Assessment Cycle 2022 – 2023

Program: Bachelor of Science (BS) in Biology (618)

School of Biological and Physical Sciences

College: Arts and Sciences

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Northwestern Mission. Northwestern State University is a responsive, student-oriented institution committed to acquiring, creating, and disseminating knowledge through innovative teaching, research, and service. With its certificate, undergraduate, and graduate programs, Northwestern State University prepares its increasingly diverse student population to contribute to an inclusive global community with a steadfast dedication to improving our region, state, and nation.

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.

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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: Tied to the course syllabus objectives

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 ≥70%.

Findings: Target met.

Analysis: In AC 2021-2022, the target was met with 74% (74/100) of students scoring ≥ 70% on the assessment. This was due to the enhanced instructional time on concepts of the molecular basis of life and the timing of the assessment that was instituted.

The AC 2022-2023 target was met with 75% (75/100) of students scoring ≥ 70% on the assessment. This target implies that students were able to demonstrate appropriate knowledge of the molecular basis of life. This is an increase of 1% from the previous AC, 2021-2022. The change to Pearson's textbook, *Campbell Biology*, 12th edition, helped students understand the function of the molecules of life.

Decision: Based on the analysis of AC 2022-2023, in AC 2023-2024, the faculty will implement the following changes to drive the cycle of improvement. The department head will meet with the faculty prior to the start of the next academic cycle to discuss what assignments and material was most effective as a teaching tool with the new *Campbell Biology* edition and the Mastering platform that comes with the book. Discussions of how to enhance in class lectures and PowerPoints from the new book will also be addressed.

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: Due to the target not being met in AC 2021-2022, the Director met with faculty prior to the start of AC 2022-2023 to discuss switching to the new book and how to improve delivery of the content using the resources from Pearson's Resources.

As a result, the target was not met for AC 2022-2023, with only 27% (22/82) of students reporting that they had an above-average or excellent understanding of basic cellular structure. Additionally, 34% (28/82) students reported that they had an above average or excellent understanding of basic cellular function. This performance is below (-43% and -36%, respectively), the goal of 70% of students reporting above average or excellent understanding of the basic principles of cellular structure and function. This is an increase of 18% and 7% respectively from AC 2021-2022. Measure 1.1 has been met at least for 3 consecutive years, but the students do not feel as though they have mastered the material. The coordinator enhanced the survey to include qualifiers for each learning measure in the survey, which seemed to somewhat help students gauge their level of learning yet still fell short.

Decision: Based on the analysis of the AC 2022-2023 assessment results, in AC 2023-2024, the faculty will implement the following changes to drive the cycle of improvement. The department head will meet with the faculty prior to the start of the AC 2023-2024, to discuss the qualifiers that were provided for each answer in the quiz to determine how to improve it. Further discussion will be held to decide how to address the fact that students are mastering the material but do not feel confident that they have.

SLO 2. Students will describe the role of evolution and ecology in the diversity of life.

Course Map: Tied to the course syllabus objectives
BIOL 1020: Biological Principles II. All majors are required to complete BIOL 1020.

Measure 2.1. (Direct – knowledge):

Throughout the course, students will learn about evolution and ecology. The topics covered include natural selection, evolution, ecology, population genetics, taxonomy, the diversity of prokaryotes, protists, fungi, plants, and animals. Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of ≥70%.

Findings: Target not met.

Analysis: In AC 2021-2022, the target was not met. The Director met with instructors to discuss restructuring lecture content and order and to provide external resource on the topics which also changed the topics being covered.

In AC 2022-2023, the target was not met, with 51% (42/83) of students in BIOL 1020 attained a quiz grade of 70% or higher. This is an increase of 7% from AC 2021-2022 but 19% below the target of 70%. The students struggled with the topics of evolution and ecology. The instructors restructured class material to focus on these topics in this AC cycle.

