

Assessment Cycle 2018 – 2019

Program – Bachelor of Science in Biology

College: Arts and Sciences

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Date: 5-19-19

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Date: 6-4-19

Northwestern Mission. Northwestern State University is a responsive, Student-oriented institution that is committed to the creation, dissemination, and acquisition of knowledge through teaching, research, and service. The University maintains as its highest priority excellence in teaching in graduate and undergraduate programs. Northwestern State University prepares its Students to become productive members of society and promotes economic development and improvements in the quality of life of the citizens in its region.

College of Arts and Sciences' Mission. College of Arts and Sciences' Mission. The College of Arts & Sciences, the largest college at Northwestern State University, is a diverse community of scholars, teachers, and students, working collaboratively to acquire, create, and disseminate knowledge through transformational, high-impact experiential learning practices, research, and service. The College strives to produce graduates who are productive members of society equipped with the capability to promote economic and social development and improve the overall quality of life in the region. The College provides an unequaled undergraduate education in the social and behavioral sciences, English, communication, journalism, media arts, biological and physical sciences, and the creative and performing arts, and at the graduate level in the creative and performing arts, English, TESOL, and Homeland Security. Uniquely, the College houses the Louisiana Scholars' College (the State's designated Honors College), the Louisiana Folklife Center, and the Creole Center, demonstrating its commitment to community service, research, and preservation of Louisiana's precious resources.

School of Biological and Physical Sciences. The School of Biological and Physical Sciences will become a reputable leader in public higher education by providing a transformative science educational experience using innovative instructional methods and through the scholarly achievements of our faculty, staff, students, and alumni. The School serves and inspires the students of Northwestern State University and the public through the development of lifelong learners who are excited about science, are disciplined in analytical and critical thinking skills, and are socially, environmentally, and ethically responsible. The School delivers Associate degrees in Veterinary Technology, Bachelor of Science degrees in Biology (with concentrations in Biomedical, Clinical Laboratory Science, Forensic Science, Natural Science, and Veterinary Technology), Applied Microbiology (with concentrations in Environmental and Applied Microbiology and Medical and Health Profession), and Physical Sciences. The School also offers minors in Biology, Microbiology, Wildlife Management, and Chemistry.

Assessment Cycle 2018 – 2019

Biology Program Mission Statement. The mission of the Northwestern State University Biology program is to provide a comprehensive education in biology for all of our majors and to create a unique training environment for students wishing to pursue graduate or professional education.

Purpose (optional): The primary goal of the Biology program is to prepare students to enter the job market competitively at the bachelor level or to further their education in either graduate or professional school.

Methodology: The assessment process for the Biology program is as follows:

- (1) Data from assessment tools (both direct – indirect, quantitative and qualitative) are collected and returned to the program coordinator;
- (2) The program coordinator will analyze the data to determine whether students have met measurable outcomes;
- (3) Results from the assessment will be discussed with the program faculty;
- (4) The program coordinator, in consultation with the director of the School of Biological and Physical Sciences as well as the faculty of the School, will propose changes to measurable outcomes and/or assessment tools for the next assessment period and, where needed, curricula and program changes.

Student Learning Outcomes:

SLO 1. Students will explain the basic concepts of the molecular basis of life.

Course Map: BIOL1010 - Biological Principles I. All majors are required to complete BIOL1010.

Measure 1.1. (Direct – knowledge)

Throughout the course, students will learn about the molecular basis of life including macromolecules, cellular structure, enzyme function, gene expression, cellular respiration, photosynthesis, DNA structure and function, genetics, and cellular division. Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Analysis: The target for Measure 1.1 is that 70% of the students would attain a quiz grade of 70% or higher. In AY2017-2018, 21.88% (7/32) of biology majors earned $\geq 70\%$ on the assessment. This performance was far below (-48.12%) our goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were not able to demonstrate appropriate knowledge of the molecular basis of life. As a

Assessment Cycle 2018 – 2019

result of these findings, changes in informational delivery were implemented to improve student learning/understanding. As a result of those changes, in AY2018-2019, 66.89% (202/302) of students earned a quiz grade of 70% or higher. While this performance is below (-3.11%) our goal of students earning the target of $\geq 70\%$ on this assessment, it is a large increase (+45.01%) compared to student performance from last year.

Decision: Based on the analysis of the AY2018-2019 results, we will improve informational delivery in our BIOL1010 course. In 2019-2020, the Director of the School of Biological and Physical Sciences will work to reduce class sizes in these introductory-level courses and encourage faculty to employ active learning strategies in their classrooms to provide students with greater applicational understanding of the molecular basis of life.

