**Biology Department Assessment Plan**

**Step1: Department/Program Mission (Any updates due September 15, 2009)**

The Biology Department's **mission** is to provide students with an understanding of, and an appreciation for, the fundamental mechanisms that underlie all living systems from molecular biology through ecosystem ecology.  Students should understand the ways in which they are affected by living organisms and how their lives in turn have an impact on other living organisms and the biosphere.  They should become proficient in the methods of science and aware of the processes that lead to discoveries in science.  In course work, they should develop observational, analytical, and communication skills, regardless of their chosen career path.  Ultimately, biology is best understood by active involvement with organisms and the systems of life in laboratory and field settings, and in collaborative student-faculty research.

**Step 2: List goals/outcomes (Any updates due September 15, 2009)**

**We have identified the following learning goals for our students:**

**I.  Content goals**

**Goal 1.** Our students will understand and apply fundamental biological principles from each of the following four major areas of biology - cell biology, molecular biology and genetics, organismal biology, and ecology and evolution.

**Goal 2.**  Our students will acquire in-depth knowledge of the major areas of biology and be able to integrate principles from these areas.

**Goal 3**.  Our students will acquire scientific investigation skills in laboratory and field courses necessary to apply the methods that biologists use to answer biological questions.

**II.  Process goals**

**Goal 1**.  Our students will develop enhanced critical thinking skills.

**Goal 2.** Our students will engage in the scientific process.

**Goal 3**.  Our students will communicate effectively in written and oral forms.

**Step 3: Identify program components (Any updates due September 15, 2009)**

*Required courses, elective courses,out-of-classroom or other experiences that are designed to achieve each educational objective. NOTE: Every class will not, nor is it expected to,achieve each outcome. The goal is to get an even distribution of experiences that achieve the outcomes.*

All majors in Biology are required to take our two core courses, BIOL 195 (Ecology, Evolution, and Biodiversity) and BIOL 210 (Cell and Molecular Biology).  Students are introduced to each of our listed student learning outcomes in one of those two core courses.  All majors must successfully complete a minimum of eight units in biology, including six with laboratory components.  Majors must complete at least one course from each of three groups of courses: a field course (List I course), an “inside” laboratory course (List II course), and an advanced integrative course (List III course).   In each of our non-core courses, students experience further emphasis on one or more of our student learning outcomes.

A grid of our goals and student outcomes in biology courses we offer is available as a [PDF file](https://docs.google.com/a/albion.edu/fileview?id=0BxYWBZS7r6a-NGM3NGUxM2ItOWY4Yi00NWU5LTlkODUtMWVmYjRkNTAzN2Q0&hl=en) (if you want to see it, ask me and I can send it - I cannot out how to link it here).  We do not include any BIOl x89 courses, our topical seminars (BIOL 401/402) or our research courses (BIOL 411/412) in the list.  At this time, we do not include BIOL 366, which has not been offered in several years, as it will be revised soon.

**Step 4: Select methods/data sources and instruments (Any updates due September 15, 2009)**

*...that you will use to gather information about whether expected outcomes and learning objective are being achieved. NOTE: You do not need to collect data from the same sources every year. Rather, some kind of assessment rotation will be sufficient (e.g., Years1 & 3, collect data from graduating seniors, Years 2 & 4 collect data from employers and alumni, etc.).*

We have developed or borrowed rubrics for use by the department for several of these items (**writing rubric** [**PDF**](https://docs.google.com/a/albion.edu/fileview?id=0BxYWBZS7r6a-MzhkMzVmNmMtMWY5Ni00OWJlLTg5OTYtMjBhOWUxM2FkMmUy&hl=en), **oral research presentation rubric** [**PDF**](https://docs.google.com/a/albion.edu/fileview?id=0BxYWBZS7r6a-ZTQ2MDU2NzktYWE2Mi00MjM5LTg0ZTctN2UxZTc4Mzc5ZWYx&hl=en) **-** again, if you want them, ask me as I cannot link them), and we will be working to develop department-wide rubrics for other items.  We will assess understanding of biological principles of senior biology majors and minors from ETS Field Test in Biology (subscores reported in each of the four areas of cell biology, molecular biology and genetics, organismal biology, and ecology and evolution).  We have been giving this test to our senior majors since 2000, and to our minors since 2005.  We would like to continue to give this test each year to seniors, if possible.  If additional funding is available, every several years we will use the ETS Major Field Test to assess levels of knowledge of incoming first-year students who plan to major in biology and of senior majors.  We will compare percentile scores between first-year and senior students.  We expect that seniors should show an average of an increase of at least 25% in their percentile scores in each area over those of first-year students.

As a department, we will discuss other ideas for assessment, such as developing a short student self-assessment tool that can be used for all students at the end of each of BIOL 195, 210, and another self-assessment tool for all majors and minors in their last semester on campus.  We will keep track of students who carry out research with faculty members, and we will document student presentations at national and regional meetings and students who are co-authors on publications.  In addition, we hope to begin collecting data from alumni.

We will focus on different goals in different years.  We have some data on some content and progoals from ETS Field Tests in Biology on which we will focus in 2009-2010.  We will begin collecting self-assessment from students this year, and we can begin to use those data in future years.

**Step 5: Analyze and interpret the data (Due October 1, 2009 with preliminary data; Due November 2, 2009 with final data for this assessment cycle)**

The Biology Department has been administering the ETS Major Field Test to all senior majors and minors for several years.  Summary data for our Biology majors and minors for 2007-2009, three years with exam Biology 4BMF, are presented in Table 1.  We cannot compare those data with earlier years, when there was a different version of the exam.  (ETS reports percentiles to nearest value of 5.)

