

2015-16 Student Learning Assessment Report, Academic

Program: Biology (BS)	Degree: Major	Department Head: James Angstadt	Submitted By: James Angstadt	Date Submitted: 05/24/2016	
<p>Mission: The Biology Department seeks to develop in each student an appreciation of the science of biology at all levels of study (molecular, cell, whole organism and populations) which is understood and integrated in terms of Darwinian evolution. This is accomplished through a rigorous, broadly based, laboratory-intensive curriculum taught by faculty who are dedicated, first and foremost, to enriching the learning experience of their students. In addition to a biology core curriculum, all students take additional courses in the areas of cell/molecular biology, physiology, morphology, and organismic/population biology. A major emphasis of our program is to encourage critical thinking and an active engagement in the biological sciences. We do this by keeping class sizes small and including a laboratory experience as an integral component of most courses. Many laboratories incorporate independent research projects where students creatively build on fundamental concepts and techniques to address interesting biological questions. The program further encourages and reinforces independent research skills by offering credit for on-campus Independent Research courses mentored by departmental faculty or off-campus Science internships in Biology. In order to accomplish these pedagogical goals, the department hires only broadly-trained faculty who also possess expertise in a particular biological discipline. Faculty members are encouraged to establish and maintain active research programs in order to remain current in their disciplines, enthusiastic about their courses, and to provide independent study opportunities for students. The results underscored our commitment to communicating strict deadline policies to our students. We do not accept late work in any of our classes, so the assessment ensured we emphasize our policies clearly in our introductory lectures.</p>					
1. Major/Program Student Learning Outcomes Students will be able to...	2. Phase	3. Assessment Procedures (Planning/ determining)	4. Assessment Results (Collecting/ analyzing)	5. Use of Results (Discussing/ using results)	6. Determining if changes impacted student learning
<p>1. Demonstrate an understanding of the process of science and develop an appreciation of contemporary issues in biology.</p> <p>Criteria: (How do you know students are achieving learning outcome?) At least 80% of students scoring 70% or greater on Final Exam.</p>	<p>Planning</p> <p>Collecting</p> <p>Discussing</p>	<p>Method: (ex. tests, presentations, research paper) Evaluate results of Biol 190 Final Exam. Focus is on "understanding science"</p> <p>Using a Sample of Students? Yes</p> <p>If yes, describe your sample. All students in 4 sections of Biol 190</p> <p>When does assessment occur? Fall 2013 and Spring 2014</p> <p>How often does assessment occur?</p>	<p>These results are from 2013-2014</p> <p>Final quiz in this course assesses a basic understanding of topics covered throughout the semester, which focus on the scientific method. Specific topics that students learn about include scientific hypotheses and models, experimental design, basic statistics, methods of data analysis and presentation, understanding and searching scientific literature, writing a primary research paper in the sciences, and oral presentation of research findings.</p> <p>N= 76 students 100% met the standard. 38/76 scored in the A range 28/76 scored in the B range 10/76 scored in the C range</p> <p>Learning Outcome Met? (Based on Criteria) Yes</p>	<p>The statements below are from the report for 2013-2014</p> <p>The department is satisfied that students completing this course, which is required of all biology majors, are gaining a basic, but comprehensive, understanding of the scientific method and the means by which scientists communicate their research findings.</p>	

