



**Undergraduate Program-Specific Student Learning Outcome Assessment
Annual Report – 2020-21
GUIDELINES
for the
2020-21 ACADEMIC YEAR**

Office of Institutional Effectiveness, Planning, and Assessment

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I. Program Information

Program/Department: *Biological Sciences*

Department Chair: Matthew Wallace E-mail: mwallace@esu.edu Phone: 422-3720

Department Assessment Coordinator: Jennifer White E-mail: jwhite@esu.edu Phone: 422-3712

II. Program-Specific Student Learning Outcomes (Educational Objectives) Assessed During Last Academic Year

List ALL Program-Specific SLOs first, their direct alignment to University SLOs, and the assessment timeline (annual or bi-annual) for assessing each program SLO.

Program Goals: B.S./B.A. in Biology

All graduates should be able to:

1. correctly apply the scientific method
 - design a hypothesis and use the scientific method to answer a question
 - use basic analytical skills, including statistics, in the scientific process
2. summarize, critically interpret, and present data in both mathematical and graphical formats
3. communicate within the scientific community:
 - find, retrieve, read, and comprehend scientific literature
 - create effective written and oral presentations that integrate and explain scientific results and conclusions
4. recognize and relate the different levels of structure in biology from atoms through the biosphere
5. correlate structure with function at multiple levels
6. recognize the hierarchy in the diversity of life and identify the characteristics of major lineages of organisms
7. understand evolutionary theory and its role as the unifying theme in the biological sciences
8. explain how genetic information is copied, transmitted between generations, and utilized during an organism's lifespan
9. understand ecological relationships among organisms and between organisms and their environment
10. demonstrate the skills and knowledge required for success in obtaining employment or in pursuing graduate/professional training in the biological sciences

BIOLOGY 331: Genetics

Program SLO:	UNIVERSITY SLO	TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)
BIOL #1: Apply the scientific method	V. Apply scientific reasoning to solve problems.	every semester

BIOLOGY 200: General Ecology

Program SLO:	UNIVERSITY SLO	TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)
BIOL #1: Apply the scientific method	V. Apply scientific reasoning to solve problems.	annual

BIOLOGY 104: Human Ecology

Program SLO:	UNIVERSITY SLO	TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)
BIOL #6. Recognize the hierarchy in the diversity of life and identify the characteristics of major lineages of organisms.	V. Apply scientific reasoning to solve problems.	annual

BIOM 470: Marine Biology

Program SLO:	UNIVERSITY SLO	TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)
MRSC #4: recognize the diversity of marine life and the evolutionary relationships between major marine groups.	V. Apply scientific reasoning to solve problems.	annual

BIOL 114: Introductory Biology I

Program SLO:	UNIVERSITY SLO	TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)
BIOL #3. Communicate within the scientific community	II. Utilize critical thinking skills	annual
BIOL #2. summarize, critically interpret, and present data in both mathematical and graphical formats	VIII. Quantitative	annual
BIOL #1: Apply the scientific method	V. Apply scientific reasoning to solve problems.	annual

III. Direct Measures Used

Using the table below, list and briefly describe the direct methods used to collect information assessing (If applicable).

Dept. SLO #	Direct Assessment Measure(s) Used	Assessment description (exam, observation, national standardized exam, oral presentation with a rubric, etc.)	Assessment completed by (student, supervisor, faculty, etc.)	When the assessment was administered in the student (internship, 4 th year, 1 st year, etc.)	To which students were assessments administered (all, only a sample, etc.)
BIOL 331	multiple choice question on two exams during the semester	Students were given introduction to topic, received feedback on understanding via the exam, and then had chance to improve their mastery of the concepts. The question requires students to infer the relationship between the alleles of each gene, and apply understanding to solve the problem.	Faculty	Usually sophomore year; assessment given S 2019, F 2019, F 2020	All students
BIOL 200					
BIOL #1	A full lab report including hypotheses and statistical analyses.	Multi-draft lab report with abstract, intro., methods, results, discussion & lit. cited w/ tables, graphs, statistical analyses.	Faculty	Usually sophomore year	All students
	Targeted exercises on data collection, organization, statistical	Calculating ecological community indices & behavioral observation coupled with with			