Table 1.  ETS Major Field Test (Biology 4BMF) Scores for Albion Senior Biology Majors and

            Minors, 2007-2009.  Total scores and subscores are reported as scaled scores; scores for

            assessment indicators are reported as percent correct.

                                                                                           2007                2008                2009

**Number of Albion students tested (majors/minors)**                42/16               68/14               57/16

**Total Mean Score** (range 120-200) for Albion BIO Majors           152.5               153.8               154.0

Albion Examinees’ Mean Score as percentile                                45                    45                    45

             (n = 21,681 individuals for comparison)

Albion Institutional Mean Score as percentile                              45                    50                    55

            (n = 381 schools)

Total Mean Score for Albion BIO Minors                                    153.3               150.1               153.1

**Subscores** (range 20-100) for Albion BIO Majors (percentile)

Cell Biology                                                                         52.8 (45)         53.8 (45)         54.8 (50)

Molecular Biology & Genetics                                                  54.2 (50)         53.4 (45)         53.6 (45)

Organismal Biology                                                               50.3 (35)         53.2 (45)         51.8 (40)

Pop. Biology/Ecology/Evolution                                               54.7 (45)         53.3 (40)         55.8 (55)

**Assessment Indicators** for Albion BIO Majors and Minors shown as percent correct (percentile)

1 Biochemistry & Cell Energetics                                             47 (65)             46 (60)             49 (70)

2 Cell Structure, Organization, and Function                             56 (45)             56 (45)             54 (35)

3 Molecular Biology & Molecular Genetics                                 49 (60)             49 (60)             47 (55)

4 Diversity of Organisms                                                       47 (35)             51 (50)             51 (50)

5 Organismal – Animal Structure and Function                          60 (50)             58 (35)             56 (25)

6 Organismal – Plant Structure and Function                            38 (20)             41 (30)             42 (30)

7 Population Genetics & Evolution                                          56 (55)             56 (55)             55 (50)

8 Ecology: Population, Community, Ecosystem                         56 (40)             56 (40)             61 (65)

9 Analytical Skills                                                                51 (35)             53 (45)             52 (40)

# majors/minors with scores > 175 (95 percent or higher;

   comparison group of 21,681 individuals)                               1/0                   4/0                   0/0

# with scores 171-175 (90-94%)                                            2/0                   3/0                   5/1

# with scores 166-170 (80-89%)                                            4/1                   4/0                   6/2

#with scores 161-165 (70-79%)                                             4/0                   6/3                 10/1

% of majors/minors with scores of at least 70%                     26/6                 25/21               37/25

# majors/minors with scores < 151 (lowest 35%)                   20/6                 34/8                 20/6

%  majors/minors with scores in lowest 35%                         48/37                50/57               34/37

**Step 6: How will the data collected be used for decision-making, strategic planning, etc. (Due October 1, 2009 with preliminary data; Due November 2, 2009 with final data for this assessment cycle)**

*NOTE:You will need to submit a summary report of your findings to the Assessment Committee for review. In that report, please include details of how the data will be used, any program changes that will be made (or not made). Questions to ask yourself/to include in the report are as follows:*

* *How, exactly, will your data be used to help with program planning and improvement?*
* *Will your program form a committee to review assessment findings, and make recommendations for change or improvement in a timely manner?*
* *Will your entire department convene to discuss assessment results and program changes?*
* *Who will make formal recommendations for curricular or other changes—the chair/head? The committee?*

Based on scores of our students on the ETS Field Tests (Biology 4BMF), we recognize that there is room for improvement in all areas covered by this exam (which focuses mostly on content).

At this time, we have chosen to focus on **Assessment Indicator 9, Analytical Skills**.  This particular assessment indicator ties in with several of our learning goals for students, including:

  Content Goal 3.  Our students will acquire scientific investigation skills in laboratory and field courses

      necessary to apply the methods that biologists use to answer biological questions.

  Process Goal 1.  Our students will develop enhanced critical thinking skills.

This assessment indicator also ties in with possible new competencies for students who are interested in careers in health fields, as set forth in “Scientific Foundations for Future Physicians,” Report of the AAMC-HHMI Committee, 2009, including:

   Competency E1.  Apply quantitative reasoning and appropriate mathematics to describe or explain phenomena

       in the natural world.

We have already begun a discussion within our department as to how we can better work with our students to improve their analytical skills.  Our entire department is eager to work on this target, and we will meet regularly (at least once a semester) to specifically review our findings and determine ways to assess improvement in this area (including improved scores on the ETS Field Exam).  The department chair will make formal recommendations after discussing all ideas with everyone in the department.

Ideas include:

-  return to giving ETS Field Exam in Biology to set of incoming Biology students in their first semester, in order to be able to compare scores between entering and leaving students (requires additional funding from Provost’s Office for assessment exams for entering students)

-  have discussions with faculty members in mathematics and psychology about a possible new course in biostatistics or biometrics, with focus on experimental design and interpretation of actual biological data sets as well as introduction or reinforcement of some basic statistics

-  put more intentional focus in most existing biology courses on interpretation of data sets and figures (especially graphs)

-  bring back our “Biology Majors (and Minors) Handbook,” which has specific sections on topics such as Statistics, Citations, and other areas

-  revisit and update our Skills Flow Chart for our Introductory Biology Courses – when we had three introductory courses (before 1999), we were clear about what activities happened in each of those courses with regard to five different areas:  Observation, Statistics, Library, Written/Oral Skills, and Computer.  We need to rework this chart for our current two-course introductory sequence.

-  start a Moodle Website for Biology majors (if allowed, apparently Moodle is mainly for courses at Albion), where we could more easily reach all majors and post our Biology Majors Handbook