Annual/Biennial Program Assessment Report

Academic Year Assessed: 2022/2023

College: Agriculture

Department: Microbiology & Cell Biology

Submitted by: Kari Cargill

Undergraduate Assessment reports are to be submitted annually. The report deadline is October 15th .

Graduate Assessment reports are to be submitted biennially. The report deadline is October 15th .

Program(s) Assessed

List all majors (including each option), minors, and certificates that are included in this assessment:

Majors/Minors/Certificate	Options
Biotechnology	**Animal Systems, Microbial Systems**
Cell Biology and Neuroscience	**Biomedical Science, General**
Microbiology	**Environmental Health, Environmental Microbiology, Med Lab Science Plan A, Med Lab Science Plan B, Microbiology Track, Pre-Medical Track, Pre-Veterinary Track**
Pre-veterinary Med Certificate	
Microbiology Minor	
Astrobiology Minor	

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☐ **Have you reviewed the most recent Annual Program Assessment Report submitted and Assessment and Outcomes Committee feedback? (*please contact Assistant Provost Deborah Blanchard if you need a copy of either one).***

YES, reviewed 2022 Assessment report. No feedback was given.

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1. **Past Assessment Summary.** The PLOs assessed this year were new in this iteration and cycle of our departmental assessment plan. 2021 was a new year 0 due to a merging of departments. Also, because there eight PLOs takes 4 years for the first ones to cycle through (doing 2 per year). We plan to address this overly long lag by consolidating our PLOs for more timely assessment and response to our findings.

2. Action Research Question. The question asked for this assessment cycle is:

PLO #3: Can students read and review a scientific paper?

Future Research Questions (for use with updated PLOs)
PLO#1: Can students read and review a scientifice paper?
PLO#2: Can students write and perform a testable hypothesis?
PLO#3: Can students write and/or present complex biological concepts?
PLO#4: Can students analyze scientific data?

3. PLO #3: Can students communicate complex biological concepts in a presentation?
PLO#4: Can students describe molecular concepts related to intra- and inter-cellular signaling pathways?

4. Assessment Plan, Schedule, and Data Source(s).

a) Program Learning Objective to be assessed (current and future plans).

Current Plan PLOs

PLO#	PLO Description (2022-2023)
1.	Be able to read a cell biology, neuroscience, environmental health, immunology, and/or microbiology paper published in a top journal, appreciate the strengths and weaknesses of the study's approach and develop a coherent, synthetic review of this study's place in our knowledge.
2.	Design and carryout an experiment to test a hypothesis or fundamental concept in environmental health, immunology, cell biology, neuroscience, and/or microbiology.
3.	Effectively communicate complex biological concepts in presentations and in writing.
4.	Understand intra- and inter-cellular signaling pathways at the molecular level.
5.	Understand the molecular basis of genetic and infectious diseases and therapies to treat them.
6.	Understand the process of genetic inheritance and evolution.
7.	Access and analyze bioinformatics data.
8.	Be able to describe the functional organization of sensory and motor systems of the human nervous system both in terms of structure and function.

Updated plan to use in future assessments:

PLO#	PLO Description (2023-2024)
1.	Be able to read a paper published in a top journal, in the fields that are encompassed in our department that include microbiology, cell biology, and/or immunology; identify the strengths and weaknesses of the study's approach and develop a coherent, synthetic review of this study's place in our knowledge.
2.	Produce a testable hypothesis, or fundamental concept, in microbiology, cell biology, and/or immunology.
3.	Effectively communicate complex biological concepts in presentations and/or in writing.
4.	Be able to access and analyze primary data to produce a coherent synthesis of the information.

b) Assessment schedule (current and future plans)

ASSESSMENT CHART (2022-2023) (CURRENT)						
Program Learning Outcomes	**Course Alignments: Rubric, number and course title**	**Data items**				
1	BIOM494 (Seminar/Workshop), BIOM450 (Microbial Physiology), BIOH425 (Sensory Neurophysiology)	In-class presentations				
2	BIOM360 (General Microbiology), BIOM455R (Research Methods in Microbiology), BIOB260 (Cell and Molecular Biology)	Written assignments				
3	BIOM497 (Educational Methods), BIOH323 (Human Developmental Biology)	In-class presentations and written assignments				
4	BIOB425 (Advanced Cell & Molecular Biology), BIOB410 (Immunology)	Written examinations				
5	BIOM431 (Medical Bacteriology), BIOM400 (Medical Microbiology)	Written examinations				
6	BIOM363 (Eukaryotic Cell Biology), BIOH420 (Molecular Genetics)	Written examinations and assignments				
7	BIOM419 (Programming for Biologists)	Written assignments				
8	BIOH428 (Molecular Neurological Disease), BIOH313 (Neurophysiology)	Written examinations and assignments				
ASSESSMENT SCHEDULE						
		Year to be assessed				
PLO	**Course**	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
1	BIOM494	XXX				XXX
2	BIOM360	XXX				XXX
3	BIOM497		XXX			
4	BIOB425		XXX			
5	BIOM431			XXX		
6	BIOM363			XXX		
7	BIOM419				XXX	
8	BIOH428				XXX	

