

Assessment Cycle 2025-2026

Program: Bachelor of Science (BS) in Applied Microbiology (619)

Department of Biology and Microbiology

School of Science, Technology, Engineering, & Math

College: Arts and Sciences

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Date: 06-15-2026

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 Science, Technology, Engineering and Math. The School of Science, Technology, Engineering and Math at Northwestern State University serves to create a collaborative environment for natural and applied science education that inspires students and faculty to engage in an interdisciplinary approach to developing strong analytical skills in interpersonal communication, critical thinking, research, and data literacy as they become lifelong learners who are prepared for an ever-changing, global STEM community.

Department of Biology and Microbiology Mission Statement. The mission of the Northwestern State University Biology and Microbiology Department is to provide a comprehensive education in biology and microbiology for all of our majors and to create

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a unique training environment for students wishing to pursue graduate or professional education.

Purpose (optional): The primary goal of the Applied Microbiology 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 Applied Microbiology program is as follows:

- (1) Data from assessment tools (both direct and 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 STEM 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 demonstrate their knowledge of the scientific method.

Course Map: Tied to the course syllabus objectives

BIOL 2060: Microbiology I. All majors are required to complete BIOL 2060.

Measure 1.1. (Direct – knowledge)

Throughout the BIOL 2060 course, students will learn the essential parts/steps of the scientific method and how to apply that knowledge to scientific problems/questions. 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: In AC 2024-2025, the target was not met. Thirty-three percent (33% or 1/3) of students scored $\geq 70\%$ on the scientific method assessment. The department head developed a PowerPoint presentation covering the parts of the scientific method

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independent of class material. This allowed students to focus on this topic and led to the faculty spending extra instructional time on it in class.

Based on the analysis on the AC 2024-2025 results, the following changes were made in AC 2025-2026. Faculty developed an unknown microbe lab where the students had to use the scientific method to identify it. As a result of the changes in AC 2025-2026, the target was met in AC 2025-2026 with 100% (3/3) students scoring $\geq 70\%$ on the scientific method assessment. This is higher (+67%) than the result in last year's AC. This demonstrates that Applied Microbiology majors understand and can apply the scientific method.

Commented [DG1]: Changed dates.

Decision: In AC 2025-2026, the target was met. Based on the analysis of AC 2025-2026, the faculty will implement the following changes to drive the cycle of improvement in AC 2026-2027. The Department Head will meet with faculty to discuss moving the scientific method assessment to the end of the semester. It is currently at the end of the first quarter of class. This will allow more time to use the scientific method for the unknown lab and provide additional time to thoroughly review the experiment and to identify strengths and weaknesses that occurred during the application of the method. This additional experience will strengthen students' understanding of individual parts of the scientific method through hands-on application and critical analysis of the outcome.

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 parts and application of the scientific method. 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 was not met for AC 2024-2025, with 67% (2/3) of students indicating at least an above-average understanding of the scientific method. This was a decrease (-34%) in comparison to the prior AC. One student struggled with this content and did not feel like he had above-average knowledge. Statements were added clarifying each level of knowledge. Faculty also shared resources to drive content understanding. Ultimately, students did not feel like they had at least an above-average knowledge of the topic.

Based on the analysis on the AC 2024-2025 results, the following changes were made in AC 2025-2026. Qualifying statements were added to this survey to help the students understand their level of knowledge (*i.e.*, above-average knowledge of the scientific method allows students to apply this method to new ideas). Faculty redesigned assignments using the educational framework of Transparency in Learning and Teaching (TILT) to enhance comprehension of content and the students' appraisal of their knowledge. As a result of the changes in AC 2024-2025, the target was not met for AC 2025-2026 with 33% (1/3) indicating at least above-average understanding of the scientific method. This result is lower (-34%) than in AC 2024-2025. Students continue to

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not express above-average understanding of content regardless whether they meet the target in SLO 1.1 or not.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. The Department Head will meet with the faculty to discuss reducing the target of level of knowledge for this measure to average. There are students who express average knowledge of the scientific method which is high enough to meet the target for measure 1.1, and these are being not being included but possess the skill and knowledge. Best practices for enhancing confidence in the classroom will also be discussed.

SLO 2. Students will demonstrate their knowledge of experimental design.

Course Map: Tied to the course syllabus objectives

BIOL 2090: Microbiology II. All majors are required to complete BIOL 2090.

