Institutional Effectiveness Report

General Education

Department of Biology

Academic Year 2019-2020

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Executive Summary of Report

The Biology Department assessed student achievement in the one general education course offered by the department (Biology 103) with cumulative exams. We were unable to administer the cumulative exam to the other general education course offered by the department (Biology 104) in spring semester because the campus transitioned from face-to-face classes to on-line in Spring due to COVID-19. This academic year we again used "pre-post testing" to assess achievement from the beginning to the end of the semester. We created different but comparable forms of each exam to ensure that the student is not taking the same exam twice. Results show good achievement: benchmarks and targets were achieved. We will continue discussions of these issues related to achievement. To improve student performance we will enhance instruction in areas we determine from the exam results that need to be reinforced.

General Education - Science-Related Student Learning Outcomes:

There are three learning outcomes of the general education that are science-related:

1. The student will have an understanding of the natural world.
2. The student will be able to think critically and to apply scientific principles to reach conclusions.
3. The student will be able to use technology.

Assessment Methods

1. The student will have an understanding of the natural world at the overall average of: Baseline (last year's results average of Bio 103 and Bio 104) 63%, Benchmark 64%, Target (4 year, set in 2019) 64%, as measured by a cumulative exam.

2. The student will be able to think critically and to apply scientific principles to reach conclusions at the overall average of: Baseline (last year's average of Bio 103 and Bio 104) 57%, Benchmark 60%, Target (4 year, set in 2019) 64%, as measured by a cumulative exam.

3. The student will be able to use technology as measured by the proportion of courses that require that students use at least one form of technology (Baseline 93%, Benchmark 90%, Target 93%)

The Department of Biology offers two courses that non-majors may take to complete science-related general education requirements at FMU (Biology 103 and 104). However, we were only able to assess Biology 103 in the fall semester 2019. We were unable to assess Biology 104 in the spring 2020 because the campus transitioned from face-to-face classes to on-line in Spring due to COVID-19.

To assess student success in meeting the science-related learning outcomes 1 and 2 above, a course-specific cumulative exam (multiple choice format) was administered. We

implemented the use of "pre-post testing" to assess achievement from the beginning to the end of the semester in each course. We created different but comparable forms of each exam to ensure that the student is not taking the same exam twice. We administered the exam to Biology 103 students at the beginning and at the end of the Fall semester 2019. We regard the mean percent score of the exam results to be a reasonable indicator of student-success in meeting the science-related general education learning outcomes.

Student use of technology (SLO 3) is incorporated into the required laboratory portions of the non-majors courses. All students gather data and use technology and instrumentation in a variety of laboratory exercises in these courses. For example, students use scientific instrumentation to gather data and do statistical testing, use spreadsheets, and create graphs to evaluate the data collected. The process of gathering the necessary data for each laboratory exercise requires accuracy in taking measurements and using the technology and instrumentation correctly.

We also assess learning outcome 3 by the proportion of courses that incorporate technology in some form. Access to and use of technology is imbedded into biology courses in a variety of ways. Student use of technology is incorporated into both lectures and the laboratory portions of the biology courses and students must successfully use the technology to complete assignments. All students gather data and use technology and instrumentation in a variety of laboratory exercises in these courses. Students must successfully use scientific instrumentation to gather data, and software to use spreadsheets, and do statistical testing, and create graphs to evaluate the data collected to complete assignments. The process of gathering the necessary data for each laboratory exercise requires accuracy in taking measurements and using the technology and instrumentation correctly. In addition to data collection required all laboratories, specific instrumentation is used in lecture sections and laboratories. In addition, all courses used on-line resources during Spring 2020 due to the transition from face-to-face to online because of COVID-19.

Our benchmark is 90% of our courses require that students use at least one form of technology (Baseline 93%, Benchmark 90%, Target 93%). This benchmark adjusts for courses that may not lend themselves to use of technology such as diversity of organism courses.

Assessment Results

Student Learning Outcomes

1. The students demonstrated an understanding of the natural world at an average of 71% as measured by a cumulative exam. Since that is greater than the benchmark of 64% and the target of 64%, both of those goals were achieved by Bio 103 students.

2. The students demonstrated the ability to think critically and to apply scientific principles to reach conclusions at an average of 66% as measured by a cumulative exam. Since that is greater than the benchmark of 60% and the target of 64%, both of those goals were achieved by Bio 103 students.

Tables 1 below lists the exam questions that apply to each learning outcome and summarize the results. We administered exams at the beginning and the end of the semester in both courses.

Table 1. Summary of results of the Biology 103 cumulative exam administered in Fall 2019 at the beginning and at the end of the semester and results from the end of the Fall 2018.

