law of conservation of matter are not similar.

22. What implication(s) does the second law of thermodynamics have for biological systems?
A. Systems cannot create energy because energy is neither created nor destroyed.
B. With each transformation, less available energy is available to do work so older systems have less energy.
C. A constant supply of energy is necessary for maintenance of biological systems.
D. Energy is unlimited because it is used and reused by living organisms.
E. None of these is an implication of the second law of thermodynamics.
23. Photosynthesis is the process of converting __________ into __________ energy.
A. chemical bond energy; kinetic
B. sunlight; chemical bond
C. solar energy; kinetic
D. solar electrical energy; heat
E. chemical bond energy; potential

24. Photosynthesis produces sugars from
A. water, carbon dioxide, and energy.
B. water, other sugars, and oxygen.
C. oxygen, carbon dioxide, and water.
D. carbon dioxide, enzymes, and energy.
E. oxygen, water, and energy.

25. All members of a species that live in the same area at the same time make up a(an)
A. species.
B. ecosystem.
C. community.
D. population.
E. biome.

26. A biological community consists of all
A. populations living and interacting in an area.
B. members of a species living in the same area.
C. living things on Earth.
D. populations of a given species.
E. members of a species living in the same biome.

27. An ecosystem consists of
A. a physical environment within which a biological community lives.
B. the species with which a biological community interacts.
C. a biological community and its physical environment.
D. the primary producers within a biological community.
E. all the species in a biological community.

28. Primary consumers are also known as
A. carnivores.
B. scavengers.
C. decomposers.
D. herbivores.
E. top carnivores

True/False

29. Nitrogen is an essential component of amino acids and proteins.

30. Photosynthesis is a step in the global nitrogen cycle.

31. Evolution occurs as a result of
A. the discovery of a desirable characteristic in a population.
B. an individual’s physiological modification.
C. environmental change that forces modification in a resident species.
D. better survival or reproduction rates by individuals with a particular characteristic.
E. a population’s physiological modification.
32. Natural selection will ultimately make a species
A. more intelligent.
B. physically bigger.
C. more adapted to its environment.
D. more aggressive.
E. less vulnerable to its predators.

33. An organism’s biotic potential is the maximum number of offspring
A. that it can produce.
B. that survive to adulthood.
C. its habitat can support.
D. it produces at one time.
E. it actually produces over its lifetime.

True or False

34. The most common reason that introduced species cause trouble is because they are larger than native species.

35. The introduction of a predator onto an island originally free from predators is likely to cause the extinction of a native species.

36. The world human population reached 1 billion in about
A. 1400.
B. 1500.
C. 1600.
D. 1700.
E. 1800.

37. Historically, up until the Middle Ages, populations were mostly limited by
A. low fertility rates.
B. culturally imposed family planning practices.
C. disease, famine, and war.
D. religious restrictions on marriage.
E. infanticide.

38. Malthus and Marx
A. worked together to form their theories.
B. agreed about the root causes of overpopulation, poverty, and social upheaval.
C. disagreed about the root causes of overpopulation, poverty, and social upheaval.
D. held the same beliefs but worked on different issues.
E. disagreed about the severity of overpopulation, poverty, and social upheaval.

39. Family planning means enabling people to
A. have fewer children so that the population growth rate can reach ZPG.
B. have no children.
C. have many children.
D. decide in advance how many children they should have.
E. have more children if they live in a country with a birth dearth.

True or False

40. So far, the most successful and popular solution(s) to global overpopulation has/have been mandatory sterilization.
41. Human population growth most closely resembles the S-shaped growth curve.

42. Historically, the greatest threat to grasslands has been
A. damage by off-road vehicles.
B. air pollution.
C. conversion to farmland.
D. global climate change.
E. mineral extraction.

43. One biome type that has not been as badly threatened as other biomes is
A. arctic tundra.
B. tropical rainforests.
C. grasslands.
D. temperate forests.
E. southern pine forests.

