



**SOUTH DAKOTA BOARD OF REGENTS  
ACADEMIC AFFAIRS FORMS**

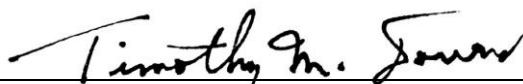
**Institutional Program Review  
Report to the Board of Regents**

Use this form to submit a program review report to the system Chief Academic Officer. Complete this form for all units/programs undergoing an accreditation review, nationally recognized review process, or institutional program review. The report is due 30 days following receipt of the external and internal review reports.

|                              |                              |
|------------------------------|------------------------------|
| <b>UNIVERSITY:</b>           | NSU                          |
| <b>DEPARTMENT OR SCHOOL:</b> | Science and Math             |
| <b>PROGRAM REVIEWED:</b>     | Chemistry                    |
| <b>DATE OF REVIEW:</b>       | 12/6/2019                    |
| <b>TYPE OF REVIEW:</b>       | Institutional Program Review |

**University Approval**

*To the Board of Regents and the Executive Director: I certify that I have read this report, that I believe it to be accurate, and that it has been evaluated and approved as provided by university policy.*

  
\_\_\_\_\_  
President of the University

3/19/2020  
\_\_\_\_\_  
Date

**1. Identify the program reviewers and any external accrediting body:**

Dr. Nate Netzer, Assistant Professor of Chemistry at Peru State University in Peru, Nebraska.

Peru State University is accredited by Higher Learning Commission (HLC) and NCATE (National Council for Accreditation of Teacher Education).

**2. Items A & B should address the following issues: mission centrality, program quality, cost, program productivity, plans for the future, and assessment of progress.**

**2(A). Describe the strengths and weaknesses identified by the reviewers**

Strengths:

1. Faculty Expertise
  - Chemistry faculty have a strong background in chemistry. Each faculty member is dedicated to the field, particularly as it relates to student research and education.
2. New Facility and Equipment
  - The new Harvey Jewett IV Science Education Center greatly supports science education. The 2<sup>nd</sup> floor is dedicated to chemistry with spaces equipped with new chemistry equipment to support chemistry research and education endeavors.

3. Location of University
  - To capture rural students, particularly those motivated to do well in chemical sciences, Northern State University and the chemistry program is with situated in northeastern South Dakota to do so.
4. Outcomes of the Program are Apparent
  - The chemistry program, through its research activities and industry partners, provides students with connections and readies them for the field. Many go on to easily transition into professional school or into a position in industry.

Weaknesses:

1. Limited Time for Research
  - Faculty and staff in the chemistry program have high teaching loads, i.e., 24 credit hours per academic year, which precludes them from conducting research and publishing said research. Thus, research productivity is on the lower end in the department.
2. Layout of Labs in New Facility
  - The high visibility and openness of the labs and lab preparation areas may distract students or researchers and limit lab productivity.

**2(B). Briefly summarize the review recommendations**

The reviewer recommends the following:

1. Determine the dynamics of our student population. For example, map where students are from and target recruitment efforts accordingly.
2. Establish an agreement to streamline application processes for students into graduate programs, much like the Rural Health Opportunities Program (RHOP) in Nebraska.
3. Conduct a “true” self-evaluation before applying for American Chemical Society (ACS) accreditation.

These recommendations address several goals/objectives of the chemistry program.

**2(C). Indicate the present and continuous actions to be taken by the college or department to address the issues raised by the review. What outcomes are anticipated as a result of these actions?**

In response to Weakness #1:

The issue of faculty workload needs to be addressed with current and/or future administration in the SD Board of Regents and leadership within the bargaining unit, i.e., Council for Higher Education (COHE). It is important as faculty we communicate with these entities about issues and needs with regard to faculty positions. An outcome of doing so, at the very least, would be awareness of the issues and needs.

In response to Weakness #2:

The new science building is an asset to the department, but as with any new facility, there are growing pains. Being newly situated in the building, we have noticed some minor issues with the lab spaces. As the reviewer mentioned, high visibility in the labs makes for a safe, open lab space, but also can increase student distractions. Most students, however, remain engaged in lab. As instructors, we are aware of the potential for high distractions, and make sure to engage students in the lab throughout the class period or during research endeavors. An outcome of doing so would be the reduction of distractions due to engaging activities.

- 3. Starting in Fall 2019 reporting year, campuses will identify the undergraduate cross-curricular skill requirements as part of programmatic student learning outcomes and identify assessment methods for cross-curricular skill requirements as outlined in Board Policy 2:11. Program review completed prior to Fall 2019 need not include cross curricular skills.**

As mentioned by the reviewer, the science programs have a new science building, i.e., the Harvey Jewett IV Science Education Center, that helps facilitate science research and education. In concert with this, faculty have been successful in obtaining research monies to purchase new science equipment. With the new building and equipment, we have state-of-the-art classroom and lab spaces equipped with new science equipment to generate high quality education and research.

Further, we are moving towards ACS accreditation, and part of doing so is hiring an additional faculty member with expertise in chemistry. With this new hire, the chemistry program is very close to achieving this goal. A new hire also means new programs and courses, which include a BS in Biochemistry degree and a yearlong course in Biochemistry. Both will assist in the preparation of our students for graduate schools.

