

Department of Biological Sciences

Assessment Procedures

MISSION STATEMENT: The mission of the Department of Biological Sciences is to teach our students basic knowledge in biology, equip them with skills to enhance this basic knowledge, engage them in critical scientific inquiry, and provide opportunities to communicate scientific information clearly in preparation for employment and/or continuing education in the life sciences.

INTRODUCTORY STATEMENT

The Department of Biological Sciences (DBS) began the development of an assessment plan two years ago. The initial action was to elect an Assessment Committee (Ass. Com) to develop the assessment plan. Members of Ass. Com. attended several systemwide meetings, solicited faculty input, and examined successful plans at other universities to determine, given our curriculum, the appropriate way to proceed. Once the committee agreed on reasonable learning outcomes (Table 1; what we wanted students to be able to achieve) we considered how to assess whether we were successfully meeting those goals. Like our sister campus at Bakersfield, we decided to draft a mission statement and then focus our initial assessment efforts on activities in two areas directly related to our the learning outcomes. These assessment focus areas are, *Biological Literacy* and *Scientific Inquiry*.

Goal 1 Demonstrate literacy of the central themes of biology through out the curriculum.

Objective A. Demonstrate Freshman-Sophomore literacy of the principles of form, function and organization at the levels of; molecules, cells, tissues, organs organism, population, community and ecosystem.

Objective B. Integrate the principles from Objective A into a demonstration of Junior-Senior level biological literacy in the areas of; genetics, physiology, evolution and ecology.

Objective C. Demonstrate senior level biological literacy in selected elective courses selected by the student.

Goal 2 Engage in scientific inquiry in the biological science by demonstrating competency in analytical, information and communication skills.

Objective D. Demonstrate competency in the following: a) formulating questions and testing hypothesis b) collecting, analyzing and presenting data and drawing appropriate conclusions c) presenting results orally and in writing and d) evaluating and/or utilizing current biological literature

Table 1 Learning outcomes for students in Biological Sciences.

A. Cognitive Learning Outcomes

- 1. Learn and retain information essential to a broad knowledge in**
 - a. Characteristics of living things, their uniqueness, and their unity**
 - b. Organization (molecule-cell-tissue-organism-population-ecosystem) and function of living systems**
 - c. Growth and development**
 - d. Sex and reproduction**
 - e. Hereditary transmission**
 - f. Molecular basis of energetics**
 - g. Absorption/movements/transport**
 - h. Synthesis and metabolic control**
 - i. Responses to stimuli**
 - j. Interactions of organisms with physical and biological environment**
 - k. Populations in space and time**
 - l. Quantitative methods in biology**
 - m. Instrumentation and methods of biological investigation and data analysis**
- 2. Be familiar with the scientific method of inquiry and the scientific attitude**
 - a. Know and understand biological principles and generalizations (fundamentals, assumptions, Hypotheses, theories, laws) and their implications**
 - b. Be able to apply the logic and methods of empirical investigation (analyze the problem, form hypothesis, design and execute investigation, evaluate data and assumptions, synthesize knowledge gained, communicate the knowledge)**
 - c. Judge the reliability of sources of biological information and select the best sources**
- 3. Develop competence in basic/applied research and operate with expertise in the laboratory including**
 - a. Active participation in laboratory and field research**
 - b. Knowledge of lab hazards and safety principles**
 - c. Ability to use routine lab equipment with ease**
- 4. Understand the distinction between primary and secondary literature, and be able to read and interpret Selected primary literature, including tables, charts, and graphs**
- 5. Be able to conduct a literature search on a biological topic using primary and secondary literature**
- 6. Be able to write a well-organized scientific report following journal guidelines and be able to defend the conclusions orally and in writing**
- 7. Be able to use computers in solving problems and in carrying our projects in biology**

B. Conceptual Learning Outcomes

- 1. Be a scientifically literate citizen who understands the basic principles underlying modern science, technology, health, and environmental issues and their global impact**
- 2. Develop the ability, motivation, and initiative to study and learn independently**
- 3. Become a life-long learner, develop an active mode of learning, and be able to understand new scientific information and relate it to what was learned previously**
- 4. Develop innovative, creative thinking in biology, be open to unconventional interpretations, and be**

responsive to change

5. Be able to use biological/scientific information to make reasonable decisions and ethical choices
6. Be able to relate personal interests in biology to
 - a. Role as a citizen in a highly scientific/technological society.
 - b. Activities of the biological community
 - c. Scientific/technological concerns related to biology that have a worldwide impact

ASSESSMENT APPROACHES

A. Biological Literacy

We are defining biological literacy as the learning and retention of information essential to a broad knowledge in the biological sciences. In general we would consider items A1 a. -m. (Table 1) to be representative of the topics we would consider necessary for a biologically literate graduate. To assess the status of our curriculum in achieving these literacy goals, we propose to acquire a sample copy of the Major Field Test in Biology from ETS. This test will be compared to our curriculum and program objectives. If the test, as anticipated, reflects the major themes of our Principles level curriculum we propose to administer the test to a cohort of seniors who have completed all five Principles level courses within the past 6 months. We propose to administer the test to at least 20 students in Spring 2001 and again Fall 2001. The results of the test will be used for evaluation purposes solely within the department. Results will not be made available to any individual outside the department. Clearly for this test to be of use as a true assessment instrument, a cohort of freshmen/transfer students should be tested before starting our curriculum and again upon graduation from our program. We need to consider a mechanism to select test participants and how to provide an incentive to commit maximum performance on the exam.