44. Ecological diversity is a measure of the number of
A. different kinds of organisms within a community or ecosystem.
B. different versions of the same gene in an ecological community.
C. sizes, colors, and shapes of organisms within an ecological community.
D. niches, trophic levels, and ecological processes of a biological community.
E. different species in an ecosystem.

45. The total number of living species is probably
A. about 450,000.
B. between 500,000 and 1 million.
C. between 3 million and 50 million.
D. between 75 and 95 million.
E. at least 300 million.

46. Species diversity is most concentrated in
A. North America and Europe.
B. South America, Africa, and Southeast Asia.
C. South Africa, Australia, and Europe.
D. Oceania, East Asia, and Antarctica.
E. North America, South America, and Africa.

47. The main reason for the current high rate of animal extinctions is
A. uncontrolled sport hunting in the developed world.
B. commercial harvesting of wildlife in Africa.
C. drought conditions caused by the greenhouse effect.
D. habitat destruction worldwide.
E. None of these by themselves cause high rates of animal extinctions, but together they combine to cause high rates.

48. Tropical moist forests have high species diversity because they have highly developed, diverse niche opportunities and habitats.
49. Since tropical forests typically have only a few commercially valuable trees per acre, logging operations
A. usually do little damage to the trees that are left.
B. do extensive damage because of road building and injury to surrounding trees.
C. generally do not encourage conversion of the forest to farmland.
D. are usually not successful.
E. Tropical forests typically have many more than a few commercially valuable trees per acre.

50. Although most of the world’s forests are shrinking, biologists are especially concerned about tropical forest loss
because
A. they contain such high biodiversity.
B. tropical trees are the biggest trees in the world.
C. they contain irreplaceable wood resources.
D. there are fewer remaining tropical forests than any other forest type.
E. All of these are reasons that biologists are especially concerned about tropical forest loss.

51. Old-growth forests are notable for containing species that
A. are exotic in North America.
B. have an unusually high market value.
C. are highly adapted to their special environment.
D. are found in other North American forests, in very different environmental conditions.
E. migrate long distances to feed in the old-growth forests.

52. Of all the old growth forests that stood in the United States before European settlement, how much remains today?
A. about 50 percent
B. about 35 percent
C. slightly over 25 percent
D. about 15 percent
E. less than 10 percent

53. Most commercial loggers prefer “clear-cut” harvesting because it
A. is the most environmentally sustainable type of harvest.
B. is the most efficient way to get valuable small timber without disturbing the larger early successional trees.
C. is the most efficient, cheapest harvest method using large, fast machinery instead of costly labor.
D. is the most effective way to refresh soil with sun and rain.
E. does not waste any trees.

54. World deserts are
A. decreasing as world climate becomes wetter.
B. increasing because of the increase in global carbon dioxide.
C. increasing because of logging and grazing.
D. decreasing because of massive reforestation.
E. about the same in area but have many threatened species of plants.

55. Many developing countries in Africa find their wildlife is worth the most money
A. as products for export.
B. as meat for local people.
C. as photographic subjects.
D. when replaced by domestic livestock.
E. when replaced by sustainable cash crops.
56. As officially defined by Congress in the 1964 Wilderness Act, “wilderness” is
A. any area with important scenic, historic, and recreational value.
B. undeveloped land where humans have little impact and temporary presence, and visitors can find solitude.
C. a place where people live in harmony with nature, building only low-impact structures and roads.
D. an area of at least 10,000 acres with no human intrusion.
E. an area of at least 10,000 acres with low-impact development by humans.

57. Undernourished parents often raise children who are undernourished because the parents
A. transfer genetic deficiencies to their children.
B. do not know any better.
C. cannot afford to feed their children properly.
D. do not have access to information about nutrition.
E. All of these are reasons for the vicious cycle.

58. What are two common diseases that result from protein deficiencies?
A. dysentery and diarrhea
B. dysentery and scurvy
C. scurvy and pellagra
D. goiter and cretinism
E. marasmus and kwashiorkor

59. Anemia is a common disease resulting from a shortage of dietary
A. protein.
B. iodine.
C. iron.
D. vitamin A.
E. folic acid.