Below is the new approved program assessment for chemistry that addresses Program Learning Outcomes (PLOs) as defined by the SD Board of Regents. Since the SD Board of Regents recently adopted the PLOs, the chemistry program recently edited its assessment program, which means the implementation of the new approved chemistry annual program assessment will start during AY 20-21.

## Chemistry and Chemistry Education

**PLO1 - Inquiry and Analysis:** A systematic process of exploring issues, objects or works through the collection and analysis of evidence that results in informed conclusions or judgments. Analysis is the process of breaking complex topics or issues into parts to gain a better understanding of them. Chemistry students demonstrate an ability to break down a chemistry problem into multiple steps, resulting in an informed conclusion.

| <b>Course</b> | <b>Embedded assessment</b>  | <b>Expected Benchmark</b> |
|---------------|---|---------------------------|
| Chem 112, 114 | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. | Proficient                |
| Chem 326      | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. | Exemplary                 |

**Rubric:**

| Below Proficient   | Proficient  | Exemplary   |
|--|---|---|
| Minimal understanding of chemistry processes. (Chem 112, Chem 114, and Chem 326) | Basic understanding of, and has the ability to apply fundamental chemical processes. (Chem 112, Chem 114, and Chem 326) | Deep understanding of, and has the ability to apply and analyze, fundamental chemical processes. (Chem 112, Chem 114, and Chem 326) |

**PLO2 - Critical and Creative Thinking:** A habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion. Both the capacity to combine or synthesize existing ideas, images, or expertise in original ways and the experience of thinking, reacting, and working in an imaginative way characterized by a high degree of innovation, divergent thinking, and risk taking. Chemistry students can demonstrate this by effectively communicating chemistry ideas in writing.

| Course        | Embedded assessment  | Expected Benchmark |
|---------------|--|--------------------|
| Chem 332, 434 | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. These assignments include writing assessments. | Proficient         |
| Chem 490, 498 | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. These assignments include writing assessments. | Exemplary          |

**Rubric:**

| Below Proficient  | Proficient  | Exemplary  |
|---|---|--|
| Student uses invalid reasoning. (Chem 332, 434, 490, and 498) | Student has no logical errors; reasoning can be followed with some effort by the reader. (Chem 332, 342, and 344) | Student has no logical errors and reasoning can be easily followed by the reader. (Chem 332, 342, and 344) |

**PLO 3 - Information Literacy:** The ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively and responsibly use and convey that information to address the need or problem at hand. Chemistry students can demonstrate this by applying mathematical principles to solve applied problems.

| Course   | Embedded assessment   | Expected Benchmark |
|----------|---|--------------------|
| Chem 112 | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. | Proficient         |
| Chem 114 | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. | Exemplary          |

**Rubric:**

| Below Proficient   | Proficient  | Exemplary  |
|--|---|--|
| Student demonstrates little or no progress toward solving an applied problem. (Chem 112 and 114) | Student demonstrates substantial progress toward solving an applied problem, with work shown in an organized manner. (Chem 112 and 114) | Student demonstrates ability to use all necessary given information in an organized and complete way to solve an applied problem. (Chem 112 and 114) |

**PLO 4 – Teamwork:** Behaviors under the control of individual team members - effort they put into team tasks, their manner of interacting with others on team, and the quantity and quality of contributions they make to team discussions. Chemistry students will demonstrate the ability to work as team while completing a chemistry task.

| <b>Course</b> | <b>Embedded assessment</b>  | <b>Expected Benchmark</b> |
|---------------|---|---------------------------|
| Chem 326, 328 | Peer evaluations of performance and participation as a member of a group completing a graded assignment, and/or portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. | Proficient                |
| Chem 452      | Peer evaluations of performance and participation as a member of a group completing a graded assignment, and/or portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. | Proficient                |

**Rubric:**

| <b>Below Proficient</b>  | <b>Proficient</b>  | <b>Exemplary</b> |
|--|--|------------------|
| Failure to communicate and participate in the task as a team. (Chem 326, 328, and 452) | Communicating and working as a team is evident per student and/or instructor evaluations. (Chem 326, 328, and 452) | N/A              |

**PLO 5 – Problem Solving:** The process of designing, evaluating and implementing a strategy to answer an open-ended question or achieve a desired goal. Chemistry students will write convincing arguments to prove or disprove chemical statements.

| <b>Course</b> | <b>Embedded assessment</b>   | <b>Expected Benchmark</b> |
|---------------|--|---------------------------|
| Chem 342      | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. These assignments include writing assessments. | Proficient                |
| Chem 344      | A portion of graded homework, a portion of a graded quiz or exam, or a portion of a graded special project. These assignments include writing assessments. | Exemplary                 |

**Rubric:**

| <b>Below Proficient</b>                            | <b>Proficient</b>   | <b>Exemplary</b>   |
|--|---|--|
| Student uses invalid reasoning. (Chem 342 and 344) | Student has no logical errors; reasoning can be followed with some effort by the reader. (Chem 342 and 344) | Student has no logical errors and reasoning can be easily followed by the reader. (Chem 342 and 344) |