Measure 1.2. (Indirect – survey)

At the end of the course, a survey is administered to students to gauge their appraisal of their understanding of the basic concepts covered in the course. The target is to have 70% of the students report an above average or excellent knowledge of the indicated concepts.

Findings: Target not met.

Analysis: The target for Measure 1.2 is that 70% of the students would report an above average or excellent knowledge of basic cellular structure and function. In AY2017-2018, this assessment was not performed. Therefore, our assessment of student-reported understanding in AY2018-2019 will provide the baseline for our assessment. In AY2018-2019, 42.08% (85/202) of students reported that they had an above-average or excellent understanding of basic cellular structure. Additionally, 41.09% (83/202) students reported that they had an above-average or excellent understanding of basic cellular function. This performance is below (-27.92% and -28.91%) our goal of 70% of students reporting above-average or excellent understanding of the basic principles of cellular structure and function.

Decision: Based on the analysis of the 2018-2019 results, we will work to improve informational delivery in our BIOL1010 course. In 2019-2020, the Director of the School of Biological and Physical Sciences will work to reduce class sizes in these introductory-level courses and encourage faculty to employ active learning strategies in their classrooms to improve students' confidence in their understanding of the basic principles of cellular structure and function.

SLO 2. Students will recognize the basic features of animal and plant structure and physiology.

Course Map: BIOL1020 - Biological Principles II. All majors are required to complete BIOL1020.

Assessment Cycle 2018 – 2019

Measure 2.1. (Direct – knowledge)

Throughout the course, students will learn about the structure and physiology of plants and animals. The topics covered include transpiration, plant tissues, flower structures, plant reproduction and water movement, primary animal tissues, homeostasis, action potentials, muscle function, and body control (endocrine and nervous system functions). Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Analysis: The target for Measure 2.1 is that 70% of the students would attain a quiz grade of 70% or higher. In AY2017-2018, 51.72% (60/116) of biology majors earned $\geq 70\%$ on the assessment. This performance was below (-11.92%) our goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were not able to demonstrate appropriate knowledge of the structure and physiology of plants and animals. As a result of these findings, changes in informational delivery were implemented to improve student learning/understanding. As a result of those changes in AY2018-2019, 49.77% (108/217) of students earned a quiz grade of 70% or higher. This performance is below (-20.23%) our goal of students earning the target of $\geq 70\%$ on this assessment, and it represents a slight decrease (-1.95%) compared to student performance from last year.

Decision: Based on the analysis of the 2018-2019 results, we will work to improve informational delivery in our BIOL1020 course. In 2019-2020, the Director of the School of Biological and Physical Sciences will work to reduce class sizes in these introductory-level courses and encourage faculty to employ active learning strategies in their classrooms to provide students with greater applicational understanding of the basic structure and physiology of plants and animals.

Measure 2.2. (Indirect – survey)

At the end of the course, a survey is administered to students to gauge their appraisal of their understanding of the basic concepts covered in the course. The target is to have 70% of the students report an above average or excellent knowledge of the indicated concepts.

Findings: Target not met.

Analysis: The target for Measure 2.2 is that 70% of the students would report an above-average or excellent knowledge of plant and animal anatomy and physiology. In AY2017-2018, 58.33% (21/36) of biology majors reported above-average or excellent understanding of basic plant anatomy and physiology. This performance was below (-11.67%) our goal of 70% of students' self-reporting their understanding level at above-average or excellent. In that same year, 75% (27/36) of biology majors reported above-average or excellent understanding of basic animal anatomy and physiology. As a

Assessment Cycle 2018 – 2019

result of these findings, the Director encourage faculty to focus on creating links between class concepts and providing students with relevance to how the information covered in the classroom pertains to the biological world to increase student confidence in their knowledge/understanding of plant and animal structure and physiology. As a result of those changes, in AY2018-2019, 13.68% (13/95) of students reported that they had an above-average or excellent understanding of plant anatomy and physiology. Additionally, 40.00% (38/95) students reported that they had an above-average or excellent understanding of animal anatomy and physiology. This performance is below (-56.32% and -30.00%) our goal of students earning the target of $\geq 70\%$ on this assessment, and it represents a large decrease (-44.65% and -35.00%) compared to student performance from last year.

Decision: Implementing the decision/plan of action from AY2017-2018 did not provide evidence of improvement. Specifically, there was a 44.65% and 35.00% decrease in student reported confidence in their understanding of plant and animal structure/anatomy and physiology, respectively. The analysis demonstrates that our changes in information deliver did not improve the perception of student learning/understanding. Instructors will work to create links between class concepts and providing students with relevance to how the information covered in class pertains to the biological world in an attempt to improve student confidence in their knowledge/understanding of plant and animal structure and physiology.

SLO 3. Students will describe the role of evolution and ecology in the diversity of life.

