Assessment Plan for Revised Biology BA program: 2012-2017

Student Learning Objectives	Courses Resulting in Achievement of Objectives	Activities Resulting in Achievement of Objectives	Measures of Achievement of Objectives	Timetable
1) Students will demonstrate an understanding of core concepts and principles of biology	Concepts introduced in introductory series, BIO 111/212/213/214 and upper division BIO electives.	Class assignments, projects, exams and laboratory activities.	ETS Major Field Tests in Biology administered to all seniors in BA program once every five years	Fall 2017
2) Students will be able to prepare and deliver clear and cogent presentations of experimental results	BIO 303 Genetics	Oral presentations of laboratory investigations	Evaluation of oral presentations on laboratory investigations (Rubric Attached)	Fall 2013, Fall 2015
3) Students will demonstrate proficiency in standard laboratory or field research including: use of standard instrumentation, performing routine calculations, maintaining laboratory notebooks, and interpreting experimental results.	BIO 314 Advanced Cell Biology, BIO 315 Ecology and BIO 430 Stream Ecology	Laboratory and/or field exercises associated with courses.	Evaluation of core laboratory assignments, lab notebooks and final research reports in BIO 314, BIO 315, and BIO 430 (approximately 60 students) (Rubric Attached)	Fall 2012-Spring 2013
4) Students will be able to demonstrate proficiency in scientific writing	Writing intensive courses in BA program: BIO314, BIO315, BIO 430 and BIO405.	Research papers or essays	Evaluation of papers or essays (Rubric Attached)	Fall 2014-Spring 2015

Student Learning Objective 1: Students will demonstrate an understanding of core concepts and principles of biology. Evaluation of ETS Major Field Test Results (make consistent with actual practice)

The ETS field test will be administered to Biology majors who have completed at least 20 hours of Biology courses work. Target sample size is approximately 30 students. Students will take the exam in the context of upper division biology courses within the major.

Evaluation of ETS results

1. Mean total score of BSC biology students will be compared to scores of 15 peer institutions (medium size public colleges or university serving predominantly urban students).

   Exceeding Standard – means score exceeding the 70th percentile of peer institutions
   Meeting Standard – mean score in the 40th to 70th percentile of peer institutions
   Failing Standard – mean score below the 40th percentile of peer institutions.

2. Mean scaled score of BSC biology students in 4 sub-disciplines (1. Cell Biology, 2. Molecular Biology and Genetics, 3. Organismal Biology and 4. Population Biology, Evolution and Ecology) will be compared to mean scores from peer institutions.

   Exceeding Standard – means score exceeding the 70th percentile of peer institutions
   Meeting Standard – mean score in the 40th to 70th percentile of peer institutions
   Failing Standard – mean score below the 40th percentile of peer institutions.

3. Mean scores of BSC biology students on 9 assessment indicators (1. Biochemistry and cell energetic, 2. Cellular Structure, organization and function, 3. Molecular biology and genetics, 4. Diversity of organisms, 5. Animals, 6. Plants, 7. Population genetics and evolution, 8. Ecology, 9. Analytical skills) will be compared to mean scores of peer institutions

   Exceeding Standard – means score exceeding the 70th percentile of peer institutions
   Meeting Standard – mean score in the 40th to 70th percentile of peer institutions
   Failing Standard – mean score below the 40th percentile of peer institutions.

4. Calculate means total scores, mean subdiscipline scores and mean scores for assessment indicators for students within each concentration of the Biology BA program. If sample sizes are large enough, compare to mean scores of peer institutions.

   Exceeding Standard – means score exceeding the 70th percentile of peer institutions
   Meeting Standard – mean score in the 40th to 70th percentile of peer institutions
   Failing Standard – mean score below the 40th percentile of peer institutions.

5. Scores of individual students will be analyzed and compare to means of students at peer institutions.

   Exceeding Standard – total score -2SEM (standard error of measurement) is greater than peer mean
   Meeting Standard – total score is within $\pm$ 2SEM of the peer mean
   Failing standard – Total score + 2SEM is below the peer mean

6. Analyze 4 sub-discipline scores of individual students and compare to means of students at peer institutions. For all students exceeding or failing the standard – analyze biology courses completed

   Exceeding Standard – total score -2SEM (standard error of measurement) is greater than peer mean

Meeting Standard – total score is within ± 2SEM of the peer mean
Failing standard – Total score + 2SEM is below the peer mean

Student Learning Objective 2: Students will be able to prepare and deliver clear and cogent presentations of experimental results

Assessment Activity: Oral presentation of independent project in BIO303

Assessment Rubric

1. Does Not Meet Standard

(If any of these errors are committed, the report doesn't meet the standard)

a. Failed to describe the research question, the experiment or the significance of the results.
b. Spoke quietly or mumble such that much of the presentation was inaudible.
c. Visual aids failed to summarize research question, experiment, or data.
d. Numerous errors in usage of scientific terminology or errors of fact which reflect a lack of understanding of the experiment and its results.

2. Approaching Standard

(All of these items must be achieved to be "approaching the standard")

a. Presentation included a description of the research question, experiment and significance of results.
b. Spoke audibly but read much of the presentation verbatim from notes or off slides, used distracting speech pattern (“like, you know, uh”, etc.) numerous times, or failed to make eye contact with audience.
c. Visual aids included research question, experiment, data and significance, but presenter failed to actively refer to visual aids during much of the presentation.

3. Meeting Standard

(All of these items must be achieved to be "meeting the standard")

a. A organized presentation with a clear delineation of research question, experiment and significance of results
b. Oriented audience to tables, figures and graphs and explicitly led them through the analysis.
c. Spoke clearly and extemporaneous with few references to notes. Stood up straight and established eye contact with audience throughout the presentation, although may have displayed some evidence of nervousness.