<p>2. Demonstrate competence with equipment and experimental methods.</p> <p>Criteria: (How do you know students are achieving learning outcome?) At least 80% of students scoring 70% or greater on lab intensive, graded tasks.</p>	<p>Impact</p>	<p>Method: (ex. tests, presentations, research paper) Lab skills test and lab practical exams</p> <p>Using a Sample of Students? No</p> <p>If yes, describe your sample.</p> <p>When does assessment occur?</p> <p>How often does assessment occur?</p>	<p>Fall 2014 Neurobiology Biol-440 Lab skills quiz – students graded on an array of practical skill demonstration and written questions. Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Only 74% of the students met the criterion for success.</p> <p>Spring 2015 General Biology for Social Sciences Biol-140 Practical exam requires students to identify structure and function of organs in dissected specimens, answer questions about cardiovascular function, interpret histology images, and demonstrate ability to solve biomechanics problems. Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Only 74% of students met the criterion for success.</p> <p>Spring 2015 General Biology II Biol-120 Lab practical exam. Students were presented with questions at 40 stations, in which they were asked to identify various biological specimens. Students were also asked questions pertaining to mammalian and plant physiology as well as to calculate and evaluate statistical results from a stream analysis. Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Only 74% of students met the criterion for success.</p> <p>Fall 2015 Neurobiology Biol-440 Lab skills quiz 93% of students met or exceeded the criterion for success. Thus, use of results led to improved student performance. Criteria were met.</p>	<p>Fall 2014 Neurobiology Biol-440 In fall 2015, we will attempt to improve lab skill learning by offering students a review/practice session a day or so prior to administering the quiz.</p> <p>Spring 2015 Gen Bio for Social Sciences Biol-140 In the fall of 2015 we will emphasize the importance of attending the review sessions already offered to prepare for this assessment.</p> <p>Spring 2015 Gen Bio II Biol-120 Many of our freshman scored exceptionally well on this assessment – over 13% with grades of 93% or higher. The rigor of this assessment must be maintained in order to properly prepare students for their sophomore level biology courses. To help improve the results, we will increase our efforts to encourage effective study habits.</p> <p>Spring 2016, General Biology II, Biol 120 This year, only 62% met the criterion for success. Again, some students (17%) scored in the A range on the assessment. Given that the assessment is essential the same, we believe that this result is most likely to reflect a decline in the quality of incoming students.</p>	<p>Fall 2015 Biol-440. There was a 19 percentage point increase in students who met or exceeded the standard. Thus, use of results led to improved student performance for this group of students.</p> <p>Fall 2015 and Spring 2016 Gen Bio IIA for Social Sciences Biol-140 6 lab sections total. There was a 17 percentage point increase in the number of students who met or exceeded the criterion. This indicates that our use of results improved student learning for this group of students.</p> <p>Spring 2016 General Biology II, Biol 120 Our efforts here were less successful, with a decline in the percent of students meeting the criterion for success. We believe this results is most likely to reflect a decline in the quality of incoming students.</p>
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<p>3. Develop independent research skills and an ability to apply basic mathematical techniques in the biological sciences.</p> <p>Criteria: (How do you know students are achieving learning outcome?) At least 80% of students scoring 70% or greater on selected tasks</p>	<p>Collecting Discussing</p>	<p>Method: (ex. tests, presentations, research paper) One or both of the following: a. assess performance on selected exam questions that test for competence in this skill. b. Evaluate student performance on projects or written assignments that requires</p> <p>Using a Sample of Students? Yes</p> <p>If yes, describe your sample. Students in various biology courses.</p> <p>When does assessment occur? Throughout the academic year</p> <p>How often does assessment occur? Throughout the year</p>	<p>Fall 2015 General Biology I BIOL-110 Students read an article on recent hominin ancestors, obtained background information on the subject and interpret data from the literature. Assesses independent research skills. Learning Outcome Met? (based on Criteria) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Two lecture sections (n= 55 students). 91% of students met the criterion for success.</p> <p>Fall 2015 General Biology I BIOL-110 Two lecture sections (n= 55 students). Exam question where students had to calculate the carrier frequency of an allele given a population at Hardy-Weinberg equilibrium. Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>Only 49% of students met the criterion for success.</p> <p>Fall 2015 General Biology I BIOL-110</p>	<p>Comments on individual assessments that failed to meet our goal.</p> <p>Fall 2015 General Biology I BIOL-110 Two lecture sections (n= 55 students). Exam question where students had to calculate the carrier frequency of an allele given a population at Hardy-Weinberg equilibrium. Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Only 49% of students met the criterion for success.</p> <p>This assessment result is a bit misleading because the question was worth only 3 points, and students received a score of 1, 2 or 3. Thus, the student needed a perfect 3/3 to meet the criterion. Nevertheless, Dr. Harbison plans to incorporate additional classroom activities to try and improve student understanding of the relevant concepts.</p> <p>Fall 2015 General Biology I BIOL-110 Genetics exam questions requiring calculation of expected phenotypic ratios or allele frequencies in a genetic cross. Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>Only 35-39% of students met the criterion</p>	

Genetics exam questions requiring calculation of expected phenotypic ratios or allele frequencies in a genetic cross.

Learning Outcome Met? (based on Criteria)
 Yes No

Only 35-39% of students met the criterion for success.

For this sample, across the 3 assessments, 60% of students met the criterion. For Biol 110 the criterion was not met.