60. The three crops that humans rely on for the majority of nutrients and calories are
A. potatoes, wheat, and oats.
B. wheat, rice, and corn.
C. barley, oats, and rye.
D. corn, oats, and rice.
E. oats, beans, and barley.

61. Historically, the greatest threats to human health came from
A. carcinogenic or toxic chemicals.
B. psychological stress factors due to crowding.
C. pathogenic organisms.
D. teratogenic chemicals.
E. injuries (intentional and unintentional).

62. Hazardous substances ______________ while toxins are ______________.
A. react with specific cell components to kill cells; poisonous substances
B. are dangerous substances; poisonous substances
C. are usually of concern at all concentrations; are dangerous substances
D. are poisonous substances; also poisonous substances
E. All of these choices are true.

63. Toxic substances are dangerous because they
A. react or interfere with specific cell functions.
B. can physically remove or tear tissues.
C. are usually synthetic.
D. cause debilitating, parasitic diseases.
E. cause excessive water accumulation in tissues.

64. Which of the following statements is true?
A. If a substance is toxic, its toxicity is highly dependent on its form and where it is present in the environment.
B. If a substance is toxic, it is equally toxic regardless of its form or where it is present in the environment.
C. The most important factor in the toxicity of a substance is the route by which it enters our bodies.
D. The most important factor in the toxicity of a substance is its persistence in the environment.
E. None of these statements are true.

65. Among the most important characteristics of chemicals in determining their environmental risks is/are
A. solubility.
C. reactivity.
B. persistence.
D. toxicity
E. All of these are correct.

66. The biomagnification of DDT demonstrates that
A. higher trophic level organisms can concentrate toxins in a type of “inverse biological pyramid.”
B. birds should not depend on fish for food.
C. DDT is easily metabolized and excreted by most organisms.
D. DDT is an extremely water-soluble material.
E. water-soluble toxins are widespread.

67. The World Health Organization regards health as primarily a matter of ________ well being.
A. physical
B. mental and physical
C. social and mental
D. physical, mental, and social
E. physical and social

68. Parasitic worms are very common in areas where
A. the climate is dry.
B. the climate is hot.
C. sanitation is poor.
D. urban development has been too rapid.
E. the climate is humid.

69. When comparing the toxicity of natural and synthetic chemicals, natural chemicals are ________ synthetic chemicals.
A. nearly always less toxic than
B. nearly always more toxic than
C. on average, just as toxic
D. much safer
E. more difficult to detect

70. Highly persistent toxic chemicals
A. retain their toxicity as they cycle through the food chain and environment.
B. lose their toxicity once released in the environment.
C. accumulate within one organism but break down at higher trophic levels.
D. are highly unusual among artificial chemicals.
E. are usually not that toxic in their life span.
# APPENDIX D2: ENVS 10 Assessment, Pre- and Post- Test Results, Given by Part-time Lecturer James Reede, Jr.

