

**Assurance of Student Learning
2019-2020**

Ogden College of Science and Engineering

Biology

Molecular Biotechnology - 738

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Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages.

Student Learning Outcome 1: Students will demonstrate a level of molecular biotechnology content knowledge appropriate to their degree level.

Instrument 1 Final comprehensive exam in the required lecture course BIOL 327 (Genetics).

Instrument 2

Instrument 3

Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 1.

Met

Not Met

Student Learning Outcome 2: Students will demonstrate the ability to apply scientific methodology and laboratory/analytical skills to a biotechnological question, thereby being prepared for success in molecular biotechnology-related fields.

Instrument 1 Laboratory notebook grades in the required investigative laboratory course BIOL 212 (Genome Discovery and Exploration).

Instrument 2

Instrument 3

Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.

Met

Not Met

Student Learning Outcome 3: Students will have the ability to communicate effectively in oral and written form.

Instrument 1 Final exam in form of a poster presentation in the required investigative laboratory course BIOL 212 (Genome Discovery and Exploration).

Instrument 2

Instrument 3

Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.

Met

Not Met

Program Summary (Briefly summarize the action and follow up items from your detailed responses on subsequent pages.)

This major was only in its second year in the academic year 2019/2020. Evaluations of seniors or the careers of graduates have not been possible yet. The evaluation based on the lower-level course BIOL 212 looks very promising in that analytical and communication skills are acquired by the students. The content knowledge of the major's subject by the

students is not satisfactory yet. Better advisement on the order in which courses should be taken, and students starting the major in their freshman year is expected to improve this aspect of the evaluation.

Student Learning Outcome 1

Student Learning Outcome	Students will demonstrate a level of molecular biotechnology content knowledge appropriate to their degree level.		
Measurement Instrument 1	DIRECT MEASURE 1: Final comprehensive exam in the required lecture course BIOL 327 (Genetics). All Molecular Biotechnology majors are required to take BIOL 327 (Genetics), which is also taken by other majors. Genetics is central to the discipline of molecular biotechnology. As part of this course, each student is required to take a comprehensive final examination, which tests their content knowledge and their ability to synthesize different concepts.		
Criteria for Student Success	80% of the majors will score a 70% or higher on the comprehensive final.		
Program Success Target for this Measurement	80%	Percent of Program Achieving Target	50%
Methods	Out of 4 molecular biotechnology majors, who took the exam in 2019/2020, 2 received a C as their grade in this exam (70-80% of the available points) and the other 2 a D (60-70% of the available points). Because the Molecular Biotechnology major is only in its second year, the number of students, who have reached this 300-level course is still very low and mainly due to students, who switched to the major in the middle of their undergraduate career.		
Measurement Instrument 2			
Criteria for Student Success			
Program Success Target for this Measurement		Percent of Program Achieving Target	
Methods			
Measurement Instrument 3			
Criteria for Student Success			
Program Success Target for this Measurement		Percent of Program Achieving Target	
Methods			
Based on your results, highlight whether the program met the goal Student Learning Outcome 1.		Met	Not Met

Actions (Describe the decision-making process and actions for program improvement. The actions should include a timeline.)

There will be better advisement to make sure that students are well prepared for the BIOL 327 course. In particular, students will be strongly encouraged to take the course BIOL 212 early and before BIOL 327. BIOL 212 represents an introduction to some aspects of BIOL 327 and is taught as an investigative course that inspires students. BIOL 212 should be taken in a student's first or third semester, whereas BIOL 327 should be taken in the fifth or seventh semester.

Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.)

There will be better communication and information exchange between advisors for the Molecular Biotechnology major through an advisors meeting.

Next Assessment Cycle Plan (Please describe your assessment plan timetable for this outcome)

Assessment during next year's evaluation cycle (2020/2021) will determine whether the improvement in advisement was effective. It will also most likely lead to a larger number of students being assessed. Over the long run, it will be possible to assess content knowledge accumulated over a student's entire undergraduate career through the assessment exam in their senior-level BIOL 489 course. This assessment exam will use a collection of GRE subject questions.

Student Learning Outcome 2

Student Learning Outcome	Students will demonstrate the ability to apply scientific methodology and laboratory/analytical skills to a biotechnological question, thereby being prepared for success in molecular biotechnology-related fields.		
Measurement Instrument 1	<p>DIRECT MEASURE 1: Laboratory notebook grades in the required investigative laboratory course BIOL 212 (Genome Discovery and Exploration).</p> <p>In the course, students perform their own research project. Each student is required to collect an environmental sample as well as culture and isolate the phages present. The student subsequently observes the phage under an electron microscope, isolates the phage's DNA and has it sequenced. As part of the experimentation, students are required to maintain an up-to-date laboratory notebook. They are assessed based on the different elements in their notebook as Table of Contents, Title or Brief Statement of Purpose, Protocols (with notes, modifications and changes), Materials, Data, Discussion of Results, Neatness, and Photographs.</p>		
Criteria for Student Success	Students will achieve an average of 80% of the available points.		
Program Success Target for this Measurement	80%	Percent of Program Achieving Target	87.4%
Methods	<p>Molecular Biotechnology majors n=14 average 87.4% \pm 7.2 (mean \pm 1SE)</p> <p>The median was 93.5%.</p> <p>The rubric for the evaluation for the laboratory notebook in BIOL 212 is attached.</p>		
Measurement Instrument 2			
Criteria for Student Success			
Program Success Target for this Measurement		Percent of Program Achieving Target	
Methods			
Measurement Instrument 3			
Criteria for Student Success			
Program Success Target for this Measurement		Percent of Program Achieving Target	
Methods			

Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.	Met	Not Met
Actions (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.)		
The investigative design of the course BIOL 212 has been very successful in making students learn on a deeper level. An initiative has formed to create such an investigative course also at the advanced 400 level.		
Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.)		
The investigative laboratory course BIOL 450 (Recombinant Gene Technology) will be newly designed within a year and offered during the 20/21 academic year.		
Next Assessment Cycle Plan (Please describe your assessment plan timetable for this outcome)		
During the next assessment cycle we plan to again evaluate the laboratory notebook of BIOL 212 (Genome Discovery and Exploration), because we believe that this strategy works well in evaluating this particular student outcome.		

Student Learning Outcome 3

Student Learning Outcome	Students will have the ability to communicate effectively in oral and written form.		
Measurement Instrument 1	DIRECT MEASURE 1: Final exam in form of a poster presentation in the required investigative laboratory course BIOL 212 (Genome Discovery and Exploration). All Molecular Biotechnology majors are required to take BIOL 212. The final exam requires each student to design an effective visualization of their research results and the composition of a concise and logical text to create a persuasive poster. The student is also required to then explain the poster to a peer audience and a judge.		
Criteria for Student Success	Students will achieve an average of 80% of the available points.		
Program Success Target for this Measurement	80%	Percent of Program Achieving Target	81.4%
Methods	Molecular Biotechnology majors n=14 average 81.4% ± 6.6 (mean ± 1SE) The median was 85.0%. The rubric for the evaluation for the poster presentation in BIOL 212 is attached.		
Measurement Instrument 2			
Criteria for Student Success			
Program Success Target for this Measurement		Percent of Program Achieving Target	
Methods			
Measurement Instrument 3			
Criteria for Student Success			
Program Success Target for this Measurement		Percent of Program Achieving Target	
Methods			
Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.			Met
Actions (Describe the decision-making process and actions for program improvement. The actions should include a timeline.)			Not Met

Requiring students to present a poster on their experimental results as their final exam has proven to be an effective tool for increasing student learning. A few other courses of the major have introduced this tool as well.

Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.)

Efforts will be made to assess the effectiveness of the tool of poster presentation for student learning also in other courses.

Next Assessment Cycle Plan (Please describe your assessment plan timetable for this outcome)

The final exam in form of a poster presentation in BIOL 322 (Introduction to Molecular and Cell Biology Laboratory) will be assessed during the next assessment cycle.

BIOL 212 Notebook Evaluation:

Essential Lab Notebook Element	Points Available	Your points earned
Table of Contents (Titles, Dates, Page numbers)	5	
Title or PURPOSE statement on each lab entry and How each lab connects to previous lab, date on each entry.	5	
PROTOCOLS with changes/notes/modifications/mistakes for each lab (includes temps, specific volumes, reagents, concentrations, specific equipment)	25	
Materials listed and recorded on expense report in front cover filled out	10	
DATA- every enrichment documented, every dilution documented, detailed description of plaque morphology, all titres, DNA concentration, nanodrop graph, all gels labeled and results explained. Dilution scheme is completely drawn out at least once.	25	
DISCUSSION of results- what are you seeing, are you plaques changing- why? What did you do to check to see if it is still pure? What mistakes did you make and how did that affect the results?	15	
NEATNESS- Corrections made by crossing out (no white out, no scribbling out incorrect entries); pen only, no pencil. Papers are cut appropriately, all taped/glued in.	15	
PHOTOS- location photos for each location, each day is documented with meaningful, quality photos- blurry photos that do not actually show anything do not count for points.	20	
Subtotal	120 possible	
Papers sticking out of lab notebook	Up to -25	
Notebook obviously put together all at one time instead of weekly	Up to -50	

Additional drawings/illustrations/photos- student went above and beyond to do a great job	Up to +25	
No name on front cover	Loss of all points	

_____/120 points = _____%

Comments from Grader:

Biology 212

Poster Evaluation Rubric

Scoring Grade Range:

1= REDO, 2= NEEDS WORK, 3= GOOD, 4= EXCELLENT, 5= NOBEL PRIZE

Scoring Criteria:

Sample Location

Phage Name

Title

Investigator Name

Abstract

Background

Methods

Plaque Results

EM Results

Titer Results

DNA Concentration

Gel Results

Discussion

Conclusion

Poster Layout

Poster Content

Presentation