Course Map: BIOL2020 - Biological Principles III. All majors are required to complete BIOL2020.

Measure 3.1. (Direct – knowledge)

Throughout the course, students will learn about the high level of diversity of organisms. They learn how evolution, populations, ecology, and behavior can influence this diversity. Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target met.

Analysis: The target for Measure 3.1 is that 70% of the students would attain a quiz grade of 70% or higher. In AY2017-2018, 33.33% (16/48) of biology majors earned $\geq 70\%$ on the assessment. This performance was below (-36.67%) our goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were not able to demonstrate appropriate knowledge of the role of evolution, populations, ecology and behavior has on the diversity of organisms. As a result of these findings, changes in informational delivery were implemented to improve student learning/understanding. As a result of those changes, in AY2018-2019, 75.90% (63/83) of students earned a quiz grade of 70% or higher. This performance exceeds (+5.90%)

Assessment Cycle 2018 – 2019

our goal of students earning the target of $\geq 70\%$ on this assessment, and it represents a large increase (+42.57%) compared to student performance from last year.

Decision: Based on the current analysis of the 2018-2019 results, we have improved informational delivery in our BIOL2020 course. Such a large increase in student performance may be an artifact of the student population in BIOL2020 during the AY2018-2019. If these results remain consistent in AY2019-2020, the target of the assessment will be modified to increase the challenge in student understanding of the high level of diversity of living things.

Measure 3.2. (Indirect – survey)

At the end of the course, a survey is administered to students to gauge their appraisal of their understanding of the basic concepts covered in the course. The target is to have $\geq 95\%$ of the students report an above average or excellent knowledge of the indicated concepts.

Findings: Target not met.

Analysis: The target for Measure 3.2 is that 95% of the students would report an above-average or excellent knowledge of basic concepts in evolution and ecology. In AY2017-2018, when the target was 70% of the students would report an above-average or excellent knowledge of basic concepts of evolution and ecology, 92.86% (26/28) of biology majors reported above-average or excellent understanding of basic concepts of evolution and 89.29% (25/28) of biology majors reported above-average or excellent understanding of basic concepts in ecology. As a result of these findings, the Director increased the target of the assessment to $\geq 95\%$ of students reporting an above-average or excellent knowledge of the concepts in evolution and ecology. To meet this new target, faculty were encouraged to focus on creating links between class concepts and the biological world to increase student confidence in their knowledge/understanding of the diversity of life. As a result of those changes, in AY2018-2019, 27.59% (16/58) of students reported that they had an above-average or excellent understanding of evolution, and 50.00% (29/58) students reported that they had an above-average or excellent understanding of ecology. This performance is well below (-67.41% and -45.00%) our goal of $\geq 95\%$ of students reporting above-average or excellent understanding of the basic concepts in evolution and ecology.

Decision: Implementing the decision/plan of action from AY2017-2018 did not provide evidence of improvement. Specifically, there was a 65.27% and 39.29% decrease in student reported confidence in their understanding of concepts of evolution and ecology, respectively. The analysis demonstrates that our changes in information deliver did not improve the perception of student learning/understanding enough to meet our newly raised target of $\geq 95\%$. Instructors will work to create links between class concepts and providing students with relevance to how the information covered in class pertains to the biological world to improve student confidence in their knowledge/understanding of evolution and ecology and how they relate to the diversity of life.

Assessment Cycle 2018 – 2019

SLO 4: Students will employ critical thinking to interpret scientific literature.

Tied to course: BIOL 4900. All majors are required to complete BIOL 4900.

Measure 4.1. (Direct - Ability)

Throughout the course, students will read scientific articles from the primary literature and be required to pass quizzes over the material. The target is to have 70% of students attain a final average quiz grade of $\geq 90\%$.

Findings: Target not met.

Analysis: The target for Measure 4.1 is that 70% of the students would attain a quiz grade of $\geq 90\%$. In AY2017-2018, 0% (0/27) of biology majors earned $\geq 90\%$ on the assessment. This performance was below (-70%) our goal of 70% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to evaluate critically primary scientific literature. As a result of these findings, the Director encouraged faculty to help their students develop such skills using additional/various teaching methods including active learning/flipped classroom activities and extended classroom/assessment time. As a result of those changes, in AY2018-2019, 61.64% (45/73) of students earned a quiz grade of 90% or higher.

Decision: Based on the analysis of the 2018-2019 results, the critical thinking and scientific literature interpretation skills of students in the BIOL4900 course have improved (+61.64%). While the noted improvement does not reach our target levels (-8.36%), continuation of our modified efforts should further increase student performance.

Measure 4.2. (Direct – Ability)

Throughout the course, students will read scientific articles from the primary literature and be required to write about their interpretation of the material. The target is to have 70% of students attain a final average written assignment grade of $\geq 90\%$.