<table>
<thead>
<tr>
<th>Student</th>
<th>Student’s Major</th>
<th>PRE</th>
<th>POST</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Undergraduate Degree - Civil Engineering (Pre) BS</td>
<td>DNT</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Undergraduate Degree - Computer Engineering BS</td>
<td>79</td>
<td>90</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Undergraduate Degree - Criminal Justice (Pre) BS</td>
<td>63</td>
<td>96</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>Undergraduate Degree - Business (Pre-Mis)</td>
<td>47</td>
<td>89</td>
<td>42</td>
</tr>
<tr>
<td>5</td>
<td>Undergraduate Degree - Construction Mgmt (Pre) BS</td>
<td>60</td>
<td>89</td>
<td>29</td>
</tr>
<tr>
<td>6</td>
<td>Undergraduate Degree - Sociology BA</td>
<td>40</td>
<td>73</td>
<td>33</td>
</tr>
<tr>
<td>7</td>
<td>Undergraduate Degree - Sociology BA</td>
<td>63</td>
<td>99</td>
<td>36</td>
</tr>
<tr>
<td>8</td>
<td>Undergraduate Degree - Spanish BA</td>
<td>60</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>Undergraduate Degree - Graphic Design (Pre) BS</td>
<td>73</td>
<td>97</td>
<td>24</td>
</tr>
<tr>
<td>10</td>
<td>Undergraduate Degree - Criminal Justice BS</td>
<td>53</td>
<td>99</td>
<td>46</td>
</tr>
<tr>
<td>11</td>
<td>Undergraduate Degree - Economics BA</td>
<td>63</td>
<td>97</td>
<td>34</td>
</tr>
<tr>
<td>12</td>
<td>Undergraduate Degree - Undeclared</td>
<td>57</td>
<td>54</td>
<td>-3</td>
</tr>
<tr>
<td>13</td>
<td>Undergraduate Degree - Business (Entrepreneurship)BS</td>
<td>73</td>
<td>61</td>
<td>-12</td>
</tr>
<tr>
<td>14</td>
<td>Undergraduate Degree - Anthropology (BA)</td>
<td>DNT</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Undergraduate Degree - Anthropology (BA)</td>
<td>53</td>
<td>79</td>
<td>26</td>
</tr>
<tr>
<td>16</td>
<td>Undergraduate Degree - Sociology BA</td>
<td>DNT</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Undergraduate Degree - Communication Studies BA</td>
<td>43</td>
<td>74</td>
<td>31</td>
</tr>
<tr>
<td>18</td>
<td>Undergraduate Degree - Civil Engineering (Pre) BS</td>
<td>57</td>
<td>77</td>
<td>20</td>
</tr>
<tr>
<td>19</td>
<td>Undergraduate Degree - Sociology BA</td>
<td>43</td>
<td>91</td>
<td>48</td>
</tr>
<tr>
<td>#</td>
<td>Program</td>
<td>Acceptance</td>
<td>Graduation</td>
<td>Retention</td>
</tr>
<tr>
<td>----</td>
<td>----------------------------------------------</td>
<td>------------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>20</td>
<td>Undergraduate Degree - Construction Mgmt (Pre) BS</td>
<td>70</td>
<td>76</td>
<td>6</td>
</tr>
<tr>
<td>21</td>
<td>Undergraduate Degree - Environmental Studies BA</td>
<td>47</td>
<td>100</td>
<td>53</td>
</tr>
<tr>
<td>22</td>
<td>Undergraduate Transitory - Special High School - ACE</td>
<td>50</td>