Measure 2.1. (Direct – knowledge)

Throughout the BIOL 2090 course, students will learn how to develop a hypothesis, identify experimental variables, and explain what types of experimental controls should be used to test the hypothesis from a dataset-specific to microbiology. Each student is required to pass a quiz covering these concepts in experimental design. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Commented [DG2]: Align with decision

Analysis: In AC 2024-2025, 100% (7/7) of Applied Microbiology majors earned $\geq 70\%$ on the assessment. This was a significant increase since zero met the target in the previous cycle. The Department Head met with the faculty and created assignments to allow students to practice creating and testing hypotheses. The focus was to find common things that students were used to engaging with.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The Department Head met with the course instructor and discussed how to incorporate additional practices on controls into assignments as done in the previous cycle with experimental variables. This enhanced focus on this content area. The target was reduced to 70% of students scoring at least 70% on the assessment as the goal for measure hadn't yet been met. Additionally, this new target is aligned with the target on the similar Measure 1.1. As a result of the changes in AC 2024-2025, the target was not met for AC 2025-2026 with 67% (2/3) of students reaching the measure. This result is lower (-33%) than in AC 2024-2025.

Commented [DG3]: Are these the changes that were made in the 2025-2026 cycle?

Decision: In AC 2025-2026, the target was not met. Based on the analysis of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle

Commented [DG4]: Not aligned with target above.

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of improvement. The Department Head will meet with the course instructor to discuss why students tend to struggle with this measure. The faculty member will institute a new teaching technique to support learning by using the educational framework of Transparency in Learning and Teaching (TILT) on assignments. The faculty member has already attended a professional development on this technique.

Measure 2.2. (Direct – knowledge)

As part of the final examination for BIOL 2090, students must answer two constructive response questions assessing their understanding of experimental design. The target is to have 70% of the students earn at least 70% of the points on each of those questions.

Findings: Target not met.

Analysis: In AC 2024-2025, 100% (7/7) of Applied Microbiology majors earned $\geq 50\%$ on the assessment. Due to absent students not completing this requirement in the last two cycles, we created a policy for allowing make-up of missed assignments. A makeup day was created as a result.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. Assignments were reviewed and improved, and additional time was spent on the topic in class. Instructors also discussed bringing this measure into alignment with the targets of measure 1.2 and 2.1, and to measure a higher understanding of the concepts. The target was changed to 70% of the students earning at least 70% of the points on each of those questions. In the previous AC, the measure was to have 100% of the students score 50% of the points on the measure. As a result of the changes in AC 2024-2025, the target was not met in AC 2025-2026 with 67% (2/3) students earning at least 70% of the points on the constructive response questions assessing content knowledge of experimental design. This target has only been met once in the last 4 cycles. Students are struggling to comprehend experimental design.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027, to drive the cycle of improvement. The faculty will institute a flipped learning classroom activity on this topic to establish a new way that students are able to engage with the material. This should enhance student focus on the topic and improve outcomes.

SLO 3: Students will be able to communicate scientific information

Course Map: Tied to the course syllabus objectives

BIOL 4995: Scientific Communication. All microbiology majors are required to complete. This new SLO was created and mapped to a new upper-level course.

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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 and will be assessed using a standard rubric. The target is to have 70% of students attain a final average grade of $\geq 70\%$ on this assignment.

Findings: Target met.

Analysis: In AC 2024-2025, 100% (2/2) of Applied Microbiology students met the goal for presentation requirements on the grading rubric. This demonstrated that microbiology majors could effectively communicate science by writing a scientific article. The Department Head met with faculty prior to the start of AC 2024-2025, and resources on writing a scientific article were shared. One faculty was new and had scant resources. Now, all faculty have comparable resources for this measure. With the new material, faculty were able to spend additional time on the topic to drive success.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The Department Head met with the faculty to scaffold the creation of this writing assignment by having it divided into parts each with smaller assessments. Once completed, students could merge these parts of their paper, give a final review, then submit the complete scientific article for assessment. As a result of the changes in AC 2024-2025, the target was met for AC 2025-2026 with students showing excellence and 100% (2/2) of students attaining a final average assignment grade of $\geq 70\%$ on their scientific article. This matches the outcome from last year's score. Microbiology majors at Northwestern State are excelling at communicating scientific findings to peers in the greater scientific community.

Commented [MH5]: What did the faculty do to improve the results for AC 2023-2024 in this class?

Decision: In AC 2025-2026, the target was met. Based on the analysis of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. The Department Head will meet with the faculty prior to the start of AC 2026-2027 to discuss alignment and clarity of the rubric since assignments for this were divided into smaller components in the last cycle.

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 provide non-traditional communication on 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 average grade of $\geq 70\%$.

Findings: Target met.