Findings: Target met.

Analysis: The target for Measure 4.2 is that 70% of the students would earn a grade of $\geq 90\%$ on a writing assignment concerning analysis/interpretation of primary scientific literature. In AY2017-2018, 44.44% (12/27) of biology majors earned $\geq 90\%$ (a newly adopted goal) on the assessment. This performance was far below (-45.56%) the goal of 70% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to evaluate critically primary scientific literature and write effectively about their interpretations. As a result of these findings, the Director encouraged faculty to use additional/various teaching methods including active learning/flipped classroom activities and extended classroom/assessment time to allow students to further develop their critical thinking and effective writing skills. As a result

Assessment Cycle 2018 – 2019

of those changes, in AY2018-2019, 80.82% (59/73) of students earned a quiz grade of 90% or higher on the assessment.

Decision: Based on the analysis of the 2018-2019 results, we have improved (+36.38%) the critical thinking and effective writing skills of students in BIOL4900. Such a large increase in student performance may be an artifact of the student population in BIOL4900 during the AY2018-2019. If these results remain consistent in AY2019-2020, the target of the assessment will be modified to increase the challenge in student critical thinking and writing skills.

SLO 5: Students will demonstrate professional development.

Tied to course: BIOL 4900. All majors are required to complete BIOL 4900.

Measure 5.1. (Direct - Skill)

Students will be required to formulate a resume that conforms to guidelines set forth in the course. The target is to have 100% of students develop a resume that meets $\geq 90\%$ of the prescribed guidelines.

Findings: Target not met

Analysis: The target for Measure 5.1 is that 100% of the students would formulate a resume that conforms $\geq 90\%$ of the guidelines set forth in the BIOL4900 course. In AY2017-2018, 70.37% (19/27) of biology majors earned $\geq 90\%$ on the resume assessment. This performance was far below (-29.63%) our goal of 100% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to produce a quality, professional resume. As a result of this finding, the Director encouraged faculty to assist students in the development of professional writing skills by using additional rounds of feedback on this assessment piece as well as the implementation of templates to further clarify expectations of the assignment. As a result of these changes, in AY2018-2019, 67.12% (49/73) students earned the target of $\geq 90\%$ on this assessment. This represents a slight decrease (-3.25%) in student performance compared to last academic year.

Decision: Based on the analysis of the 2018-2019 results, the critical thinking and scientific literature interpretation skills of students in the BIOL4900 course have improved. While the noted improvement does not reach our target levels (-22.88%), continuation of our modified efforts should further increase student performance.

Measure 5.2. (Direct - Skill)

Students will be required to formulate a cover letter targeted to a specific job listing that conforms to guidelines set forth in the course. The target is to have 100% of students develop a cover letter that meets $\geq 90\%$ of the prescribed guidelines.

Findings: Target not met.

Assessment Cycle 2018 – 2019

Analysis: The target for Measure 5.2 is that 100% of the students would formulate a cover letter targeted to a specific job listing that conforms $\geq 90\%$ of the guidelines set forth in the BIOL4900 course. In AY2017-2018, 59.26% (16/27) of biology majors earned $\geq 90\%$ on the cover letter assessment. This performance was far below (-40.74%) our goal of 100% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to produce a quality, professional cover letter. As a result of this finding, the Director encouraged faculty to assist students in the development of professional writing skills by using additional rounds of feedback on this assessment piece as well as the implementation of templates to further clarify expectations of the assignment. As a result of these changes, in AY2018-2019, 60.27% (44/73) students earned the target of $\geq 90\%$ on this assessment.

Decision: Based on the analysis of the 2018-2019 results, the professional cover letter writing skills of students in the BIOL4900 course have improved (+1.01%) compared to last academic year. While the noted improvement does not reach our target levels (-39.73%), continuation of our modified efforts should further increase student performance.

Comprehensive summary of key evidence of improvements based on analysis of results. As a result of the findings of AY2017-2018, several changes were implemented to improve student performance. Specifically, the Director encouraged faculty to use more active learning exercises/approaches to informational delivery. Such techniques can improve student comprehension and application of knowledge. Additionally, some targets were increased to further challenge our students' performance on some assessments. As a result of these changes, improvements were observed in 5/10 specific measures.

Plan of action moving forward. In some areas, for example direct assessment of student comprehension of primary scientific literature, student performance is already exceeding our target. If this improvement over last year's target continues through the AY2019-2020, our assessment goals will be adjusted to provide greater challenge to our students' critical thinking skills. In most areas, although our assessment targets were not met, there was marked improvement from the previous AY. These results indicate the successful implementation of our improvement strategies. These strategies will drive student improvement and performance.