Student Learning Outcome	**Assessment** (question that pertains to each learning outcome)	**Result** (Mean percent correct)		
		Fall 2018 End	Fall 2019 Beginning	Fall 2019 End
1. The student will have an understanding of the natural world.	1, 6-8, 11-15	67.3	49.3	71.4
2. The student will be able think critically and to apply scientific principles to reach conclusions.	12-5, 9,10,16-18	65.2	50.9	65.6
Number of students		128	171	132
Overall mean		66.1%	50%	68.5%

Biology 103: Student achievement exceeded the benchmarks and targets of both SLO 1 (understanding the natural world) and SLO 2 (critical thinking and applying scientific principles) (Benchmarks: SLO 1 64%, SLO 2 60%; Targets: SLO 1 64%, SLO 2 64%) in both the overall exam average and on questions that assessed each SLO separately. In addition, achievement improved 18.5% by the end of the semester and increased about 2% compared to last year.

Student Learning Outcomes

3. The student will be able to use technology as measured by the proportion of courses that require that students use at least one form of technology (Baseline 93%, Benchmark 90%, Target 93%). The benchmark was met.

Students use technology and instrumentation as they gather data and analyze results to complete laboratory exercises.

Access to and use of technology is imbedded into biology courses in a variety of ways. On-line courses are dependent on technology; with the transition from face-to-face to online all biology courses were on-line this spring. Table 7 lists technology used in Biology courses and laboratories. The majority of lectures and labs have some exposure to technology imbedded into them (average = 98%; fall 22/23 = 96%; spring 24/24 = 100%). With the transition to

completely on-line delivery and assessment in the spring due to COVID-19, 100% of biology courses used technology in the spring. Thus, we met our benchmark of 90% and target of 93% of courses requiring students using some form of technology.

A variety of technology is incorporated by instructors into our courses at all levels into both lectures and laboratories. The types of uses vary including posting grades and assignments, on-line quizzes, and use of software programs and instrumentation in laboratories. In addition to the listings below, Excel and Prism (graphing program) are the programs that the department are used routinely by courses that require data analysis and graphing.

Table 7. Types of technology, the uses, the courses this technology is incorporated. All courses used on-line resources during Spring 2020 due to the transition from face-to-face to online because of COVID-19.

Program	Use	Course number
Blackboard	posting grades, announcements, resources, course notes, homework	102, 103, 104, 105, 106, 115L, 107, 108, 120, 202, 205, 209, 210, 215, 301, 302, 303, 305, 307, 308, 311, 317, 320, 401, 402, 406, 407, 409, 411, 412, all courses in spring
	On-line quizzes and exams	102, 103, 105, 104, 106, 107, 108, 305, 308, 401, 407, all courses in spring
	Submit assignments	406, all courses in spring
Textbook/publisher website/resources	Homework, assignments, quizzes	105, 106, 107, 108
	Virtual labs, exercises, e.g., *Labster*	115L, 106, 107, 108, 205, 401
Other programs	ArcGIS	202, 308, 402, 411
	Mesquite	409
	Other course specific programs: e.g., Modelling programs, videography,	102, 306, 320, 402
iPads	Data collection	306, 412
Instructor created websites	Course resources, grades	213, 215, 236
Vernier and Pasco Probes (various), O2 & pH meters, EEG	Lab data collection	103, 104, 107, 115L, 120, 236, 308, 317, 402, 406, 411

Action items

An action plan that addresses the following areas is being developed for implementation during the next academic year:

Student Learning Outcomes

1. The student will have an understanding of the natural world.
2. The student will be able to think critically and to apply scientific principles to reach conclusions.

1. We will continue to administer the cumulative exams in both semesters (Bio 103 Fall, Bio 104 Spring) and to as many sections of the courses as possible.

2. To improve student achievement, faculty reinforced certain core principles and concepts and critical thinking skills. Benchmarks and targets were achieved in Bio 103. However, we were unable to assess Bio 104 this year thus we will ensure that instruction will continue to be enhanced in all areas in both courses in 2020-2021.

3. We implemented pre- and post- exams at the beginning and end of the courses this academic year and will continue this practice in the 2020-2021 academic year. Creation of different but comparable forms of each exam for Bio 103 was completed but evaluation of the results for reliability and refinement of them will be carried over to the 2020-2021 academic year.

4. We evaluated the exams for balance between content vs critical thinking. However, the evaluated of exams based on individual exam item analysis results from test item statistics will be carried over to 2020-2021 to determine if more question refinement is warranted. That continued evaluation and revision of the exams to better assess the students will be carried over to the 2020-2021 academic year.

Student Learning Outcomes

3. The student will be able to use technology.

1. We will continue to discuss ways to encourage faculty to find methods to incorporate technology into their courses.

2. Some biology instructors shared ways they currently use the various features of Blackboard and other on-line resources with the department. We will continue these discussions and include discussions of other types and uses of technology in the classroom to increase student use of technology in our courses.

3. The Biology Department's investigation into methods to better assess student achievement of this student learning outcome was not completed this year and will be carried over to the 2019-2020 academic year.