Updated plan to use in future assessment cycles:

ASSESSMENT CHART (2023-2024)						
Program Learning Outcomes	**Course Alignments: Rubric, number and course title**	**Data items**				
1	BIOM494 (Seminar/Workshop – capstone)(fall or spring) BIOH 425 (Sensory Neurophysiology)(spring)	In-class presentations				
2	BIOB 260 (Cell and Molecular Biology)(fall or spring) BIOM 360 (General Microbiology)(fall or spring)	Written lab reports				
3	BIOM 400 (Medical Microbiology)(spring) BIOH 458 (Human Pathophysiology)(spring)	In-class presentations and/or written assignments				
4	BIOM 419 (Programming for Biologists)(fall) BIOM 455R (Research Methods in Microbiology)(spring) BIOM 457R (Research Methods in Immunology)(fall)	Written data analysis				
ASSESSMENT SCHEDULE						
		Year to be assessed				
PLO	**Course(s)**	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028
1	BIOM494 (sp 24, f25, f27 or sp28) BIOH425 (f25, f27)	XXX		XXX		XXX
2	BIOB260 (sp 24, f25, sp27) BIOM360 (sp24, f25, f27 or sp28)	XXX		XXX		XXX
3	BIOM400 (sp25, sp27) BIOH 458 (sp25, sp27)		XXX		XXX	
4	BIOM419 (f24, f26) BIOM455R (sp25, sp27) BIOM455R (f24, f26)		XXX		XXX	

b) **Threshold values – 3 out 5 on a 5-point scale**

5. What Was Done.

a) **Was the completed assessment consistent with the program's assessment plan? If not, please explain the adjustments that were made.**

No. Departmental UGCC changed with new chair and members in Fall 2022. For this reason, assessments were done in Spring 2023. The LO's to be assessed were LO3 and LO4. For LO3, the BIOM497 course had an inadequate number of undergraduates enrolled to assess and BIOH323 did not have student presentations to assess. Instead, BIOM400 was substituted for this assessment.

For LO4, BIOB410 was used as planned.

b) **How were data collected and analyzed and by whom? Please include method of collection and sample size.**

Assessments for LO3 (BIOM400) were done by a faculty member who attended in-class student presentations, six of which were randomly selected to be scored. Assessments for LO4 (BIOB410) were done by a faculty member who was given class examinations with certain questions addressing the criteria for this learning outcome. Ten student examinations were randomly selected for scoring of 5 multiple choice questions and 2 essay questions. A rubric spreadsheet for each learning outcome (shown below) was used to score individual criteria. Results were submitted to UGCC Chair, Kari Cargill, for analysis & inclusion in this report.

c) **Please provide a rubric that demonstrates how your data were evaluated.**

Rubric for LO3 (BIOM400) assessment (scored on a scale of 1-5)

Learning Outcome 3: Effectively communicate complex biological concepts in presentations and in writing.

1. Student identifies a biological concept that relies on a least two or more interacting factors. 1 2 3 4 5
2. Student effectively communicates the concept orally. 1 2 3 4 5
3. Student effectively communicates the concept in written form. 1 2 3 4 5
4. Student understands how a concept may be a simplification of actual biological phenomenon. 1 2 3 4 5
5. Student summarizes the evidence supporting the concept. 1 2 3 4 5

Rubric for LO4 (BIOB410) assessment (scored on a scale of 1-5)

Learning Outcome 4: Understand intra- and inter-cellular signaling pathways at the molecular level.

1. Student summarizes at least one molecular signaling pathway. 1 2 3 4 5
2. Student describes at least one intra- and one inter-cellular signaling molecule. 1 2 3 4 5
3. Student explains at least one outcome (cellular response) to either an intra- or inter-cellular signal. 1 2 3 4 5
4. Student describes how at least one signaling molecules is made. 1 2 3 4 5
5. Student describes where at least one signaling molecules is made. 1 2 3 4 5

Scoring rubric:

1 = Not done

2 = Not acceptable with clear misunderstandings

3 = Acceptable but with possible misunderstandings

4 = Acceptable and no issues

5 = Outstanding

Rubric vales:

1 – Student did not understand or perform the indicated criterion
2 – Student attempted to perform the indicated criterion but did not understand it.
3 – Student understood the indicated criterion but their attempt was poor.
4 – Student adequately understood and attempted the indicated criterion.
5 – Exceptional performance based on understanding.

The following faculty performed assessments:

BIOM400 – Mensur Dlakic
BIOB410 – Mark Jutila

6. What Was Learned.

a) Based on the analysis of the data, and compared to the threshold values established, what was learned from the assessment?