<td>76</td>
<td>26</td>
</tr>
<tr>
<td>23</td>
<td>Undergraduate Degree - Civil Engineering (Pre) BS</td>
<td>77</td>
<td>100</td>
<td>23</td>
</tr>
<tr>
<td>24</td>
<td>Undergraduate Degree - Interior Design (Pre) BA</td>
<td>47</td>
<td>77</td>
<td>30</td>
</tr>
<tr>
<td>25</td>
<td>Undergraduate Degree - Mechanical Engineering BS</td>
<td>67</td>
<td>94</td>
<td>27</td>
</tr>
<tr>
<td>26</td>
<td>Undergraduate Degree - Government - Journalism BA</td>
<td>57</td>
<td>93</td>
<td>36</td>
</tr>
<tr>
<td>27</td>
<td>Undergraduate Degree - Business (Gen'l Mgmt-Pre)</td>
<td>67</td>
<td>94</td>
<td>27</td>
</tr>
<tr>
<td>28</td>
<td>Undergraduate Degree - Theatre Arts (Theatre) BA</td>
<td>60</td>
<td>99</td>
<td>39</td>
</tr>
<tr>
<td>29</td>
<td>Undergraduate Degree - Environmental Studies BA</td>
<td>60</td>
<td>69</td>
<td>9</td>
</tr>
<tr>
<td>30</td>
<td>Undergraduate Degree - Computer Science (Pre)</td>
<td>60</td>
<td>99</td>
<td>39</td>
</tr>
<tr>
<td>31</td>
<td>Undergraduate Degree - Business (Int'l Business-Pre)</td>
<td>60</td>
<td>91</td>
<td>31</td>
</tr>
<tr>
<td>32</td>
<td>Undergraduate Degree - Undeclared</td>
<td>57</td>
<td>76</td>
<td>19</td>
</tr>
<tr>
<td>33</td>
<td>Undergraduate Degree - Business (Gen'l Mgmt-Pre)</td>
<td>33</td>
<td>91</td>
<td>58</td>
</tr>
<tr>
<td>34</td>
<td>Undergraduate Degree - Coms (Public Relations) BA</td>
<td>53</td>
<td>86</td>
<td>33</td>
</tr>
<tr>
<td>35</td>
<td>Undergraduate Degree - Business (Acct Info Sys-Pre)</td>
<td>63</td>
<td>99</td>
<td>36</td>
</tr>
<tr>
<td>36</td>
<td>Undergraduate Degree - History BA</td>
<td>50</td>
<td>99</td>
<td>49</td>
</tr>
<tr>
<td>37</td>
<td>Undergraduate Degree - Ethnic Studies (General) BA</td>
<td>40</td>
<td>85</td>
<td>45</td>
</tr>
<tr>
<td>38</td>
<td>Undergraduate Degree - Undeclared</td>
<td>DNT</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Undergraduate Degree - Undeclared</td>
<td>43</td>
<td>100</td>
<td>57</td>
</tr>
<tr>
<td>40</td>
<td>Undergraduate Degree - Civil Engineering BS</td>
<td>DNT</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Undergraduate Degree - Criminal Justice BS</td>
<td>40</td>
<td>79</td>
<td>39</td>
</tr>
<tr>
<td>No.</td>
<td>Undergraduate Degree</td>
<td>37</td>
<td>91</td>
<td>54</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>42</td>
<td>Business (Acct-Pre)</td>
<td>37</td>
<td>91</td>
<td>54</td>
</tr>
<tr>
<td>43</td>
<td>Sociology BA</td>
<td>37</td>
<td>83</td>
<td>46</td>
</tr>
<tr>
<td>44</td>
<td>Environmental Studies BS</td>
<td>77</td>
<td>99</td>
<td>22</td>
</tr>
<tr>
<td>45</td>
<td>Business (Marketing)BS</td>
<td>DNT</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**AVERAGE** 55.87179  87.31111  31.43932
APPENDIX E: Assessment Report Provided by Professor Michelle Stevens