Decision: The target has not been met for 3 consecutive academic cycles. Based on the analysis of AC 2022-2023, the faculty will implement the following changes in AC 2023-2024 to drive the cycle of improvement. The department head will meet with the faculty prior to the start of the next AC and discuss whether the topics being assessed have enough time and focus being devoted to them. Furthermore, we will determine whether the questions are accurately assessing class topics. The new *Campbell Biology* book and Mastering platform had a small impact on student performance, and we will determine which material on this platform is the most effective to deliver content.

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: In AC 2021-2022 the target was not met. Prior to the start of the AC 2022-2023, the Director met with the faculty and discussed how to better focus content and provide external sources on the topics. The book was switched to Pearson's *Campbell Biology*, 12th edition which also provides students access to Pearson's online platform, Mastering. This platform provides several types of online resources: ebook, quizzes, dynamic study modules, etc.

In AC 2022-2023, the target was not met, with 41% (29/71) of students in BIOL 1020 reporting an above average or excellent understanding of basic concepts in evolution and 32% (23/71) of biology majors reporting an above average or excellent understanding of basic concepts of ecology. This performance is below (-29% and -38%, respectively), the goal of 70% of students reporting above average or excellent understanding of the basic concepts in evolution and ecology. This was a drop of 5% from 2021-2022 assessment where students did not understand concepts in evolution, but an increase of 6% of students reporting about their understanding of ecology. Students do not feel confident of their knowledge in this content area which is supported by the fact that they did not demonstrate sufficient knowledge on these topics in measure 2.1, where the target was also not met.

Decision: For the last 3 academic cycles, the target has not been met in 2.1 or 2.2. Based on the analysis of AC 2022-2023, to drive the cycle of improvement in AC 2023-2024, efforts to enhance learning of class concepts and the assessment will be done when the department head meets with the faculty prior to the start of AC 2023-2024. Qualifiers will be added to the answers of the survey to better define the knowledge level on this topic. These will also be investigated to determine if they effectively describe mastery of content.

SLO 3: Students will be able to communicate scientific information.

Course Map: Tied to the course syllabus objectives

BIOL 4995: Scientific Communication. All majors are required to complete BIOL 4995.

Measure 3.1. (Direct – ability):

Throughout all sections of Scientific Communication courses, students will learn about the various aspects of communication in the sciences. Each student will write a scientific article which will be assessed using a standard rubric. The target is to have 70% of students attain a final average quiz grade of ≥70%.

Findings: Target met.

Analysis: In AC 2021-2022, the target was met with 100% (9/9) of biology majors scoring ≥70% on the assessment. Rubrics are being followed, and students are meeting consistent expectations across the many sections being offered.

In AC 2022-2023, the target was met with 97% (63/65) of biology majors scoring ≥70% on the assessment. This is a decrease (-3%) from the previous AC. The Director has met with students and ensured that faculty are creating rubrics to assess these students. Some students had difficulty adhering to due dates and writing in a scientific manner. Nonetheless, students are graduating with the ability to communicate science to other scientist in written form within their respective fields.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following in AC 2023-2024 to drive the cycle of improvement. The Department Head will ensure that faculty are providing clear due dates that are readily visible and provide rubrics consistent among all sections. A course steward was selected to ensure that this will occur.

Measure 3.2. (Direct – ability): Throughout all sections of Scientific Communication courses, students will learn about the various aspects of communication in the sciences. Each student will present to the public a non-traditional communication of a scientific article/project developed by the student; the communication will be assessed using a standard rubric. The target is to have 70% of students attain a final score on this assignment of ≥70%.

Findings: Target met.

Analysis: In AC 2021-2022, the target was met with 86% (6/7) of biology majors scoring ≥70% on the assessment. The Director ensured that rubrics were provided to give clear student expectations and that enough time was provided on this topic.