4. Exceeding Standard

(All of these items must be achieved to be "exceeding the standard")

a. Well organized presentation with clear integration of content.
b. Displayed real insight into the natural process being investigated and has original suggestions for improvement of the experiment or further investigations.
c. Appeared relaxed and confident, spoke clearly, stood up straight and established eye contact with audience throughout the presentation.
d. Explained and expanded on information in slides during the presentation. Oriented audience to tables, figures and graphs and explicitly led them through the analysis.

Student Learning Objective 3: Students will demonstrate proficiency in standard laboratory research including: use of standard instrumentation, performing routine calculations, maintaining laboratory notebooks, and interpreting experimental results

Assessment Activity: Laboratory exercises in BIO 314

Assessment Rubric

1. Does Not Meet Standard

(If any of these errors are committed, the report doesn't meet the standard)

a. Failed to obtain accurate and precise results from standard instruments

b. Failed to correctly perform and report routine calculations

c. Failed to completely record and summarize experiment results

d. Numerous errors in usage of scientific terminology or errors of fact which reflect a lack of understanding of the experiment and its results

2. Approaching Standard

(All of these items must be achieved to be "approaching the standard")

a. Obtained measures from standard instruments but resulting data my exhibit significant error variance

b. Routine calculations were performed but algorithms used were not reported or some calculations contain errors

c. Experimental results were recorded but may be poorly organized or incomplete

d. A few errors in scientific usage or errors of interpretation but not sufficient to obscure a basic understanding of the experimental results

3. Meeting Standard

(All of these items must be achieved to be "meeting standard")

a. Measures obtained from standard instruments are generally accurate and precise

b. Calculations were complete and performed correctly

c. Experimental results were completely recorded

d. Usage of scientific terminology and interpretation of results is generally correct but may be simplistic

4. Exceeding Standard

(All of these items must be achieved to be "exceeding standard")

a. Measures obtained from standard instruments are extremely accurate and precise

b. Calculations were complete, performed correctly, and well organized

c. Experimental results were completely recorded and well summarized

d. Superior usage of scientific terminology and interpretation of results is clear and insightful

Student Learning Objective 3: Students will demonstrate proficiency in field research including: use of standard instrumentation, performing routine calculations, maintaining field notebooks, and interpreting experimental results

Assessment Activity: Field research exercises in BIO 315

Assessment Rubric

1. Does Not Meet Standard

(If any of these errors are committed, the report doesn't meet the standard)

a. Failed to obtain accurate and precise results from standard instruments

b. Failed to correctly perform and report routine calculations

c. Failed to completely record field observations and results

d. Numerous errors in usage of scientific terminology or errors of fact which reflect a lack of understanding of the field exercise and its results

2. Approaching Standard

(All of these items must be achieved to be "approaching the standard")

a. Obtained measures from standard instruments but resulting data may exhibit significant error variance

b. Routine calculations were performed but algorithms used were not reported or some calculations contain errors

c. Field observations and results were recorded but may be poorly organized or incomplete

d. A few errors in scientific usage or errors of interpretation but not sufficient to obscure a basic understanding of the field exercise

3. Meeting Standard

(All of these items must be achieved to be "meeting standard")

a. Measures obtained from standard instruments are generally accurate and precise

b. Calculations were complete and performed correctly

c. Field observations and results were completely recorded

d. Usage of scientific terminology and interpretation of results is generally correct but may be simplistic

4. Exceeding Standard

(All of these items must be achieved to be "exceeding standard")

a. Measures obtained from standard instruments are extremely accurate and precise

b. Calculations were complete, performed correctly, and well organized

c. Field observations and results were completely recorded and well summarized

d. Superior usage of scientific terminology and interpretation of results is clear and insightful

Student Learning Objective 4: Students will be able to demonstrate proficiency in scientific writing

Assessment Activity: Laboratory report in 314, 315 or 405

Assessment Rubric

5. Does Not Meet Standard

(If any of these errors are committed, the paper doesn't meet the standard)

e. Commits one or more major errors of interpretation
f. Omits one or more sections of a scientific paper, or one or more sections incorrectly written (e.g. *Results* or *Materials and Methods* without narrative)
g. Data are not summarized in tables, figures or graphs
h. Numerous errors in usage of scientific terminology, errors of fact or awkward writing which reflect a lack of understanding of the experiment and its results.

6. Approaching Standard

(All of these items must be achieved to be "approaching the standard")

d. Includes all the sections of a scientific paper. Some of the sections may be lacking essential material or material may be included in inappropriate sections of the report
e. Data are summarized in tables, figures or graphs. Tables and graphs may be poorly labeled, lack legends, or fail to employ scientific conventions.
f. A few errors in scientific usage, errors of fact, or grammar but not so many as to obscure the description of the experiment.

7. Meeting Standard

(All of these items must be achieved to be "meeting the standard")

d. Principle results of the investigation are correctly interpreted
e. Includes all the relevant material organized into appropriate sections of a scientific paper. The level of detail may be inappropriate for a professional paper and the organization of the narratives within a section may be awkward.
f. Data are summarized in tables, figures or graphs which are clearly labeled, employ scientific conventions and contain informative legends.
g. Generally appropriate scientific usage employed, report is factually accurate and contains few grammatical errors and little awkward writing.

8. Exceeding Standard

(All of these items must be achieved to be "exceeding the standard")

a. A very complete and professional scientific paper with material properly organized within appropriate sections, tables, and figures. Report is clearly written and follows scientific conventions.
b. Student displays real insight into the natural processes being investigated, successfully evaluates the outcome of the experiment and offers original suggestions for improvement of the experiment or further investigations.