1. **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.
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.

ENVS 10 Pre and Post Test (percentages)

<table>
<thead>
<tr>
<th>Question</th>
<th>Pretest Meets</th>
<th>Approaches</th>
<th>Fails</th>
<th>Post Test Meets</th>
<th>Approaches</th>
<th>Fails</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46</td>
<td>27</td>
<td>27</td>
<td>85</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>33</td>
<td>30</td>
<td>38</td>
<td>82</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>41</td>
<td>28</td>
<td>30</td>
<td>78</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>63</td>
<td>0</td>
<td>38</td>
<td>70</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>51</td>
<td>37</td>
<td>31</td>
<td>42</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>51</td>
<td>32</td>
<td>17</td>
<td>67</td>
<td>29</td>
<td>4</td>
</tr>
</tbody>
</table>

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 test their understanding of the information in the game, I administered a formative assessment the class after playing the game to test their overall comprehension of the material.

The formative assessment showed me, much to my surprise, that students only understood their particular view of the Delta, and for the most part did not understand other topics and in particular did not understand a holistic and synthetic approach to the sociopolitical, ecological and economic problem in the Sacramento San Joaquin Delta. The take home lesson was that I need to provide more introductory material for the Delta ecosystem before playing Delta Jeopardy.

I will provide data for assessment of three of the six questions.
• 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.
  • Surprisingly, despite the fact that this is the Sacramento-San Joaquin Delta, 30% of students met the standard, 70% of students approached the standard, and 0% failed.
• 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.
  • Meets the standard – 51%; Approaches the standard – 29%; Fails standard – 10%

• 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.
  • Meets the standard – 17%; Approaches the standard – 43%; Fails standard – 40%

III. ENVS 10 Final Assessment Spring 2011

The following sequence of questions tests whether by the end of the course students are becoming rigorous in their scientific evaluation of environmental problems that adversely impact human health, and whether they have become critical, inferential thinkers. These questions were given in the final.

Questions: We continue to use plastic substances like phthalates, bisphenol A and vinyl chloride and they remain legal for consumers to use. Europe has banned the use of phthalates in products used for babies, such as baby bottles. Researchers found that mothers with higher levels of phthalates had significantly more problems with birth defects in babies, particularly boys.

1. How difficult it is for science to “prove” that a substance causes a particular medical problem? To answer this question: a) Apply the basics of the scientific method to this problem; b) how difficult it is to prove anything scientifically?; and c) How difficult it is to establish the cause of a health effect?
   Meets Expectation: The student will be able to go through the scientific process including publishing in peer reviewed journals; the student will discuss hypothesis and null hypothesis and the burden of proof necessary to demonstrate that a substance is toxic or harmful; and the student will discuss the difficulty of establishing clear causality. Despite extensive experimental evidence, it is difficult to establish causality with so many confounding variables. To approach the standard, the student will have a basic understanding of the difficulty establishing causality and proving something is toxic.
   • Meets the standard – 29%; Approaches the standard – 43%; Fails standard – 29%

2. Why is it so difficult to get rid of a product that is so pervasive in our environment? To meet the standard, the student will be able to discuss the difficulty of eliminating something that is very pervasive in the economy and marketplace; the problems of advertising influencing the consumer; the difficulty of getting science to policymakers; and the market incentive to use plastics and chemicals that are pervasive, cheap and easy to use. To Approach the standard, the student will be able to understand how difficult it is to take an effective, cheap and plentiful product off the market (like DDT).
   a. Meets the standard – 48%; Approaches the standard – 41%; Fails standard – 10%
3. The plastics industry says phthalates are safe for their intended use the way they are being used in products today. What would make you agree or disagree with this statement? To meet the standard, the student needs to understand that industry is concerned with production and profit; to make a decision about health, the consumer needs to have the facts of the impacts of using the product and use the product according to the label directions.
   a. Meets the standard – 53%; Approaches the standard – 33%; Fails standard – 13%

4. In your opinion, what do you think should be done to protect you as a consumer and potential parent from these substances? To meet the standard, students must make a recommendation such as policy being informed by good science; accurate labeling of products; government regulation based on sound science of safety of products on the market.
   a. Meets the standard – 59%; Approaches the standard – 28%; Fails standard – 14%

The first question necessitates a rather sophisticated understanding of the application of science to complex environmental issues. Only a few students met the standard, and an equal number failed. The second question is less complex, and more students met the standard of understanding how science and the public can influence policy. The third and fourth questions are increasingly simple, and the majority of students met the standard.

ENVS 112 Writing Diagnostic Pre and Post Test

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

<table>
<thead>
<tr>
<th>Step</th>
<th>Pre (n=29)</th>
<th>Post (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Meets Expectation</td>
<td>9 31%</td>
<td>12 50%</td>
</tr>
<tr>
<td>b. Approaches Expectation</td>
<td>8 62%</td>
<td>15 42%</td>
</tr>
<tr>
<td>c. Fails to meet expectation</td>
<td>2 2%</td>
<td>2 2%</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Step</th>
<th>Pre (n=29)</th>
<th>Post (n=24)</th>
</tr>
</thead>
<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>
</tr>
</tbody>
</table>
d. What is the difference between a primary source and a secondary source? 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 that 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 the peer review process. To fail to meet expectation, the student does not understand the difference between primary and secondary literature.