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Analysis: The target was met in AC 2024-2025, with 100% (2/2) of Applied Microbiology majors scoring $\geq 70\%$ on the assessment. Prior to this AC, faculty created a rubric with guidelines for non-traditional communication to address equity concerns and provide clear expectations for students.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The faculty spent time discussing and clarifying the target audience for non-traditional communication. This provided better focus and outcomes for students. Peer review of produced content helped students revise their work and learn from actively helping other students. As a result of the changes in AC 2024-2025, the target was met in AC 2025-2026 with 100% (2/2) of students meeting the target exceeding the goal by +30%. Students generated a diverse array of non-traditional communications, demonstrating their ability to effectively communicate scientific ideas in a manner that can be readily consumed by the general public.

Commented [DG6]: 25-26 changes?

Decision: In AC 2025-2026, the target was met. Based on the analysis of 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. The Department Head will meet with faculty and introduce an assignment to evaluate non-traditional communications that have been released to the public. After critically analyzing these, students will have a better understanding of non-traditional communications and the required elements that effectively persuade the public.

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

Course Map: Tied to the course syllabus objectives

BIOL 4990: Capstone Course for Microbiology or BIOL 4970, CHEM 4910, or PHYS 4930. All majors are required to complete BIO L4990, 4970, or CHEM 4910, or PHYS 4930.

Measure 4.1. (Direct – skill)

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 $\geq 80\%$.

Findings: Target not met.

Analysis: In AC 2024-2025, the target was not met with 40% (2/5) of the Applied Microbiology majors earning 90% or better on the grading rubric for the project. Faculty provided an additional assignment with a data set where they had to run the statistics, create a graphical representation, and analyze the results. Thus, extra time was spent on this topic in class and they practiced data analysis

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Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. Faculty selected scientific papers for practicing critical thinking skills that are better aligned with the class. The target quiz grade was reduced to 80%. As a result of the changes in AC 2024-2025, the target was not met in AC 2025-2026, with 0% (0/1) students attaining a final average quiz grade of $\geq 80\%$. Students struggled with critical thinking skills.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. This measure will be disconnected from Chemistry and Physics. This means that the students will no longer have to read an article broad enough to be appropriate for discussion across all disciplines in the hard sciences. To more effectively evaluate applied microbiology/biology students, faculty will instead choose an article in biology and create a new critical thinking exam on the article.

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 grade of $\geq 90\%$ on the written assignment based on a standard rubric.

Findings: Target not met.

Analysis: In AC 2024-2025, the target was met with 100% (5/5) of Applied Microbiology majors scoring $\geq 90\%$ on the assessment. Faculty shared guides breaking down the individual parts of the proposal. Ideas were shared about how to create the proposal in class, and students were given 5 weeks to create the proposal. The results suggested that students were able to design a project relating to Applied Microbiology and to create proposals to support their scientific inquiry.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The instructors scaffolded the proposal into smaller components with interim deadlines. This provided additional support for students by allowing them to focus on one section at a time. These were submitted in total as a complete final proposal for their assessment. The target was changed to 70% of students attaining a final average written assignment grade of $\geq 80\%$, based on a standard rubric. At 80%, students are exhibiting an above average ability to write a project proposal, and the goal is better aligned and less stressful for students to achieve. As a result of the changes in AC 2024-2025, the target was not met in AC 2025-2026 with 0% (0/2) of students meeting the target.

Decision: In AC 2025-2026, the target was not met. Based on the results of AC 2025-2026 the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. The Department Head will meet with faculty to prompt discussion and sharing of materials from faculty who are more effective at stimulating successful project

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proposals from students. This should help to generate ideas and an impetus for improvement in faculty who are not quite successful as their colleagues close the gaps in these classrooms.

SLO 5: Students will demonstrate professional development.

Course Map: Tied to the course syllabus objectives

BIOL 4990: Capstone Course for Microbiology or BIOL 4970, CHEM 4910, or PHYS 4930. All majors are required to complete BIOL4990, 4970, or CHEM 4910, or PHYS 4930.

Measure 5.1. (Direct – skill)

Students will be required to give a public presentation of the results of their Capstone project graded by a standard rubric across all sections of capstone classes. The target is to have 80% of students give a presentation that meets $\geq 70\%$ of the prescribed guidelines.

Findings: Target met.

Commented [DG7]: Does not align with decision.

Analysis: In AC 2024-2025, the target was not met with 80% (4/5) of students scoring $\geq 70\%$ on the final presentation of their Capstone project. Faculty shared resources on the parts of the presentation and delivery to other faculty teaching the course to improve material being provided to students. These resources were covered in classes resulting in more time being spent in class on this topic.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The Department Head met with faculty and discussed recording student presentations to have students watch themselves to reflect on their own performance. The target was reduced to 80% of students scoring $\geq 70\%$ on their final presentation. This maintained rigor while also reducing stress on faculty and students to meet this target.

As a result of the changes in AC 2024-2025, the target was met in AC 2025-2026 with 100% (2/2) of students meeting the target. This was over (+20%) the target goal and was higher (+20%) than the score in the prior AC.

