Assessment Cycle 2023 – 2024

Program: (BS) Bachelor of Science in Physical Science (637)

School of Biological and Physical Sciences

College of 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.

Assessment Cycle 2023 – 2024

Physical Science Program Mission Statement. The mission of the Northwestern State University Physical Science program is to provide a comprehensive education in chemistry and physics for all 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 Physical Science 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 Physical Science 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 Head of the Department of Physical Sciences as well as the faculty of the School of STEM, 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:

NOTE: The Bachelor of Science in Physical Science is a relatively new program with low enrollment. Therefore, data collection was limited to only three students who took a required, major course.

SLO 1. Students will identify the basic components of the atomic structure.

Course Map: Tied to the course syllabus objectives.

CHEM1030: General Chemistry I

Measure 1.1. (Direct – knowledge)
Throughout the course, students will learn the structure of atoms and the importance of each subatomic particle. Each student is required to pass a quiz covering these concepts. The target is to have 75% of students attain a quiz grade of ≥70%.

Findings: Target not met

Analysis: In AC 2022 – 2023, 67% (2/3) of the Physical Science students assessed obtained a quiz grade of ≥ 70%. The target for AC 2022 – 2023 was not met. The faculty

incorporated new delivery methods for the CHEM 1030 classes; however, the students still struggled to demonstrate appropriate knowledge of the structure of atoms and the importance of each subatomic particle.

Based on the analysis of the AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024. The Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024. As a measure to drive improvement, our faculty rotated between the courses of CHEM 1030/1031 and CHEM 1040/1041 to ensure the content presented is current and aligns with pre-requisite content for future courses. Fifty percent (50%, or 2/4) of the Physical Science students assessed obtained a quiz grade of ≥ 70%. This performance is below (-20%) the goal of 70% of students earning a target of ≥ 70% on this assessment. This implies that the students still struggled to demonstrate appropriate knowledge of the structure of atoms and the importance of each subatomic particle. When comparing the results from AC 2022- 2023, there is a decrease in the percentage of students meeting the target (-17%).

As a result of these changes, in AC 2023-2024, the target was not met.

Decision: In AC 2023-2024, the target was not met. Based on the analysis of the AC 2023 – 2024 assessment results, in AC 2024 – 2025, the faculty will review the assessment questionnaire to better reflect the course objectives and material. The faculty will also offer the students supplementary instruction in general chemistry courses (1030/1031/1040/1041). At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments. These changes will improve the students' ability to demonstrate appropriate knowledge of the structure of atoms and the importance of each subatomic particle.

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 of atomic structure covered in the course. The target is to have 75% of the students report above average or excellent knowledge of the indicated concepts.

Findings: Target not met

Analysis: In AC 2022–2023, the target was not met. Sixty-seven percent (67% or 2/3) of the Physical Science students assessed gauged their understanding of the basic concepts of atomic structure covered in the course as above average or excellent. A new textbook and online platform were adopted for CHEM 1030/1040. However, the students still struggled with demonstrating concepts of atomic structure that were covered in the course.

Based on the AC 2022–2023 results analysis, the faculty implemented the following changes in AC 2023-2024. The faculty rotated between the courses of CHEM 1030/1031

and CHEM 1040/1041 to ensure the content presented is current and aligns with pre-requisite content for future courses. The Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024 to discuss other ways to help with the students' knowledge base of the basic concepts of atomic structure. The new textbook and online platform for CHEM 1030/1040 served as an updated resource that provides students with academic resources, including adaptive learning homework and short videos. When comparing the results from AC 2022- 2023, there is a decrease in the percentage of students meeting the target (-17%). Fifty percent (50% or 2/4) of the Physical Science students gauged their understanding of the basic concepts of atomic structure covered in the course as above average or excellent; therefore, the target was not met. This performance is below (-25%) the goal of 75% of students expressing a level of understanding above average or excellent on this assessment. This implies that 50% (2/4) of the physical science students gauged their appraisal of their understanding of the basic concepts of atomic structure covered in the course as average or below. The students still struggled to demonstrate their knowledge of atomic structure.

As a result of these changes in AC 2023-2024, the target was not met.

