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

Updated July 20, 2020

For more information, please contact:
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Undergraduate Program-Specific Student Learning Outcome Assessment
Annual Report – 2020-21

I. Program Information
December 20, 2020
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

<table>
<thead>
<tr>
<th>Program SLO:</th>
<th>UNIVERSITY SLO</th>
<th>TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL #1: Apply the scientific method</td>
<td>V. Apply scientific reasoning to solve problems.</td>
<td>every semester</td>
</tr>
</tbody>
</table>
### BIOLOGY 200: General Ecology

<table>
<thead>
<tr>
<th>Program SLO:</th>
<th>UNIVERSITY SLO</th>
<th>TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL #1: Apply the scientific method</td>
<td>V. Apply scientific reasoning to solve problems.</td>
<td>annual</td>
</tr>
</tbody>
</table>

### BIOLOGY 104: Human Ecology

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

### BIOM 470: Marine Biology

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

### BIOL 114: Introductory Biology I

<table>
<thead>
<tr>
<th>Program SLO:</th>
<th>UNIVERSITY SLO</th>
<th>TIMELINE for ASSESSMENT (annual, semester, bi-annual, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL #3. Communicate within the scientific community</td>
<td>II. Utilize critical thinking skills</td>
<td>annual</td>
</tr>
<tr>
<td>BIOL #2. summarize, critically interpret, and present data in both mathematical and graphical formats</td>
<td>VIII. Quantitative</td>
<td>annual</td>
</tr>
<tr>
<td>BIOL #1: Apply the scientific method</td>
<td>V. Apply scientific reasoning to solve problems.</td>
<td>annual</td>
</tr>
</tbody>
</table>
III. Direct Measures Used
Using the table below, list and briefly describe the direct methods used to collect information assessing (If applicable).

<table>
<thead>
<tr>
<th>Dept. SLO #</th>
<th>Direct Assessment Measure(s) Used</th>
<th>Assessment description (exam, observation, national standardized exam, oral presentation with a rubric, etc.)</th>
<th>Assessment completed by (student, supervisor, faculty, etc.)</th>
<th>When the assessment was administered in the student (internship, 4th year, 1st year, etc.)</th>
<th>To which students were assessments administered (all, only a sample, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 331</td>
<td>multiple choice question on two exams during the semester</td>
<td>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.</td>
<td>Faculty</td>
<td>Usually sophomore year; assessment given S 2019, F 2019, F 2020</td>
<td>All students</td>
</tr>
<tr>
<td>BIOL 200</td>
<td>A full lab report including hypotheses and statistical analyses.</td>
<td>Multi-draft lab report with abstract, intro., methods, results, discussion &amp; lit. cited w/ tables, graphs, statistical analyses.</td>
<td>Faculty</td>
<td>Usually sophomore year</td>
<td>All students</td>
</tr>
<tr>
<td>BIOL #1</td>
<td>Calculating ecological community indices &amp; behavioral observation coupled with with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course</td>
<td>Final exam question</td>
<td>Exam question</td>
<td>Faculty</td>
<td>Final exam for course, students of mixed years. Spring 2019</td>
<td>All</td>
</tr>
<tr>
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</tr>
<tr>
<td>BIOL 104</td>
<td>Final exam question</td>
<td>Exam question</td>
<td>Faculty</td>
<td>Final exam for course, students of mixed years. Spring 2019</td>
<td>All</td>
</tr>
<tr>
<td>BIOL 114</td>
<td>Goal #3</td>
<td>Initial assessment: questions asked on exam.</td>
<td>Follow-up assessment to demonstrate improvement: similar questions asked on later exam. Target percentage: 60%.</td>
<td>Faculty</td>
<td>Mostly freshman Biology majors.</td>
</tr>
<tr>
<td></td>
<td>Goal #2</td>
<td>Initial assessment: questions</td>
<td>Follow-up assessment to demonstrate</td>
<td>Faculty</td>
<td>Mostly freshman Biology majors.</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Assessment number/name</th>
<th>Target/Acetable score</th>
<th>Number assessed in 2018-2019 (N) 2019-2020 (N)</th>
<th>Number &amp; % meeting target/ Number and % not meeting target</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 331</td>
<td>50%</td>
<td>5 2019: 37</td>
<td>Exam 2: 56.8% answered the question correctly</td>
</tr>
</tbody>
</table>
Exam 1: 43.04% answered the question correctly  
Exam 2: 46.15% answered the question correctly  
Two sections exam scores were combined.

Exam 1: 47% of students answered the question correctly (n=53).  
Exam 2: 48% of students answered the question correctly

<table>
<thead>
<tr>
<th>BIOL 200</th>
<th>70%</th>
<th>~100 students each academic year</th>
<th>60 (60%) / 40 (40%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 104</td>
<td>80%</td>
<td>~100 students each academic year</td>
<td>70 (70%) / 30 (30%)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Results</th>
</tr>
</thead>
</table>
| **BIOL 331: Genetics** | • 56.8% of students were able to correctly answer the focal question during the spring semester 2019. 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** | Follow-up assessment: 30% incorrect, 70% correct. |

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