B. Scientific Inquiry

This goal is to assess the ability of our students to demonstrate competency in cognitive, analytical, communication and information skills. These skills are essentially summarized in Table 1, items 2-7. The platform for doing this will be the accumulation of a portfolio of essay exams, term papers, lab reports, oral presentations, posters, and independent study projects. Elective courses will be identified that utilize all or a subset of the evaluation instruments mentioned above. Students within two quarters of graduation will be identified in these courses and copies of their papers, lab reports, posters, etc will be collected for evaluation. This material will be collected each quarter and evaluated once a year by Ass Com. at a departmental sponsored retreat. Ass Com. will make a report on their findings and recommendations to the department.

C. Survey Instruments

The DBS Ass. Com. also decided to extend our assessment-related activities to produce and implement two survey instruments. The first survey is an Assessment Questionnaire (Attachment No. 1) that is completed by graduating seniors at the time they file for graduation. This questionnaire is designed to gather information on student demographics and perceptions about the department and curriculum. The second survey is an Alumni Questionnaire (Attachment No. 2) was sent to every biology major graduating during the 1999-2000 academic year. Again, the committee was interested in feedback regarding the ability of our curriculum to equip students with the necessary skills to meet their career objectives. We feel this "retrospective" view of the department is important given the different perspective of an ex-student.

PROGRESS AND FOLLOW-UP PLANS

- 1. Scientific Literacy:** Ass. Com administered the Major Field Test in Biology from ETS in June 2001. Nine graduating seniors completed the comprehensive examination. Exams were sent to ETS for scoring and results were recently received. In general, the combined scores for our students were very near the national average. If the results from two students who did quite poorly are removed from the average, then our students performed significantly above the national average. Given the relatively few students, who took the exam, it is very unlikely that these results are statistically significant as an indication of performance level for our graduating seniors. We will administer the exam again in Spring making a more concerted effort to increase the number of participants. Ass. Com will collate the data and make a presentation to the department. How this data will be utilized is the subject of on-going discussion by Ass. Com. and no conclusions or recommendations are available at this time. Clearly the hope is to look for both positive and negative trends in the subgroup scores and consider potential modifications in our curriculum if significant and continuing trends are apparent.
- 2. Scientific Inquiry:** Ass. Com. will meet during the Fall Quarter and identify those courses in the 2001-2002 course presentation list that meet the criteria of requiring students to demonstrate competency in cognitive, analytical, communication and information skills. The platform for doing this will be the accumulation of a portfolio of essay exams, term papers, lab reports, oral presentations, posters, and independent study projects. Following the identification of relevant courses, the responsible faculty will be contacted and recruited into the assessment activity. Students will be informed of the project and that review of their materials will be anonymous and will have no impact on their final course grade. Based upon several years of collected data, Ass. Com. will consider recommending certain changes (e.g. increased writing opportunities, more data analysis, etc).
- 3. Survey Instruments:** We have results from our first exit survey questionnaire (Attachment No. 3) which seems to indicate that exiting students have a very high opinion of the education they received in this department. The survey does indicate areas where improvement can be made (e.g. advisement, career counseling) and Ass.

Com. will consider recommendations to address these issues. Administration of the exit questionnaire will continue throughout the academic year and evaluation of the collected data will be a continuing responsibility of Ass. Com. we have not accumulated enough responses from the alumni survey to draw any conclusions. Very, very preliminary results seem to indicate that the respondents are employed in some field related to their biology degree.

ATTACHMENT NO. 2

Dear Biology Alum:

The faculty members in the Department of Biological Sciences at Cal State Hayward hope that your life and career are going well. The Department is engaged in establishing an on-going assessment program and one aspect of this program involves the solicitation of comments and feedback from biology alumni. We are requesting that you answer a few questions about your life and career after graduation in hopes that your comments will help us improve our programs and advising activity. For your convenience, I've enclosed a postage-paid envelope for the return of this survey via regular mail. I would also enjoy hearing from you personally at sbenson@csuhayward.edu. You might also enjoy visiting our new web site at www.csuhayward.edu/scaprogs/Bio/index/html.

1. Year of graduation: _____
2. Degree earned (circle one): B.A.
B.S.
B.S. Biomedical Laboratory Option
M.S.
Biotechnology Certificate
3. What was your approximate Grade Point average at graduation? _____
4. At the time of graduation did you plan to work toward a career related to your degree in biological sciences? _____ YES _____ NO
5. Are you currently working toward or employed in a career related to your degree in biological sciences? _____ YES _____ NO

Please provide a brief description of your current career activities.

6. Please answer the following questions about your employment history since graduation.

1. I am currently employed YES NO (if no, skip to question No. 7)
2. My current employment is related to the area of biology. YES NO (if no, skip to question No. 6)
3. I am currently working full -time YES NO
4. It was relatively easy securing a job related to my interests in biology. YES NO
5. My current position is commensurate with my skills and knowledge acquired from my undergraduate or graduate degree in biology. YES NO
6. Did any CSUH faculty or staff member assist you in any way after graduation to acquire a job interview or employment position? YES NO
7. My career interests have changed since graduation. YES NO
8. My current employment situation is based on a need to be at home. YES NO
9. My current employment situation is based on lack of satisfactory employment opportunities. YES NO

7. Please use the space below to add any additional comments regarding the Department of Biological Sciences at CSUH. Thank you for your participation in this survey.