In AC 2022-2023, the target was met with 95% (62/65) of biology majors scoring ≥70% on the assessment. This is an increase (9%) from AC 2022-2023, which is impressive considering that the student numbers in these classes have grown considerably in the second year of this SLO. Instructors are using rubrics to grade students and spending ample time on this topic. This result demonstrates that students can effectively communicate science in a non-traditional manner such as a podcast, infographic for social media (*i.e.*, Instagram, *etc*.), or some other manner that targets the public.

Decision: The target has been met for the last two academic cycles. Based on the analysis of AC 2022-2023, to drive the cycle of improvement in AC 2023-2024, the faculty will ensure consistency across the many sections by appointing a course steward who will be charged with providing rubrics and guidance on instruction in the class. The Department Head will meet with the faculty prior to the start of AC 2023-2024 to determine what has been most effective in this class to drive student success. Based on those conversations, course content will be adjusted as needed.

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

Course Map: Tied to the course syllabus objectives

BIOL 4970: Capstone Course for Biology or BIOL 4990, CHEM 4910, or PHYS 4930. All majors are required to complete BIOL 4970.

Measure 4.1. (Direct - ability): Throughout all sections of capstone courses, students will read the same scientific article 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 ≥90%.

Findings: Target not met.

Analysis: In AC 2021-2022, the target was met with 85% (22/26) of biology majors scoring ≥90% on the assessment. Rubrics were consistent among the sections and a significant amount of time was devoted to this topic.

In AC 2022-2023, the target was not being met with 49% (33/68) of biology majors scoring ≥90% on the assessment. This is below (-21%) the target of 70% and below the prior AC by -36%. The class has now significantly increased in size with multiple professors teaching it for the first time. This outcome suggests that students struggle to critically analyze a scientific article and effectively communicate this information when required.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following to drive the cycle of improvement in AC 2023-2024. The Department Head will meet with the faculty prior to AC 2023-2024, to discuss content delivery and time spent on this topic. With so many faculty teaching this class for the first time, there is concern that this topic does not have enough focus and content in class. Also, the Department Head will determine whether the faculty are using the same rubrics and that clear expectations are being provided to students. The examination being used will also be evaluated to ensure that the faculty are providing the best resources to assess this SLO.

Measure 4.2. (Direct – ability): Throughout all sections of capstone courses, students will write a proposal about their capstone project. The target is to have 70% of students attain a final average written assignment grade of ≥90% based on a standard rubric.

Findings: Target not met.

Analysis: In AC 2021-2022, the target was met with 77% (20/26) of biology majors scoring ≥90% on the assessment. Prior to the start of the assignment, faculty provided rubrics to the students, and the Director ensured that the appropriate amount of time was delivered on this topic.

In AC 2022-2023, the target was not met with 68% (45/68) of biology majors scoring ≥90% on the assessment. This is -2% below the target of 70%, and -9% below the score in AC 2021-2022. This class has grown significantly over the last year and several faculty members are teaching this course for the first time. These results suggest that students struggled to devise a research project and produce a research proposal to execute the project although the majority of students were successful.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following in AC 2023-2024 to drive the cycle of improvement. The Department Head will meet with the faculty to ensure that rubrics are consistent across the many new sections and discuss what has been successful in the class so that faculty that have just started teaching this course can adjust the time and content on this topic to a more appropriate level. The faculty will ensure that clear and readily accessible deadlines are provided for this project.

SLO 5: Students will demonstrate professional development.

Course Map: Tied to the course syllabus objectives

BIOL 4970: Capstone Course for Biology or BIOL 4990, CHEM 4910, or PHYS 4930. All majors are required to complete BIOL 4970.

Measure 5.1. (Direct – skill): Students will be required to give a final presentation graded by a standard rubric across all sections of capstone classes. The target is to have 100% of students give a final presentation that meets ≥70% of the prescribed guidelines.

Findings: Target not met.

Analysis: In AC 2021-2022, the target was met with 100% (26/26) of biology majors scoring ≥70% on the assessment. This was the first year that this was assessed. The results of this measure suggest that students were able to complete a senior project and reflect on these experiences while relating the material to the general public.