Decision: In AC 2025-2026, the target was met. Based on the results of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. Prior to the start of the next cycle, the Department Head will meet with the faculty to identify how students might do better at achieving this measure and to generate possible solutions. This measure will be separated from chemistry and physics, so that each area can focus on excellence in their own discipline as we are in separate departments with unique needs.

Commented [DG8]: Target was met in findings and above. Is this section just not updated?

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Measure 5.2. (Direct – skill)

At the end of the course, students will find a current entry-level job that is related to their Capstone project in a field of microbiology. This will allow them to relate their project to the current state of the workforce and needs of society. The target is to have 80% of the students meet the requirements of the grading rubric.

Findings: Target met.

Analysis: In AC 2024-2025, the target was met with 100% (5/5) of students meeting this grade requirement. This demonstrated that students were able to relate their project to the workforce and the needs of society. The Department Head met with faculty to guarantee that all faculty were aware of this requirement. This measure was also added to the rubric. Faculty also shared resources on how to find jobs in the field of biology

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The Department Head met with faculty and discussed including student generated mock resumes for the job they find. As a result of the changes in AC 2024-2025, the target was met in AC 2025-2026 with 100% (2/2) of students meeting the target. This matches the score in the prior AC and the target goal. Students were able to identify workforce needs based on their project and relayed this in the classroom.

Decision: In AC 2025-2026, the target was met. Based on the results of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. Prior to the start of the next AC, the Department Head will meet with faculty to discuss generating guides for students on how to find careers in their field. This assessment will be separated from chemistry and physics to allow these different areas and Departments to focus solely on their specific disciplines which are unique thereby providing the best experience to applied microbiology/biology majors as possible.

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 2025-2026. These changes are based on the knowledge gained through the analysis of AC 2024-2025 results.

- In Measure 1.1, students conducted an experiment to identify unknown microbes using the scientific method.
- In Measure 1.2, the assessment changed using the framework TiLT to promote student success.
- More time was spent on content including an additional assessment focused on the topic of controls in Measure 2.1.

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- Prior to the start of AC 2025-2026, the Department Head met with faculty to discuss enhancing time spent on this content in lecture and lab and to review all assessments for improvement in Measure 2.2.
- The Department Head met with the faculty prior to the start of AC 2025-2026 to scaffold the creation of this writing assignment in Measure 3.1 by having it created in parts driven by smaller assessments.
- The Department Head met with the faculty to discuss clarification of the target audience for non-traditional communication in Measure 3.2.
- For Measure 4.1, the Department Head met with faculty to review the scientific papers that were used last year for practice and found articles that were better aligned with the class.
- For Measure 4.2, instructors discussed scaffolding the proposal into smaller components with interim deadlines.
- For Measure 5.1, the Department Head met with faculty to discuss recording student presentations, and students watched themselves to reflect on their own performance.
- For Measure 5.2, the Department Head met with faculty to discuss including student generated mock resumes for the job they find.
- In Measure 4 and 5, targets were adjusted to more reasonable goals that were achievable by students and are more similar to targets of the other measures while maintaining rigor.

Commented [DG9]: Discussed?

Commented [DG10]: met?

Plan of action moving forward:

- In Measure 1.1, the assessment will be moved back in the semester to allow time to complete the unknown lab and to spend additional time critically analyzing this process and to determine what happened at each step of the scientific method along the way.
- The Department Head will meet with the faculty to discuss best practices for enhancing student confidence in the classroom for Measure 1.2.
- In Measure 2.1, the Department Head will meet with the course instructor to discuss why students tend to struggle with this measure. The faculty member will institute a new teaching technique to support learning by using the educational framework of Transparency in Learning and Teaching (TILT) on assignments.

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- In Measure 2.2, the faculty member will institute a flipped learning classroom technique on this topic to drive change for the way that students are engaging in the material. This should enhance student focus on the topic and improve outcomes.
- In Measure 3.1, the Department Head will meet with the faculty prior to the start of AC 2025-2026 to discuss alignment and clarity for the rubric since assignments for this were divided into smaller components in the last cycle.
- In Measure 3.2, the Department Head will meet with faculty and introduce an assignment to evaluate non-traditional communications that have been released to the public.
- Measure 4 and 5 will be disconnected from Chemistry and Physics.
- Faculty will choose an article in biology and create a new critical thinking exam on that article in Measure 4.1.
- In Measure 4.2, the Department Head will meet with faculty to prompt discussion and sharing of materials from faculty who are more effective at stimulating successful project proposals from students.
- The Department Head will meet with the faculty to identify why students are failing to meet Measure 5.1, and to generate possible solutions.
- The Department Head will meet with faculty to discuss generating guides for students on how to find careers in their field in Measure 5.2.