Decision: In AC 2023-2024, the target was not met. Based on the analysis of the AC 2023 – 2024 assessment results, in AC 2024 – 2025, the following changes will be made to drive improvement. The faculty will review the assessment questionnaire to better reflect the course objectives and material and ensure that the questionnaire accurately reflects the students' knowledge of the basic concepts of atomic structure. The faculty will also offer supplementary instruction to students in general chemistry courses (1030/1031/1040/1041). The supplementary instruction will highlight the basic concepts that are necessary to comprehend the atomic structure. This will also give the students a platform to ask questions concerning topics that they struggle with individually. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments. These changes will improve the students' ability to demonstrate appropriate knowledge of the structure of atoms and the importance of each subatomic particle.

SLO 2. Students will be able to classify the natural laws of thermodynamics and mechanics.

Course Map: Tied to the course syllabus objectives

CHEM 1040: General Chemistry II
PHYS 2510: General Analytical Physics I.

Measure 2.1. (Direct – knowledge)

Throughout the General Chemistry II (CHEM1040) course, students will learn about the various natural laws of thermodynamics. Each student is required to pass a quiz covering the concepts of thermodynamics. The target is to have 75% of students attain a quiz grade of ≥70%.

Findings: Target not met

Analysis: In AC 2022 – 2023, the target was not met. Fifty percent (50% or 3/6) of the physical science students assessed earned a quiz grade of ≥70%. The students struggled with demonstrating their knowledge of the natural laws of thermodynamics.

Based on the analysis of the AC 2023-2024 results, the faculty implemented the following changes in AC 2023-2024. The Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024. Our faculty rotated between the courses of CHEM 1030/1031 and CHEM 1040/1041 to ensure the content presented is current and aligns with pre-requisite content for future courses. When comparing the results from AC 2023- 2024 to AC 2022-2023, there is a decrease in the percentage of students meeting the target (-50%). In AC 2023–2024, 0% (0/1) of the physical science students assessed earned a quiz grade of ≥70%; therefore, the target was not met. This performance is below (-75%) the goal of 75% of students earning a target of ≥ 70% on this assessment. This implies that 100% (1/1) of the Physical Science students scored below the target of 70% on the quiz, and the student still struggled with being able to demonstrate appropriate knowledge of the natural laws of thermodynamics.

As a result of these changes in AC 2023-2024, the target was not met.

Decision: In AC 2023-2024, the target was met. Based on the AC 2023-2024 results analysis, the following changes will be made to drive improvement in AC 2024-2025. The faculty will review the assessment quiz to better reflect the course objectives and material. The faculty will also offer supplementary instruction to students in general chemistry courses (1030/1031/1040/1041). The supplementary instruction will offer students an opportunity to ask questions relevant to thermodynamics where they struggle individually. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments. This is to ensure that the faculty offers students methods of learning that each student can benefit from. These changes will improve the students' ability to learn about the various natural laws of thermodynamics.

Measure 2.2. (Direct – knowledge)

Throughout the General Analytical Physics I (PHYS2050) course, students will learn about the various natural laws of mechanics. Each student is required to pass a quiz covering the concepts of mechanics. The target is to have 75% of students attain a quiz grade of ≥70%.

Findings: Target not met

Analysis: In AC 2022–2023, the target was met. All (100% or 2/2) of the physical science students assessed earned a quiz grade of ≥70%. Students were able to articulate via written quiz, the natural laws of mechanics. Students struggled with the application of natural laws in real-life situations.

Based on the analysis of the AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024 to drive the cycle of improvement. The Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024. Out of this meeting, the decision to assign PHYS 2510 to the new instructor was made. A different instructor was assigned to teach PHYS 2510 during AC 2023 – 2024. When comparing the results from AC 2022–2023 to AC 2022-2023, there is a decrease in the percentage of students meeting the target (-33%). In AC 2023-2024, 67% (2/3) of the physical science students assessed earned a quiz grade of ≥70%; therefore, the target was not met. This performance is below (-8%) the goal of 75% of students earning a target of ≥ 70% on this assessment. This implies that 33% (1/3) of the Physical Science students scored below the target 70% in the quiz. Students struggled with the application of natural laws in real-life situations.

As a result of these changes, in AC 2023-2024 the target was not met.

Decision: In AC 2023-2024, the target was not met. Based on the analysis of the AC 2022-2023 results, in AC 2024-2025, the faculty will implement the following changes to drive the cycle of improvement. The faculty will improve informational delivery in the PHYS 2510 course by modifying the course content to better align with course objectives. The changes will include the addition of differential and integral calculus, as well as exercises in computer programming. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Sciences, will meet with the instructors and discuss the delivery of content and the timing of assessments. These changes will improve the students' ability to learn about the various natural laws of mechanics and how to identify and apply these concepts in real-life situations.