In AC 2022-2023, the target was not met with 99% (73/74) of biology majors scoring ≥70% on the assessment. This result is 1% below the target of 100%. Only one student failed to meet this requirement. This class has grown considerably in size and some faculty are teaching this for the first time. The Director did ensure that students were being graded using rubrics and devoting ample classroom time to this topic.

Decision: Based on the analysis of 2022-2023, the faculty will implement the following in AC 2023-2024 to drive the cycle of improvement. The Department Head will meet with the faculty to determine why this one student was unable to successfully reach the goal of ≥70% on their final presentation and determine what can be done to prevent this moving forward. Since this class is much larger with several faculty teaching it for the first time, it is important that consistent rubrics are provided across the sections and an ample amount of time is used to develop these final presentations on their project.

Measure 5.2. (Direct – skill): At the end of the course, students will find a current entry-level job in a field of biology related to their Capstone experiment. This will allow them to relate their “research” with the current state of the workforce and needs of society. The target is to have 100% of the students meet the requirements of the grading rubric.

Findings: Target not met.

Analysis: In AC 2021-2022, the target was met with 100% (26/26) of biology majors scoring ≥90% on the assessment. The Director ensured that all students were providing rubrics that matched across all sections.

In AC 2022-2023, the target was not met with 94% (64/68) of biology majors scoring ≥100% on the assessment. This result is 6% below the target of 100%. Four students failed to meet this requirement. Rubrics were being provided to students, and the Director met with the faculty to discuss the target prior to the start of the cycle. This class has grown significantly, and some faculty are teaching it for the first time.

Decision: Based on the analysis of 2022-2023, the faculty will implement in AC 2023-2024, the following to drive the cycle of improvement. Prior to the start of the next AC, the Department Head will meet with faculty to ensure that this SLO is part of the rubric being utilized in every class. Faculty will discuss how best to address this topic in the class so that they can determine the appropriate amount of time and resources is being spent.

Comprehensive summary of key evidence of improvements based on analysis of results. The following reflects all the changes implemented to drive the continuous process of seeking improvement in AC 2022-2023. These changes are based on the knowledge gained through the analysis of AC 2021-2022 results.

- Faculty changed the book and online platform for Biol 1010 and realigned material to meet SLO 1.1 and 2.1.
- External resources were utilized so that students could apply knowledge they already have to gain confidence on topics for SLO 1.2 and 2.1.
- The Director encouraged instructors to spend extra time on certain topics such as evolution and ecology and to generate new ideas to stress these topics in class.
- The Director worked with instructors to qualify the survey responses (*i.e.*, what does excellent, above average, average, and below average mean to students).
- The Director ensured that faculty were using and providing rubrics to students to ensure that expectations for SLO 3, 4, & 5 were clear since these classes were first offered in AC 2021-2022.
- The Director communicated with the faculty who were teaching Biol 4995 (mapped onto SLO 3) and Biol 4970 (mapped onto SLO 4 and 5) for the first time to ensure that expectations and student learning outcomes were understood.

Plan of action moving forward.

- Prior to the start of AC 2023-2024, the Department Head will meet with the faculty to discuss the delivery of the content and the timing of the assessment processes, goals, and requirements.

- The faculty will discuss which content in the new Pearson Mastering platform was most effective at delivering content in Biol 1010 and 1020.
- The faculty will determine whether the qualifiers being provided on the surveys in Biol 1010 and 1020 are suitable.
- The Department Head will lead a discussion with the natural science faculty to investigate whether the discrete questions being asked in SLO 2.1 are appropriately written and whether these topics are emphasized in class.
- Prior to the start of AC 2023-2024, the Department Head will ensure that rubrics are consistent for all sections of Capstone and Scientific Communication courses.
- Discussions about successful strategies in Capstone and Scientific Communication will be held so that faculty can learn from each other how to improve the classroom experience.