

End of Year Assessment Report for Programs

Program: Biology

Semester/year: Fall 2017

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Program Mission Statement

The Department of Biology is committed to excellence. Our mission is two-fold. First, preparing graduates in the biological sciences who demonstrate open-minded inquiry, integrity, service, and stewardship of God's creation. Second, helping students in the liberal arts better understand and appreciate their role in God's created order. We see this commitment as an affirmation of the mission of Greenville University.

Program Objectives

1. Think like a biologist
 1. Demonstrate working knowledge of major areas of biology as identified in the biology major (cellular/molecular, anatomical, ecology).
 2. Describe ethical dimensions of biological issues and articulate links between the study of biology and a Christian worldview.
2. Work like a biologist
 1. Formulate testable hypotheses
 2. Collect, Analyze, and Interpret Data
 3. Appropriately utilize scientific literature
 4. Integrate their biology major with their professional goals
3. Communicate like a biologist
 1. Orally present scientific information effectively
 2. Communicate scientific information in written form effectively

Use relevant scientific terminology

Assessment Methods and Benchmarks – SPRING SEMESTER

Program Objective	Introducing	Developing	Mastering
1.1 Working knowledge of major areas	BIOL110 CO 2; Exams	BIOL305 CO 3; Exam 3/4	BIOL370 CO 3; Exam 2, Final, Lab 8
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%
1.2 Describe ethical dimensions	<i>Not available this semester*</i>	<i>Not available this semester*</i>	<i>Not available this semester*</i>
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%
2.1 Formulate hypotheses	BIOL112 CO 6; Open inquiry experiment	BIOL 370 CO 8; Hypothesis development for independent project	BIOL410 Need to revise COs ; Paper & Presentation
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%
2.2 Collect, analyze, interpret	BIOL110 CO 5; Open inquiry fermentation lab	BIOL305 CO 5; Labs 2-7	BIOL410 Need to revise COs ; Paper & Presentation
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%
2.3 Utilize scientific literature	BIOL110 CO 5; Open inquiry fermentation lab	<i>Not available this semester</i>	BIOL410 Need to revise COs ; Paper & Presentation
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%
2.4 Integrate major with goals	<i>Not available this semester*</i>	<i>Not available this semester*</i>	<i>Not available this semester*</i>
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%

3.1 Orally present	BIOL305 CO 7, Presentation	<i>Not available this semester</i>	BIOL410 Research Presentation **
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%
3.2 Written form	BIOL112 CO 6; Open inquiry experiment	BIO305 CO 8; Lab folder	BIOL410 Research Paper **
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%
3.3 Use relevant terminology	BIOL112 CO 1; Exams, Homework	BIOL345 CO 5; Poster 1	BIOL370 CO 8; Lab Project
	Benchmark: >=70%	Benchmark: >=70%	Benchmark: >=70%

* A few of these “Not available this semester” cells are still empty on our curriculum map.

** The COs for BIOL410 are in need of revision to clearly reflect written and oral communication.

Assessment Findings – SPRING SEMESTER

Narrative in black font represents the Fall semester, red font represents the Spring semester.

- PO 1.1.
- I. BIOL110 CO 2: Describe cell structures and explain their functions, including osmosis, respiration, and photosynthesis using appropriate terminology. Assessment based on Exam 3. 19/68 students (29%) met this objective at a 70% threshold.
 - D. BIOL305 CO 2: Draw and explain the stages of mitosis and meiosis and recognize their contributions to diversity and diseases. Assessment based on Exams 3 and 4. 21/29 students (72%) met this objective at a 70% threshold.
 - M. BIOL370 CO 3: Explain how and why population genetics change through time, over short and long time scales (evolution). Assessed on items from two exams and a HW assignment related to population genetics. 15/20 (75%) of students met this objective at a 70% threshold.
- PO 1.2. In our current curriculum map, this program objective is not assessed.
- PO 2.1.
- I. BIOL112 CO 6: Design and conduct experiments, and interpret the results. Assessment based on the open inquiry lab. 38/39 (96%) of students met this objective at a 70% threshold.
 - D. BIOL 370 CO 8: Clearly formulate hypotheses and design experiments appropriate to test them. Assessed on grades from independent lab project in which the students design, carry out, and report an ecological experiment. 17/21=81.0% of students met this objective at a 70% threshold.
 - M. BIOL410 No specific CO for this; Assessed on Paper & Presentation assignment grades. 10/13 (77%) and 12/13 students (92%) of students met this objective at a 70% threshold.
- PO 2.2.
- I. BIOL110 CO 5: Formulate a hypothesis, and design experiment to test it, and evaluate the hypothesis using data. Assessed on grades from exam 1 and from an Open inquiry fermentation laboratory activity where students generate and test a hypothesis. 50/68 students (76%) met this objective at a 70% threshold
 - D. BIOL 305 CO 5: Use standard genetic and molecular laboratory techniques. Assessment based on Labs 2-7. 26/29 (90%) of students met this objective at a 70% threshold.
 - M. BIOL410 No specific CO for this; Assessed on Paper & Presentation assignment grades. 10/13 (77%) and 12/13 students (92%) of students met this objective at a 70% threshold.
- PO 2.3.
- I. BIOL110 CO 5: Formulate a hypothesis, and design experiment to test it, and evaluate the hypothesis using data. Assessment based on Open Inquiry Fermentation Lab. 50/68 students (76%) met this objective at a 70% threshold

M. BIOL410 CO 1: Demonstrate retrieval of information about biological, chemical and physical properties of substances and accounts of other experimental or theoretical research; There is not a specific grade item for use of literature, assessed on Paper & Presentation assignment grades. 10/13 (77%) and **12/13 students (92%)** of students met this objective at a 70% threshold.