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

Course Map: Tied to the course syllabus objectives

CHEM 4920: Scientific Communication
PHYS 4940: Scientific Communication

Measure 3.1. (Direct – ability)
Throughout all sections of the 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 earn a final score of ≥ 70% on the assignment.

Findings: Target met

Analysis: In AC 2022-2023, the target was met. All (100% or 5/5) of the physical students attained a score of ≥70% on the assignment. The students were able to write a scientific article successfully under the supervision of an instructor. The students struggled with performing a literature review.

Based on the analysis of the AC 2022-2023 results, the target was met. The Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023 – 2024 to discuss how to drive improvement on the course. As a result of this meeting, it was decided that instructors provide a lecture and discussion session covering the topic of scientific literature review for CHEM 4920/PHYS 4940. As a measure to drive improvement, instructors provided a lecture and discussion session covering the topic of scientific literature review for CHEM 4920/PHYS 4940. In AC 2023-2024, 100% (3/3) of the physical students attained a score of ≥70% on the assignment; therefore, the target was met. All students were able to successfully write a scientific article. Students struggled with performing a literature review.

As a result of these changes, in AC 2023-2024, the target was met.

Decision: In AC 2023-2024, the target was met. Based on the analysis of the AC 2023 – 2024 assessment results, in AC 2024 – 2025, the faculty will provide a lecture and discussion session for students covering the topic of scientific literature review. This was decided because (a) performing a scientific literature review is critical to writing a scientific article and (b) students struggled with this topic. These changes will improve the students' ability to write a scientific article, which will be assessed using a standard rubric.

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

Findings: Target met

Analysis: In AC 2023-2024, the target was met. All (100% or 3/3) of the physical students attained a score of ≥70% on the assignment; therefore, the target was met. All students were able to successfully meet the target.

Based on the AC 2022-2023 analysis results, the faculty/Department Head implemented the following changes in AC 2023-2024. The Department Head and program assessment

coordinator met with the faculty of the physical science department prior to the beginning of AC 2023 – 2024 to discuss ways to drive improvement for the program. It was decided that, as a measure to drive improvement, instructors offered an additional lecture and discussion session for students covering the topic of scientific literature presentation for CHEM 4920/PHYS 4940. Students struggled with presenting a linear narrative and with deriving meaning from the results of their experiments. The additional lecture was designed to provide insights into the project presentation process.

As a result of these changes, in AC 2023-2024, the target was met.

Decision: In AC 2023-2024, the target was met. Based on the analysis of the AC 2023 – 2024 assessment results, in AC 2024 – 2025, the following changes will be made to drive improvement. The faculty will provide an additional lecture and discussion session for students covering the topic of scientific literature presentation for CHEM 4920/PHYS 4940. These changes will improve the students' ability to give an oral presentation of a scientific article/project developed by the student. Students struggled with presenting a linear narrative and with deriving meaning from the results of their experiments. The additional lecture will be designed to provide insights into the project presentation process.

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

Course Map: Tied to the course syllabus objectives

CHEM 4910: Capstone Course for Chemistry
PHYS 4930: Capstone Course for Physics

Measure 4.1. (Direct – Ability)
Throughout all sections of the capstone courses, students will read scientific articles from the primary literature and be required to pass quizzes on the material. The target is to have 70% of students earn a final average quiz grade of ≥ 90%.

Findings: Target met

Analysis: In AC 2022-2023, the target was not met. Sixty-seven percent (67% or 2/3) of the physical science students attained a quiz grade of $\underline{\geq}$ 90%. Some of the students struggled to identify key ideas in a peer-reviewed scientific article.

Based on the analysis of the AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024. The Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023 – 2024. As a result of this discussion, it was decided that, as a measure to drive improvement, instructors provided a lecture and discussion session for students covering the topic of scientific literature review for CHEM 4910/PHYS 4930. This session discussed ways to identify key ideas in peer-reviewed scientific articles. The faculty was able to meet with the students one-on-one to discuss what areas they were struggling in

and aid. In AC 2023-2024, 100% (3/3) of the physical students attained a score of ≥90% on the assignment; therefore, the target was met. This implies that 100% (3/3) of the students assessed were able to meet the target successfully.

As a result of these changes, the target was met in AC 2023-2024.