The results of the BIOM400 assessment were as follows:

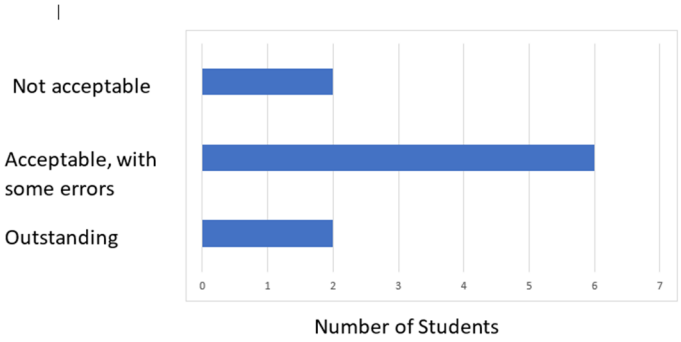
LO criteria	student A	B	C	D	E	F	average
1. biol concepts	4	4	5	5	4	4	4.3
2. oral comm.	4	5	5	5	4	5	4.7
3. written comm*	1	1	1	1	1	1	1*
4. simplifcation	1	4	4	5	4	1	3.2
5. evidence	4	4	5	5	4	5	4.5
					overall average = 3.5		

*No written component was required in this assignment.

The results of the BIOB410 assessment were as follows:

Narrative (from faculty evaluator): I evaluated all multiple choice and essay type questions in Exam #3 for BIOB410 Spring Semester and selected 5 multiple choice and 2 essay questions that I determine addressed, at least in part, the "Learning Outcome #4 above." I randomly selected 10 student exams. I then scored the performance of the students based on the above rubric by averaging their performance over both the multiple choice and essay questions. As an example, if a student got all 5 multiple choice correct, they scored a "5." If they got 4/5, they scored a "4" and so forth. I made my own judgement call based on their answers to the essay questions. The figure below shows the average ratings for the 10 students. 2 students were outstanding (score >4), 2 students were unacceptable (score <3) and the remaining students fell in the middle (scores 3-4). I noted that even for the 2 students that scored unacceptable overall, they had scores of either 3 or 4 on at least one of the essay type questions.

Note: though the selected questions addressed, in part, components of the learning outcomes, none of them addressed all five components. It might be that the focus area of earlier exams might provide a more comprehensive coverage of the expected learning outcomes.



This data does not indicate which criteria were high or low individually.

To develop an overall average from this narrative and data, the follow process was used:

2 students "outstanding", scores >4 (=5) = 2x5 = 10

6 students "acceptable", scores 3-4 (=avg 3.5) = 6x3/5 = 21

2 students "unacceptable", scores <3 (=avg 1.5) = 2x1.5 = 3

overall average 34/10 = 3.4

b) What areas of strength in the program were identified from this assessment process? **Our students have many opportunities to learn how to read and learn complex biological systems and are able to effectively communicate their understanding in verbal presentations.**

c) What areas were identified that either need improvement or could be improved in a different way from this assessment process? **We found more issues related to the assessment itself (the PLO, or the course assigned for the assessment or the class assignments that were not aligned with the PLO) and intend to address this in the future to get better data. In addition, the rubrics need updating (for new PLOs) and require inclusion of an N/A choice for scoring in cases where a rubric item may not have been part of the assignment – in order to separate from students who failed to accomplish the item.**

7. How We Responded.

a) Describe how "What Was Learned" was communicated to the department, or program faculty. How did faculty discussions re-imagine new ways program assessment might contribute to program growth/improvement/innovation beyond the bare minimum of achieving program learning objectives through assessment activities conducted at the course level? **The departmental undergraduate committee is charged with overseeing, implementing and reporting on our program assessments. Our committee has found unanticipated issues with the assessment process in place. Specifically, there are too many learning outcomes to assess and get meaningful outcomes to improve the program in a timely fashion. Also, several of the learning outcomes are too specific to one course and not to the program as a whole and so may be less helpful. Finally, some learning outcomes were initially assigned to courses that don't typically cover them. Our UG committee has dedicated multiple meetings to address these shortcomings and create an assessment plan that will be most useful in understanding how our program outcomes are being met.**

b) How are the results of this assessment informing changes to enhance student learning in the program? **Results were shared with the departmental undergraduate committee, head of the department and with the faculty. Further discussion of the assessment process, appropriate courses/assignments and suggestions for appropriate improvements are ongoing. We will continue to survey the faculty for input as to which courses address which learning outcome and what assignments (papers, presentations, exams, experiments, etc.) would be appropriate to assess.**

c) If information outside of this assessment is informing programmatic change, please describe that. **No programmatic changes forseen at this time.**

d) What support and resources (e.g. workshops, training, etc.) might you need to make these adjustments? **None**

7. Closing the Loop(s). Reflect on the program learning outcomes, how they were assessed in the previous cycle (refer to #1 of the report), and what was learned in this cycle. What action will be taken to improve student learning objectives going forward?

a) In reviewing the last report that assessed the PLO(s) in this assessment cycle, what changes proposed were implemented and will be measured in future assessment reports? **We have not made any proposed changes for courses or assignments. Rather, as stated above, we have adjusted the PLOs to better fit our departmental goals.**

b) Have you seen a change in student learning based on other program adjustments made in the past? Please describe the adjustments made and subsequent changes in student learning. **Not able to address this at this point.**