	analyses and presentation.	Chi-Square analysis.			
BIOL 104					
BIOL #6	Final exam question	Exam question	Faculty	Final exam for course, students of mixed years. Spring 2019.	All
BIOM 470					
MRSC #4: recognize the diversity of marine life and the evolutionary relationships between major marine groups.	In Marine Biology class (BIOM 470): pre-course survey (essay) and a similar essay exam question near the end of the course.	Students were asked to identify any major phyla in the ocean they could and circle (or otherwise mark) those phyla they felt were evolutionarily close. After class, during a midterm exam, an essay question asks them to list and describe marine animal phyla and list common features that unite the phyla (through evolution).	Completed by the faculty member.	Students were from mixed classes ranging from sophomores to seniors.	All students in the Marine Biology course (BIOM 470) offered in Spring, 2019.
BIOL 114					
Goal #3	Initial assessment: questions asked on exam.	Follow-up assessment to demonstrate improvement: similar questions asked on later exam. Target percentage: 60%.	Faculty	Mostly freshman Biology majors.	All students in the course.
Goal #2	Initial assessment: questions	Follow-up assessment to demonstrate	Faculty	Mostly freshman Biology majors.	All students in the course.

	asked on exam.	improvement: similar questions asked on later exam. Target percentage: 60%.			
Goal #1	Initial assessment: questions asked on exam.	Follow-up assessment to demonstrate improvement: similar questions asked on later exam. Target percentage: 60%.	Faculty	Mostly freshman Biology majors.	All students in the course.

IV. Indirect Measures Used

Using the table below, list and briefly describe the indirect methods used to collect information assessing (If applicable).

Following are incomplete data about student admissions to graduate programs and hiring into relevant jobs, compiled by faculty advisors, for 2019 and 2020 (not all faculty responded, due to more limited communication during the remote semesters). All apply to Biology Department goal #10: *demonstrate the skills and knowledge required for success in obtaining employment or in pursuing graduate/professional training in the biological sciences.*

- 3 admissions to Masters programs
- 1 admission to Veterinary school
- 3 admission to Medical School
- 2 admission to Nursing School
- 2 admissions to Pre-Physician Assistant programs
- 2 admissions to PhD programs
- multiple offers of employment in positions relevant to major

V. Student Performance Outcomes

How did the student perform on each assessment, compared to the department/program goal? What is the target/goal/score for each assessment? Then briefly summarize the results.

Assessment number/name	Target/Acceptable score	Number assessed in 2018-2019 (N) 2019-2020 (N)	Number & % meeting target/ Number and % not meeting target
BIOL 331	50%	S 2019: 37	Exam 2: 56.8% answered the question correctly

		F 2019: 79	Exam 1: 43.04% answered the question correctly Exam2:46.15% answered the question correctly Two sections exam scores were combined.
		F 2020: 53	Exam1:47% of student answered the question correctly (n=53). Exam2:48%of students answered the question correctly
BIOL 200	70%	~100 students each academic year	60 (60%) / 40 (40%)
	80%	~100 students each academic year	70 (70%) / 30 (30%)
BIOL 104			
Interpretation of phylogenetic trees	60% of students with correct interpretation	2019-2020: 98 students	65/98 (66.3%) met target
BIOM 470			
Marine Biodiversity	12/15 (80%)	18 students	16 of 18 (89%)
BIOL 114			
Goal #3	Target percentage: 60%.	136 students	Initial assessment: 16% incorrect, 84% correct. Follow-up assessment: 40% incorrect, 60% correct.
Goal #2	Target percentage: 60%.	136 students	Initial assessment: 63% incorrect, 37% correct. Follow-up assessment: 51% incorrect, 49% correct.
Goal #1	Target percentage: 60%.	136 students	Initial assessment: 32% incorrect, 68% correct.

			Follow-up assessment: 30% incorrect, 70% correct.

VI. Key Findings: *Briefly summarize the results of the assessments and how do these compare to the goals you have set?*

BIOL 331: Genetics

- 56.8% of students were able to correctly answer the focal question during the spring semester 2019. The question was asked on one exam after the subject had been discussed in class.
- The question was used in a pre/post-test comparison on exams in Fall 2019. Student ability to answer the question correctly increased modestly on the second exam. The scores reported are for two sections of genetics.
- The course is taught remotely and synchronously during the current semester, Fall 2020, due to the pandemic. Results for Fall 2020 were disappointing, but not surprising given the difficulty students are having with remote learning in genetics. Exam scores in the course are lower than when the course is taught face to face.
- For future rounds of assessment, it may make sense to include data on exam averages or overall course grades to address the degree of variation in how the class performs as a whole from year to year.