Decision: Based on the analysis of the AC 2023 – 2024 assessment results, in AC 2024 – 2025, the faculty will provide a lecture and discussion session for students covering the topic of scientific literature review. Students struggled with determining the central topic for a research article. These changes will improve the students' ability to read scientific articles from primary literature and be required to pass quizzes over the material.

Measure 4.2. (Direct – Ability)
Throughout all sections of the capstone courses, students will write a proposal about their capstone project. The target is to have 70% of students earn a final written assignment grade of ≥ 90% using a standard rubric.

Findings: Target met.

Analysis: In AC 2023–2024, the target was met. All (100% or 3/3) of the physical science students scored ≥ 90% on the assignment based on a standard rubric. This indicates that the students assessed were able to follow a structure given for a science-based proposal, determine a proper timeframe and budget for their proposed project, and justify the experiments proposed. Students struggled with the literature search process, identifying primary sources, and the main topic of a research article.

Based on the analysis of the AC 2023–2024 results, the faculty implemented the following changes, in AC 2023-2024, to drive the cycle of improvement. The faculty implemented new course materials. The faculty also included a presentation on the components of a proposal and effective writing techniques. This benefited the students as it allowed them to break down what was needed for this assignment and how to build their proposals. The students were also able to have a platform to ask the faculty questions about subjects that they struggled with individually. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments.

As a result of these changes in AC 2023-2024, the target was met.

Decision: Based on the analysis of the AC 2023 – 2024, the target was met. Based on the AC 2023-2024 results analysis, the following changes will be made to drive the cycle of improvement. The faculty will institute new course material, including delivering presentations on the components of a proposal and effective writing techniques. These changes will improve the students' ability to write a proposal about their capstone project.

SLO 5. Students will demonstrate professional development.

Course Map: Tied to the course syllabus objectives

CHEM 4910: Capstone course for Chemistry
PHYS 4930: Capstone course for Physics.

Measure 5.1. (Direct – Skill)
Students will be required to give a final presentation assessed using 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 met

Analysis: In AC 2023–2024, the target was met. All (100% or 3/3) of students gave a final presentation that met ≥70% of the prescribed guidelines. This indicated that the students could successfully present the results of their capstone project to an open audience and correctly answer most of the questions posed by the public within a timeframe specified by the course instructor. Students struggled with presenting a linear narrative and with deriving meaning from the results of their experiments.

Based on the analysis of the AC 2023–2024 results, the faculty implemented the following changes in AC 2023-2024. The faculty developed new course materials that covered the topic of effective scientific communication and the delivery of a presentation to the public. At the start of AC 2023–2024, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, met with the instructors and discussed the delivery of content and the timing of assessments. It was decided that additional instruction regarding how to properly present a scientific project to the community was necessary to drive improvement.

As a result of these changes in AC 2023-2024, the target was met.

Decision: In AC 2023-2024, the target was met. Based on the analysis of the AC 2023 – 2024 assessment results, in AC 2024 – 2025, the faculty will develop new course material that covers the topic of effective scientific communication and presentation to the public. The materials developed are aimed at addressing the challenge of timing, linear narrative, and delivering results in a way that the public understands both the topic and its importance. These changes will improve the students' ability to successfully present their capstone projects to the public.

Measure 5.2. (Direct – Skill)
Students will be required to relate their project to a specific entry level job that conforms to guidelines set forth in the course. The target is to have 100% of students relate their

capstone projects to available workforce opportunities that meet ≥ 90% of the prescribed guidelines.

Findings: Target met

Analysis: In AC 2023–2024, the target was met. All (100% or 3/3) of students related their capstone projects to available workforce opportunities that met ≥ 90% of the prescribed guidelines. Students struggled with finding statistical data regarding entry-level jobs in their respective fields.

Based on the analysis of the AC 2022–2023 results, the faculty implemented the following changes in AC 2023-2024. The faculty rotated between the Fall and Spring semester offering of CHEM 4910/PHYS 4930 to ensure that the content presented was current and relevant to the course.

As a result of these changes in AC 2023-2024, the target was met.

Decision: Based on the analysis of the AC 2023 – 2024 assessment results, in AC 2024 – 2025, the faculty will include an additional discussion that covers the topic of entering the job market with their current degrees and areas of expertise. These changes will improve the student's ability to relate their capstone projects to available workforce opportunities.