<table>
<thead>
<tr>
<th></th>
<th>Pre (n=29)</th>
<th>Post (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Expectation</td>
<td>2 (7%)</td>
<td>10 (42%)</td>
</tr>
<tr>
<td>Approaches Expectation</td>
<td>4 (14%)</td>
<td>8 (33%)</td>
</tr>
<tr>
<td>Fails to meet expectation</td>
<td>23 (79%)</td>
<td>6 (25%)</td>
</tr>
</tbody>
</table>

Observations from pre and post test.

**Question #1.** Students came into the class with knowledge of how to write a paper, conduct superficial research, and acknowledge that they needed to edit or review the paper before turning it in. For the second assessment, students generally wrote less and were either burned out in the semester or tired of formative assessments. The post test indicated that students had an improved understanding of how to formulate a thesis for a longer research paper, conduct the research using primary and secondary literature, and that peer review or editing and writing the citations section were important parts of successful paper writing.

**Question #2.** Students came into the class with a reasonable understanding of plagiarism, including the subtleties of paraphrasing, using quotes when using someone else’s words, and citing sources. The numbers indicate some improvement. However, formative assessments throughout the semester and the final paper indicated that most students struggled with and then had a working knowledge of citing sources and paraphrasing other people’s work. I still had one student who had to rewrite his paper, as it was 75% quotes from other sources!

**Question #3.** The biggest improvement was understanding the difference between primary and secondary literature. There is still room for improvement, as there was still a lack of understanding of the peer review process at the end of the semester. However, students did clearly understand that primary literature included papers doing original research, with a hypothesis, methods, results/discussion, and citation section. This area showed the most improvement.

**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.

a. What surprised you?

b. What confused you?

c. What do you need further explanation of to be successful in writing a scientific paper?

Under what surprised you, I enjoyed reading what they learned about their specific endangered species and conservation biology in general.

The result of the formative assessment was that the majority of students were confused about the differences between primary and secondary literature, and how to properly format citations. I was able to review this in class so I could answer their questions and explain the material. This gave me the insight to review citation formats; plagiarism subtleties; and I gave a simple quiz using both primary and secondary journal/magazines to see if they could tell the difference between primary and secondary literature.

**Self-assessment:** Rate your writing skills based on past experience:
It’s interesting to review student evaluation knowing their skill sets with this topics. Part of this is self evaluation against what goal? There were 3 or 4 students who had skill sets in the great category. Some students had an inflated sense of their work. Most who rates themselves as fair or poor were correct in their assessment, and improved in the semester. It seems that as the writing and content of assignments incrementally increased, students got a better understanding of the quality of their work. I like the fact that more students perceived of themselves of having a good sense of style or voice; we did reflective essays in class, and this may have contributed to their sense of voice than more scientific writing.

Research – These stayed fairly consistent, with a few more students thinking they were great researchers by the end of semester.

Organization – Interestingly, more students evaluated themselves as fair in organization. This is good, as they students were challenged by writing sequentially difficult writing assignments, and the organization for a longer research paper is more challenging.

Clarity – These stayed pretty much equivalent in the pre and post test.

Style – More students perceived of themselves as having style or voice in their writing by the end of the semester. This is very good in terms of self expression and confidence in writing from their own perspective. We did both scientific writing and reflective writing; I imagine they found their own voice and style in the reflective writing.

Spelling/ Grammar – More students felt they were “good” as opposed to great or fair by the end of the semester.

**Model United Nations Exercise** – 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.

To assess content I conducted and pre and post ten word test for the Model United Nations. These words were integral to understanding the basic scientific and polity elements of the Kyoto Protocol exercise.

I did a ten word formative assessment test before and after the exercise. 1 is failing they did not get at all, 2 is approached understanding, and 3 is got it. In the beginning, the majority of the students understood the terms developing country and emissions trading. However, even after beginning the class with lectures on climate change, they didn’t start out understanding basic terms like Kyoto Protocol or Stance or even greenhouse gas. The students who understood the terms were environmental science or bio majors.