BIOL 200: General Ecology

- The goal was set at 70% for the multi-draft lab report, 60% of students met the standard and so our goal was not met. The targeted exercise goal was 80% with 70% of students meeting the goal and so that goal was not met.

BIOL 104: Human Ecology

- In the initial assessment, only 13 of 85 students (15.3%) were able to correctly interpret evolutionary relationships on a simple phylogenetic tree.
- In the final assessment, 65 out of 98 students (66.3%) correctly interpreted evolutionary relationships on a simple phylogenetic tree.
- The target percentage for this skill was reached.

BIOM 470: Marine Biology

- The goal was to have all students score at least 12 out of 15 for the essay question (there was no set score for the pre-course survey, but all students were individually to their pre-course survey answers).
- 16 of 18 scored 12 or higher, while two students scored less (11 and 9).
- All 18 students demonstrated significantly more knowledge by the end of the course, when compared to the beginning with all students showing an increase in the number of phyla they could name from memory and an increase in the correct evolutionary relationships.

BIOL 114: Introductory Biology I

- Goal #3: Although target percentages were achieved in both assessments, there were declines by students in the follow-up assessment.
- Goal #2: Although target percentages were not achieved in either assessments, there were improvements by students in the follow-up assessment.
- Goal #1: Target percentages were achieved in both assessments, there were slight improvements by students in the follow-up assessment.

VII. Describe Process Used by Program Faculty to Discuss and Interpret Key Findings

Through what modes were assessment results shared with program faculty? What process was used by program faculty to discuss and interpret the key findings? What hypotheses do program faculty have for why these are the results?

Each monthly department meeting agenda lists Assessment as old business, and we discuss the process at most meetings. Department minutes reflect discussions and votes on new procedures or curricular changes. Documents are routinely circulated through e-mail (such as guidelines, goal statements, assessment exercises, issues to consider for voting). Special departmental meetings are occasionally called to discuss particularly pressing or complicated issues. Some revisions in policies, curriculum, or procedures are communicated to students in the form of handouts and syllabi.

VIII. Changes Made as a Result of the Key Findings / Actions Taken

What changes or actions were taken or are planned for 2020-2021 and in the future in response to your key findings?

BIOL 331:

- The assessment method will be modified by restructuring question the focal question and adding several more questions. The question used in the recent analysis requires multiple skills which may make it overly complex as an assessment tool. The focal question requires students to analyze a cross and determine the number of offspring of various types. To solve the problem, students must also have learned a system of naming alleles of a gene that is unfamiliar to them. It might be better use a less layered question for the purpose of assessment.
- Create short video recordings of the instructor explaining how to do specific types of problems students find difficult. I explain how to do the problems in class and the classes are recorded, but I feel it would be helpful for students to be able to review specific types of problems with a short, targeted video.
- Provide additional problem sets that focus on the problem types that students find most difficult. I have created 5 problems sets with answers that are assigned periodically throughout the semester. The results of assessment indicate that additional practice problems may be needed.
- Students were introduced to the tutor for the course earlier in the semester and I will continue to encourage them to schedule sessions with her, as well as making use of my office hours for questions.

BIOL 200

The plan is to devote additional lab time to reviewing lab report writing and data manipulation and to make sure students take full advantage of the Writing Studio.

BIOM 470

Plan to allow those students who do not score 12 of 15 (or comparable) to have the option of a make up essay quiz to improve their performance on the in-class midterm exam.

BIOL 114

- Goal #3: More time and emphasis will be given to reinforce and integrate previous concepts with new ones in class.
- Goal #2: More time and emphasis will be given in class to work quantitative problems and interpret data and graphs.
- Goal #1: No changes planned at this time.

IX. Adjustments to/Deviation from the Department Assessment Plan

Describe any disparity from the submitted assessment plan and why it occurred.

BIOM 470

No disparities noted. Plan was to demonstrate improved understanding and knowledge of major marine groups and their evolutionary relatedness. All students demonstrated that improvement from the pre-course survey to the midterm exam. Two students missed the target of 12 / 15 points, but still improved (both gave zero correct information on the pre-course survey).