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 2023-2024. These changes are based on the knowledge gained through the analysis of AC 2022-2023 results.

- In Measure 1.1, the Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024. As a measure to drive improvement, our faculty rotated between the courses of CHEM 1030/1031 and CHEM 1040/1041 to ensure the content presented is current and aligns with pre-requisite content for future courses. Fifty percent (50% or 2/4) of the Physical Science students assessed obtained a quiz grade of ≥ 70%. This performance is below (-20%) the goal of 70% of students earning a target of ≥ 70% on this assessment. This implies that the students still struggled to demonstrate appropriate knowledge of the structure of atoms and the importance of each subatomic particle. When comparing the results from AC 2022-2023, there is a decrease in the percentage of students meeting the target (-17%).

- In Measure 1.2, the faculty rotated between the courses of CHEM 1030/1031 and CHEM 1040/1041 to ensure the content presented is current and aligns with pre-requisite content for future courses. The Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024 to discuss other ways to help with the student’s knowledge base of the basic concepts of atomic structure. The new

textbook and online platform for CHEM 1030/1040 served as an updated resource that provides students with academic resources, including adaptive learning homework and short videos. When comparing the results from AC 2022- 2023, there is a decrease in the percentage of students meeting the target (-17%). Fifty percent (50% or 2/4) of the Physical Science students gauged their understanding of the basic concepts of atomic structure covered in the course as above average or excellent; therefore, the target was not met. This performance is below (-25%), and the goal is for 75% of students to express a level of understanding above average or excellent on this assessment. This implies that 50% (2/4) of the physical science students gauged their appraisal of their understanding of the basic concepts of atomic structure covered in the course as average or below.

- In Measure 2.1, the Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024. Our faculty rotated between the courses of CHEM 1030/1031 and CHEM 1040/1041 to ensure the content presented is current and aligns with pre-requisite content for future courses. When comparing the results from AC 2023-2024 to AC 2022-2023, there was a decrease in the percentage of students meeting the target (-50%). In AC 2023–2024, 0% (0/1) of the physical science students assessed earned a quiz grade of ≥70%; therefore, the target was not met. This performance is below (-75%) the goal of 75% of students earning a target of ≥ 70% on this assessment. This implies that 100% (1/1) of the Physical Science students scored below the target of 70% on the quiz.

- In Measure 2.2, the Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023–2024. Out of this meeting, the decision to assign PHYS 2510 to the new instructor was made. A different instructor was assigned to teach PHYS 2510 during AC 2023 – 2024. When comparing the results from AC 2022–2023 to AC 2022-2023, there is a decrease in the percentage of students meeting the target (-33%). In AC 2023-2024, 67% (2/3) of the physical science students assessed earned a quiz grade of ≥70%; therefore, the target was not met. This performance is below (-8%) the goal of 75% of students earning a target of ≥ 70% on this assessment. This implies that 33% (1/3) of the Physical Science students scored below the target 70% in the quiz.

- In Measure 3.1, the Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023 – 2024 to discuss how to drive improvement on the course. As a result of this meeting, it was decided that instructors provide a lecture and discussion session covering the topic of scientific literature review for CHEM 4920/PHYS 4940. As a measure to drive improvement, instructors provided a lecture and discussion session covering the topic of scientific literature review for CHEM 4920/PHYS 4940. In AC 2023-2024, 100% (3/3) of the physical students attained a score of ≥70% on the assignment; therefore, the target was met. All students were able to successfully write a scientific article.

- In Measure 3.2, the Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023 – 2024 to discuss ways to drive improvement for the program. It was decided that, as a measure to drive improvement, instructors offered an additional lecture and discussion session for students covering the topic of scientific literature presentation for CHEM 4920/PHYS 4940. The additional lecture was designed to provide insights into the project presentation process.

- In Measure 4.1, the Department Head and program assessment coordinator met with the faculty of the physical science department prior to the beginning of AC 2023 – 2024. As a result of this discussion, it was decided that, as a measure to drive improvement, instructors provided a lecture and discussion session for students covering the topic of scientific literature review for CHEM 4910/PHYS 4930. This session discussed ways to identify key ideas in peer-reviewed scientific articles. The faculty was able to meet with the students one-on-one to discuss what areas they were struggling in and provide aid. In AC 2023-2024, 100% (3/3) of the physical students attained a score of ≥70% on the assignment; therefore, the target was met. This implies that 100% (3/3) of the students assessed were able to meet the target successfully.