<table>
<thead>
<tr>
<th></th>
<th>Pre(%)</th>
<th>Post(%)</th>
<th>Pre(%)</th>
<th>Post(%)</th>
<th>Pre(%)</th>
<th>Post(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing Country</td>
<td>90</td>
<td>84</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Annex 1</td>
<td>10</td>
<td>44</td>
<td>0</td>
<td>24</td>
<td>90</td>
<td>32</td>
</tr>
<tr>
<td>Stance</td>
<td>59</td>
<td>84</td>
<td>0</td>
<td>8</td>
<td>41</td>
<td>8</td>
</tr>
<tr>
<td>Greenhouse Gas</td>
<td>41</td>
<td>60</td>
<td>45</td>
<td>16</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Carbon Sink</td>
<td>31</td>
<td>52</td>
<td>6</td>
<td>16</td>
<td>14</td>
<td>32</td>
</tr>
<tr>
<td>Kyoto Protocol</td>
<td>62</td>
<td>72</td>
<td>8</td>
<td>20</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>United Nations Security Council</td>
<td>7</td>
<td>36</td>
<td>17</td>
<td>12</td>
<td>76</td>
<td>52</td>
</tr>
<tr>
<td>Ozone</td>
<td>48</td>
<td>64</td>
<td>9</td>
<td>12</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Emissions Trading</td>
<td>79</td>
<td>80</td>
<td>0</td>
<td>4</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>Clean Development Mechanism</td>
<td>21</td>
<td>64</td>
<td>14</td>
<td>8</td>
<td>66</td>
<td>28</td>
</tr>
</tbody>
</table>
• **Developing Country** – The majority of the class understood the concept at the beginning of the class. It’s hard to understand why fewer understood the concept and more students failed in the post test. Perhaps the 5 extra students in the pre test were absent for the post test and accounted for this difference in percentage. There were 5 students who met the understanding in the pre test, and 5 students were absent for the post test. Maybe artifact of sampling rather than real data.

• **Annex 1 Country**. There was an improvement of understanding of this term in the post test. I am concerned that 1/3 of the class still fails to understand this concept. I will emphasize this in the next class.

• **Stance**. 2. I was surprised that less than half the class understood what an Annex 1 country was, although 75% had some understanding and 90% had no understanding in the beginning.

• **Greenhouse Gas**
• **Carbon Sink**
• **Kyoto Protocol**
• **United Nations Security Council**
• **Ozone**
• **Emissions Trading**
• **Clean Development**

3. Almost 90% understood stance, and 60% understood in the beginning.

4. Greenhouse gas improved from 40% to 76%, but I thought they all should have understood.

5. Carbon sink went from 30 to 56%, showing an important part of the exercise didn’t communicate. However, 84% understood emissions trading was cap and trade, but what were they trading? Carbon sinks. This is also something I went over in the beginning of the class so need to make clearer.

6. Kyoto Protocol most students understood, as this was the point of the exercise, but the 2 students who still didn’t know are concerning.
7. Synthesis. All indicators went up. This was a good test to help me pointedly teach these terms in the beginning lectures on climate change and explain why they need to learn them. This was a great exercise to help me determine what they had learned and what not. Very helpful.

Model United Nations Reflective Essay Assignment

At the end they did a reflexive essay with the following questions.

- Given your experience with this exercise, compare what the world needs and what is possible to achieve based on an international agreement on Greenhouse Gas Reductions.
- Evaluate the development of the Kyoto Protocol in Bangkok, and tell me what if anything can be agreed upon. 18/31 students got both answers correct; 2/31 students failed the questions; and 29/31 would have passed.

ENVS 121 Quantitative Assessment Spring 2011

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.

B. 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 no 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%

C. 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

D. 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 ANOVAs comparing your variables at the end of experiment.

1. Meets Expectation 10 63%
2. Approaches Expectation 5 31%
E. 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%