PO 2.4. In our current curriculum map, this program objective is not assessed.

PO 3.1.

I. **BIOL305 CO 7: Explain modern techniques and approaches in the fields of genetics and molecular biology. Assessment based on presentation assignment. 29/29 students (100%) met this objective at a 70% threshold.**

M. BIOL410 CO 2: Communicate their own results in writing and speaking using appropriate scientific formats and language. Assessed on grades for an 8 minute and a 16 minute oral presentation of the students research results. 10/13 (77%) and **13/13 students (100%)** of students met this objective at a 70% threshold.

PO 3.2.

I. **BIOL112 CO 6: Design and conduct experiments, and interpret the results. Assessment based on open inquiry lab. 38/39 (96%) of students met this objective at a 70% threshold.**

D. **BIOL305 CO 8: Properly document results of genetic laboratory experiments and write scientific reports. Assessment based on lab folder 1. 28/29 (96%) of students met this objective at a 70% threshold.**

M. BIOL410 CO 2: Communicate their own results in writing and speaking using appropriate scientific formats and language. Assessed on Paper grades. 10/13 (77%) of students met this objective at a 70% threshold (both Fall and Spring)

PO 3.3

I. **BIOL112 CO 1: Explain gene expression & regulation. Assessment based on selected exam items and homework. 37/39 students (95%) met this objective at a 70% threshold.**

D. **BIOL345 CO 5: Competently discuss the fundamentals of human development and embryology. Assessment based on poster assignment 1. 16/17 (94%) students met this objective at a 70% threshold.**

M. BIOL370 CO 8: Clearly formulate hypotheses and design experiments appropriate to test them. Assessed on grades from independent lab project in which students design, carry out, and report an ecological experiment. 17/21 (81.0%) of students met this objective at a 70% threshold

Analysis of Assessment Findings – SPRING SEMESTER

PO 1.1. *Demonstrate working knowledge of major areas of biology as identified in the biology major (cellular/molecular, anatomical, ecology).* Assessment of this PO is proving difficult because it is so broad (PO repeated here for reference). There are many areas in biology that students should have working knowledge of. The majority of our other POs are specific skills that we consider important for biologists to demonstrate. This PO is focused on knowledge, but that is very broad, and we have been advised that we must assess based on specific assignments or gradebook items. Students may fail to meet one particular knowledge area while successfully meeting other knowledge areas. *This highlights that we should consider some revision of our program objectives, or that we should acknowledge that single gradebook item scoring is not appropriate for this program objective.*

I. BIOL110 CO 2; *Describe cell structures and explain their functions, including osmosis, respiration, and photosynthesis using appropriate terminology.* Only about 30% of students met this objective, but cell function is the central idea of modern biology. It is possible that the numbers are depressed somewhat on this assessment by the difficulty of the exam questions (the assessment was carried out on un-adjusted grades). Given that this was based on a single exam, the assessment may not be measuring exactly what we want to measure.

D. **BIOL305 CO 2; *Draw and explain the stages of mitosis and meiosis and recognize their contributions to diversity and diseases.* Nearly 75% of students met this objective at the developing level.**

M. BIOL370 CO 3; *Explain how and why population genetics change through time, over short and long time scales.* This is a central idea in biology and in ecology, and 75% of students in this course met this at a 70% threshold. (Note: if the assessment were based only on exam items the percent meeting was ~33%; students apparently had a hard time with exam questions).