- In Measure 4.2, the faculty implemented new course materials. The faculty also included a presentation on the components of a proposal and effective writing techniques. This benefited the students as it allowed them to break down what was needed for this assignment and how to build their proposals. The students were also able to have a platform to ask the faculty questions about subjects that they struggled with individually. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments.

- In Measure 5.1, the faculty developed new course materials that covered the topic of effective scientific communication and the delivery of a presentation to the public. At the start of AC 2023–2024, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, met with the instructors and discussed the delivery of content and the timing of assessments. It was decided that additional instruction regarding how to properly present a scientific project to the community was necessary to drive improvement.

- In Measure 5.2, the faculty rotated between the Fall and Spring semester offering of CHEM 4910/PHYS 4930 to ensure that the content presented was current and relevant to the course.

Assessment Cycle 2023 – 2024

Plan of action moving forward:

- In Measure 1.1, the faculty will review the assessment questionnaire to better reflect the course objectives and material. The faculty will also offer the students supplementary instruction in general chemistry courses (1030/1031/1040/1041). At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments. These changes will improve the students' ability to demonstrate appropriate knowledge of the structure of atoms and the importance of each subatomic particle.

- In Measure 1.2, the faculty will review the assessment questionnaire to better reflect the course objectives and material and ensure that the questionnaire accurately reflects the students' knowledge of the basic concepts of atomic structure. The faculty will also offer supplementary instruction to students in general chemistry courses (1030/1031/1040/1041). The supplementary instruction will highlight the basic concepts that are necessary to comprehend the atomic structure. This will also give the students a platform to ask questions concerning topics that they struggle with individually. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments. These changes will improve the student's ability to demonstrate appropriate knowledge of the structure of atoms and the importance of each subatomic particle.

- In Measure 2.1, the faculty will review the assessment questionnaire to better reflect the course objectives and material. The faculty will also offer supplementary instruction to students in general chemistry courses (1030/1031/1040/1041). The supplementary instruction will offer students an opportunity to ask questions relevant to thermodynamics where they struggle individually. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Science, will meet with the instructors and discuss the delivery of content and the timing of assessments. This is to ensure that the faculty offers students methods of learning that each student can benefit from. These changes will improve the students' ability to learn about the various natural laws of thermodynamics.

- In Measure 2.2, the faculty will improve informational delivery in the PHYS 2510 course by modifying the course content to better align with course objectives. The changes will include the addition of differential and integral calculus, as well as exercises in computer programming. At the start of AC 2024–2025, the Physical Science assessment coordinator, in consultation with the Department Head of Physical Sciences, will meet with the instructors and discuss the delivery of content and the timing of assessments. These changes will improve the students' ability to learn about the various natural laws of mechanics and how to identify and apply these concepts in real-life situations.

- In Measure 3.1, the faculty will provide a lecture and discussion session for students covering the topic of scientific literature review. This was decided because (a) performing a scientific literature review is critical to writing a scientific article, and (b) students struggled with this topic. These changes will improve the students' ability to write a scientific article, which will be assessed using a standard rubric.

- In Measure 3.2, the faculty will provide an additional lecture and discussion session for students covering the topic of scientific literature presentation for CHEM 4920/PHYS 4940. These changes will improve the student's ability to give an oral presentation of a scientific article/project developed by the student. Students struggled with presenting a linear narrative and with deriving meaning from the results of their experiments. The additional lecture will be designed to provide insights into the project presentation process.

- In Measure 4.1, the faculty will provide a lecture and discussion session for students covering the topic of scientific literature review. Students struggled with determining the central topic for a research article. These changes will improve the students' ability to read scientific articles from primary literature and be required to pass quizzes over the material.

- In Measure 4.2, the faculty will institute new course material, including delivering presentations on the components of a proposal and effective writing techniques. These changes will improve the students' ability to write a proposal about their capstone project.

- In Measure 5.1, the faculty will develop new course material that covers the topic of effective scientific communication and presentation to the public. The materials developed are aimed at addressing the challenge of timing, linear narrative, and delivering results in a way that the public understands both the topic and its importance. These changes will improve the students' ability to successfully present their capstone projects to the public.

- In Measure 5.2, the faculty will include an additional discussion that covers the topic of entering the job market with their current degrees and areas of expertise. These changes will improve the student's ability to relate their capstone projects to available workforce opportunities