Fall 2015
General Biology for Social Sciences BIOL-140
Lab data analysis exercise required calculation of retinal ganglion cell receptive field characteristics.

Learning Outcome Met? Yes No
97% of students met the criterion for success.

Fall 2015
Plant Ecology BIOL-240
Analyze and then present data from a field experiment.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Fall 2015
Plant Ecology BIOL-240
Students were given materials (seeds to study root growth and floating aquatic plants) and they had to design an experiment, analyze the data and then write a full research report.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Fall 2015
Marine Ecology BIOL-400
Series of final exam questions that evaluate student understanding of experimental design and their ability to interpret recently published

for success. This was the first time that Mr. Rapp taught general biology lecture. If he does it again, he will add class activities that challenge students practice this sort of calculation. However, Mr. Rapp is not assigned to teach general biology lecture next fall.

			<p>data on community ecology in a coral reef. Learning Outcome Met? <input type="checkbox"/> Yes <input type="checkbox"/> No 85% of students met the criterion for success.</p> <p>Fall 2015 Biochemistry BIOL-420 Scientific paper reporting results of an independent lab project: MALDI mass spectrometry to assess protein content in commercially available protein supplement. Learning Outcome Met? <input type="checkbox"/> Yes <input type="checkbox"/> No 100% of students met the criterion for success.</p> <p>Fall 2015 Biomechanics BIOL-450 Independent Research Project Design Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input type="checkbox"/> No 100% of students met the criterion for success</p> <p>Fall 2015 Biomechanics BIOL-450 Final Exam – course emphasizes quantitative skills and thus the final exam is a useful means of assessing our students' ability to apply mathematical techniques to solving problems in the biological sciences. Learning Outcome Met? (based on Criteria) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 94% of the students met the criterion for success.</p> <p>Fall 2015 Ecology BIOL-225 Reports describing the results of an independent research project and three short data analyses from field experiments; involved data analysis and statistics (ANOVA, t-test, chi-square) Learning Outcome Met? (based on Criteria) <input type="checkbox"/> Yes <input type="checkbox"/> No 100% of students met the criterion for success.</p>		
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Fall 2015
Ecology BIOL-225
Exam with strong emphasis on ecological modeling and mathematical approaches to understanding predator-prey dynamics, population size fluctuations, and resource competition models
Learning Outcome Met?
(based on Criteria)
 Yes No
92% of students met the criterion for success.

Spring 2016
Animal Physiology BIOL-430
Evaluation of Data collection, analysis and presentation for a class project collecting information on vasoconstriction or dilation of the finger as a function of temperature.
Learning Outcome Met?
(based on Criteria)
 Yes No
96% of students met the criterion for success.

Spring 2016
Biology of the Vertebrates BIOL-230
Short report describing the results of a bird foraging experiment; involved data analysis and statistics (ANOVA, t-test)
Learning Outcome Met?
(based on Criteria)
 Yes No
100% of students met the criterion for success.

Spring 2016
Biology of the Vertebrates BIOL-230
In-class exercises where students to grapple with concepts introduced in lecture. Most of these involve graphing, interpreting quantitative results from primary literature, and working with ecological metrics (e.g., estimating population sizes from mark-recapture data)
Learning Outcome Met?
(based on Criteria)
 Yes No

92% of students met the criterion for success.

Spring 2016
Evolution BIOL-265
Homework assignment requiring calculation of predicted population allele frequencies based on a "PopGen" simulation of genetic drift effects.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Spring 2016
Developmental Biology BIOL-335
Long-term laboratory research project consisting of initial proposal (with revisions), design experiment, carry out experiments (with 3-4 trials), collect and analyze data. Students present results in a written report, a brief oral report and a poster.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Fall 2015 and Spring 2016 Combined
Biol-190 Writing and Research Skills for Biologists (3 sections combined)
Oral presentation based on analysis of the scientific literature.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Fall 2015
General Biology for Social Sciences BIOL-140
Lab data analysis exercise required calculation of retinal ganglion cell receptive field characteristics.
Learning Outcome Met?
 Yes No
97% of students met the criterion for success.

Fall 2015
Plant Ecology BIOL-240
Analyze and then present data from a field experiment.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Fall 2015
Plant Ecology BIOL-240
Students were given materials (seeds to study root growth and floating aquatic plants) and they had to design an experiment, analyze the data and then write a full research report.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Fall 2015
Marine Ecology BIOL-400
Series of final exam questions that evaluate student understanding of experimental design and their ability to interpret recently published data on community ecology in a coral reef.
Learning Outcome Met? (based on Criteria)
 Yes No
85% of students met the criterion for success.