- PO 1.2. *Describe ethical dimensions of biological issues and articulate links between the study of biology and a Christian worldview.* In our current curriculum map, this program objective is not assessed. The department needs to revise course objectives to provide some assessment of this PO or revise the PO so that it can be assessed.
- PO 2.1. *Formulate testable hypotheses.* **At the I level (96%) of students met this objective.** At both the developing and mastery level over 75% of students are meeting this objective. While there is probably room for improvement, some of these “did not meet” numbers reflect students who are struggling with other issues. For example, in BIOL410, two students were so anxious about the oral presentations that they just stopped coming to class, and did not complete the class. Even though they did not actually complete the course, they did not withdraw. If we remove them from consideration, then 10/11 (91%) students met this objective at the mastery level. *There is much room for improvement in our assessment of this objective – we need to have some assignments or specific grade components that specifically address hypothesis formulation, rather than using only a broader assignment score.*
- PO 2.2. *Collect, Analyze, and Interpret Data.* Better than 75% of students are meeting this objective at the I level, and over 90% at the D and M level, as noted above. There is much room for improvement in our assessment of this objective – we need to have some assignments or gradebook items that specifically address data collection, analysis, and interpretation, rather than using only a broader assignment score.
- PO 2.3. *Appropriately utilize scientific literature.* As noted above, better than 75% of students are meeting this objective at the mastery level, and that fraction may be as high as 91%. There is much room for improvement in our assessment of this objective – we need to have some assignments or gradebook items that specifically address use of literature, rather than using only a broader assignment score.
- M. BIOL410 Based on Paper & Presentation assignment grades, 10/13 (77%) of students met this objective at a 70% threshold.
- PO 2.4. In our current curriculum map, this program objective is not assessed. The most appropriate place to assess this objective is likely to be in advising. Work is needed to determine how this can be assessed. One possibility would be to ask advisors to assess the extent to which junior and senior students have defined career goals and are shaping their academic preparation to meet them. We might also poll the students on this issue.
- PO 3.1. *Orally present scientific information effectively.* **100% of students met this objective at the introduction level,** and better than 85% of students are meeting this objective at the mastery level (**combined Fall and Spring**).
- PO 3.2. *Communicate scientific information in written form effectively.* **96% of students met this objective at the I and D levels,** and better than 75% of students are meeting this objective at the mastery level (Fall and Spring).
- PO 3.3 *Use relevant scientific terminology.* **94% of students met this at both I and D levels,** and 81% of students met this objective at the M level. There is much room for improvement in our assessment of this objective – we need to have some assignments or gradebook items that specifically address use of terminology, rather than using only a broader assignment score.

The major change in program assessment we have made in the last 18 months has been the adoption of new program objectives, and their mapping to the curriculum. This assessment process has highlighted the need to better define some of the program objectives (specifically 1.1), the need to revise some assignments to make the assessment of program objectives more specific (PO 2.1, 2.2, 2.3, and 3.3), and the need to extend our assessment efforts to include advising (PO 2.4). This makes sense from the perspective that advising is an important activity that the faculty department carry out, and it is heavily based on our curriculum (but also includes Gen Ed requirements). It is a challenge however because it does not produce “assessable artifacts” at present, and the advising workload is heavy enough that we need to think carefully about how we gather assessment data without unduly burdening faculty.

Sharing and Discussion of Assessment Findings – SPRING SEMESTER

In the past, program assessment has been more organic and less formal. For example, we had a discussion several years ago about the range of specific laboratory skills that a biologist would be expected to have, and began a process of identifying where in our curriculum those would be introduced. This arose organically from a faculty discussion in which lack of critical skills was noted. This is typical of our process.

With the introduction of a more structured assessment process, three actions seem to be important:

- 1) Faculty should review and comment on this report each semester
- 2) Additional “subjective” assessments that come up as part of normal departmental discussions should be noted and added to future reports
- 3) Needed revision of POs, COs, and grade items should be determined and carried out (specified below, in part).

Use of Assessment Findings for Program Improvement (Action Plan) – SPRING SEMSTER

As noted above, this process has highlighted the need to:

- 1) Better define some of the program objectives (specifically 1.1). *This should be completed in Fall 2018.*
- 2) Map assignments to PO 1.2. This may only have assessment at the D level. *This should be completed in Fall 2018.*
- 3) Consider revising PO 2 to include reference to specific laboratory skills, as this process was begun several years ago. *This is a longer-term goal, and should be addressed in the 2018-2019 academic year.*
- 4) Revise some assignments to make the assessment of program objectives more specific (PO 2.1, 2.2, 2.3, and 3.3). *Needed changes should be identified in Fall 2018.*
- 5) Extend our assessment efforts to include advising (PO 2.4). This makes sense from the perspective that advising is an important activity that the faculty department carry out, and it is heavily based on our curriculum (but also includes Gen Ed requirements). It is a challenge however because it does not produce “assessable artifacts” at present, and the advising workload is heavy enough that we need to think carefully about how we gather assessment data without unduly burdening faculty. This is a more major project, and we probably don’t want to rush this. We should develop a plan to address this issue by the end of the year (Fall 2018).

Full Year Reflection – FALL/INTERTERM/SPRING TERMS

*The main findings of the fall assessment still are relevant. The curriculum map needs to be substantially revised. Currently, too many objectives are assessed based on course objectives or assignments that are far too “course”. We were simple not able to accomplish this revision in the Spring of 2018. **We need to revise the curriculum map to reflect more specific assignments/assessment; currently we have too many “lumped” assessments.** This will include some course revisions, though it is most likely that this will be in the form of component grades for assignments – e.g. for a Lab experiment report, instead of entering a single grade, enter separate grades for hypothesis development, data use, and written communication. Given the need to revies the curriculm map to reflect the new institutional SLOs, this is an opportune time to revisit these.*

Supporting Documents

[you may insert documents below or upload them separately]