Fall 2015
Biochemistry BIOL-420
Scientific paper reporting results of an independent lab project: MALDI mass spectrometry to assess protein content in commercially available protein supplement.
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success.

Fall 2015
Biomechanics BIOL-450
Independent Research Project Design
Learning Outcome Met? (based on Criteria)
 Yes No
100% of students met the criterion for success

Fall 2015
Biomechanics BIOL-450
Final Exam – course
emphasizes quantitative skills
and thus the final exam is a
useful means of assessing our
students' ability to apply
mathematical techniques to
solving problems in the
biological sciences.
Learning Outcome Met?
(based on Criteria)
 Yes No
94% of the students met the
criterion for success.

Fall 2015
Ecology BIOL-225
Reports describing the results
of an independent research
project and three short data
analyses from field
experiments; involved data
analysis and statistics
(ANOVA, t-test, chi-square)
Learning Outcome Met?
(based on Criteria)
 Yes No
100% of students met the
criterion for success.

Fall 2015
Ecology BIOL-225
Exam with strong emphasis on
ecological modeling and
mathematical approaches to
understanding predator-prey
dynamics, population size
fluctuations, and resource
competition models
Learning Outcome Met?
(based on Criteria)
 Yes No
92% of students met the
criterion for success.

Spring 2016
Animal Physiology BIOL-430
Evaluation of Data collection,
analysis and presentation for a
class project collecting
information on
vasoconstriction or dilation of
the finger as a function of
temperature.
Learning Outcome Met?
(based on Criteria)
 Yes No
96% of students met the
criterion for success.

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BIOL-230
Short report describing the results of a bird foraging experiment; involved data analysis and statistics (ANOVA, t-test)
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 Yes No
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Spring 2016
Developmental Biology
BIOL-335
Long-term laboratory research project consisting of initial proposal (with revisions), design experiment, carry out experiments (with 3-4 trials), collect and analyze data. Students present results in a written report, a brief oral report and a poster.

			<p>Learning Outcome Met? (based on Criteria) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 100% of students met the criterion for success.</p> <p>Fall 2015 and Spring 2016 Combined Biol-190 Writing and Research Skills for Biologists (3 sections combined) Oral presentation based on analysis of the scientific literature. Learning Outcome Met? (based on Criteria) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 100% of students met the criterion for success.</p> <p>Among all courses except Biol 110, the criterion for success was met. Of a total of 446, 435 (97.5%) met the criteria. When combined with the results of Biology 110, across all courses where the assessment occurred, 468 of 501 students (93%) met the criterion.</p> <p>Learning Outcome Met? (Based on Criteria) Yes</p>		
<p>4. Know the important facts and concepts relevant to the discipline.</p> <p>Criteria: (How do you know students are achieving learning outcome?) At least 80% of students scoring 70% of greater on selected tasks.</p>	Planning	<p>Method: (ex. tests, presentations, research paper) Track performance on selected exam questions from a course in one of the four major course areas or genetics. Instructor identifies an exam question that requires critical thinking and reports the re</p> <p>Using a Sample of Students? Yes</p> <p>If yes, describe your sample. Students in selected courses with an emphasis on upper level courses.</p> <p>When does assessment occur? Throughout the academic year</p> <p>How often does assessment occur? Throughout each semester</p>	<p>Learning Outcome Met? (Based on Criteria)</p>		

<p>5. Demonstrate critical thinking by successfully applying fundamental biological concepts to novel scenarios.</p> <p>Criteria: (How do you know students are achieving learning outcome?) At least 50% of students meet or exceed standard (Score 70% or greater).</p>	<p>Planning</p>	<p>Method: (ex. tests, presentations, research paper) Track performance on selected exam questions from a course in one of the four major course areas or genetics. Instructor identifies an exam question that requires critical thinking and reports the re</p> <p>Using a Sample of Students? Yes</p> <p>If yes, describe your sample. Evaluate students in selected courses with an emphasis on upper level courses</p> <p>When does assessment occur? Throughout the academic year.</p> <p>How often does assessment occur? Throughout the academic year.</p>	<p>Learning Outcome Met? (Based on Criteria)</p>		