



Student Learning Assessment Report, Academic

Report Year

2022-2023

Program

Chemistry Major

Department Head

Lucas Tucker

Submitted By

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Previously Submitted Reports

2021-2022 Chemistry Major

Mission

Our mission is to provide a curriculum and environment that enables students to achieve a level of knowledge of chemistry appropriate for their chosen field or liberal arts education. We provide students with the foundation in chemistry and biochemistry necessary for their pursuit of careers in industry, research, education, engineering, health professions or other interdisciplinary fields. Our courses encourage active participation and critical understanding of safety issues and subject matter in both courses and laboratories. We strive to provide our faculty with career and research opportunities for their scholarly development and provide the college and community with a resource of knowledge and professional contribution.

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Master a broad set of chemical knowledge concerning the fundamentals in the basic areas of the discipline (analytical, biochemistry, inorganic, organic and physical chemistry).

Solve problems competently by identifying the essential parts of a problem and formulating a strategy for solving the problem.

Rationally estimate the solution to a problem, apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret their results.

2. Phase

Check all that apply

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

American Chemical Society National Standardized Exams for students in CHEM 120, 220, 240, 310, and 320 .

When does assessment occur?

End of spring semester for 120 and 220, others may occur at the end of fall or spring semesters each year (when the courses run)

How often does assessment occur?

The exams are administered at the end of each course which is typically once a year. Results are analyzed every year.

Criteria (How do you know students are achieving learning outcome?)

50% of all students will meet/exceed National Averages

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

CHEM120 S23

ACS National Ave 2013 test =39

75 of 129 exceeded (58%)

Class ave. (129) = 44

Chem Major Ave.(3) = 40 (2 exceeded...1 did not)

Biochem Major Ave.(11) = 46 (7 exceeded...4 did not)

CHEM 220 S23

ACS National Ave 2018 test = 33.9

46 of 83 exceeded (55.4%)

Class ave. (83) = 35.9

Chem Major Ave.(8) = 33.0 (5 exceeded...3 did not)

Biochem Major Ave.(7) = 37.6 (4 exceeded...3 did not)

CHEM240 S23

ACS Inorganic Foundations 2016 National Mean = 34

13 of 21 met or exceeded (62%)

Class avg. (21) = 34

Chem Major avg. (7) = 29 (2 met or exceeded...5 did not)

Biochem Major avg.(9) = 37 (7 met or exceeded...2 did not)

(of the minors in the course (5), avg was 36, 4 met or exceeded, 1 did not.)

CHEM310 F22

ACS Thermodynamics 2013 National Mean = 27

8 of 13 exceeded (61%)

Class avg. (13) = 27.8

Chem Major avg. (8) = 28.3 (5 exceeded...3 did not)

Biochem Major avg.(5) = 27.0 (3 exceeded...2 did not)

CHEM320 S23

ACS Quantum 2013 National Mean = 27

5 of 8 exceeded (62%)

Class avg. (8) = 27.3

Chem Major avg. (7) = 27.4 (5 exceeded...2 did not)

Biochem Major avg. (not required for the major)

Learning Outcome Met? (Based on Criteria)

Yes



Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Demonstrate an understanding of safe laboratory practices and follow the proper procedures and regulations for safe handling and use of chemicals.

2. Phase

Check all that apply

Planning/ determining procedure

Planning/ Redesigning based on past assessment

- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

Students in general and organic chemistry laboratories are required to turn in prelab assignments that include an outline of the lab procedure and a table of chemicals and associated hazards.

When does assessment occur?

End of spring semester general chemistry laboratory, CHEM121.

How often does assessment occur?

Prelab assignments are associated with every lab (approx. 8 per semester). The data will be analyzed using the master grade sheets for the course at the end of

Criteria (How do you know students are achieving learning outcome?)

80% of students will score 70% or better on this portion of the laboratory writeup.

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

Based on the grades from CHEM 121 in Spring 2023:

On average, 89.4% of students (119 out of 133) scored higher than 70% on pre-lab quizzes

On average, 99.2% of students (132 out of 133) scored higher than 70% on ELNs

Learning Outcome Met? (Based on Criteria)

Yes

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Perform data analysis of both collected and provided data sets and demonstrate an understanding of modern methods of analysis using tool such as excel and python (e.g. pandas, NumPy, statsmodels, and SciPy); demonstrate an understanding of the theory behind, and effectively use, laboratory equipment, instrumentation, and techniques to carry out experiments.

2. Phase

Check all that apply

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

Homework scores will be compiled in CHEM311 (assessing data analysis using computational tools)

Student laboratory reports will be evaluated throughout CHEM415 (instrumental Analysis). The scores for the Results section for each experiment will be compiled.

When does assessment occur?

The "Results" section score of each of the lab reports (approx. 8 per semester) are scored against a rubric for CHEM415 and the homework average in CHEM311

How often does assessment occur?

Data are collected and results are analyzed every year at the end of the course.

Criteria (How do you know students are achieving learning outcome?)

For the homework in CHEM311, all students will score better than 70%.

For the results section of the CHEM415 reports, at least 75% of students will meet or exceed the standard of 70%

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

CHEM 311 F22

There were 3 BICM and 6 CHEM majors in CHEM 311. 7/9 of the students (3 BICM, 4 CHEM) met or exceeded this goal. Two students (both CHEM) did not.

For CHEM415,

Of the 10 students in class, 2 students did not meet the standard, 8 did (80%) meet the expectations for the "Results" section of the lab reports.

Learning Outcome Met? (Based on Criteria)

Yes

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Design an experiment, carry out the procedure, and appropriately record and analyze the results.

Employ literature to locate, retrieve and utilize information to effectively design an experiment.

2. Phase

Check all that apply

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

The independent research project assigned as part of CHEM430 will be evaluated.

When does assessment occur?

The independent project occurs during the last month of the course.

How often does assessment occur?

Data are collected and results are analyzed every year at the end of the course.

Criteria (How do you know students are achieving learning outcome?)

At least 80% of students will meet or exceed the standard of 70%

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

For the final experiment, of the 3 students in the class, 2/3 exceeded the goal of a 70% or higher score.

The other student did not submit enough work to break that threshold.

Learning Outcome Met? (Based on Criteria)

No

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

2. Phase

Check all that apply

Communicate chemical concepts as well as the results of their experimental laboratory research with clarity and coherence through effective writing and oral communication skills.

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
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- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

As part of the students' senior capstone course, the student's presentation of their research both orally and in written form will be evaluated by faculty members using a rubric.

When does assessment occur?

The capstone research course is typically taken during a student's last semester and the student is required to present their work as either a poster or an oral pre

How often does assessment occur?

Results are analyzed every year after the oral presentation.

Criteria (How do you know students are achieving learning outcome?)

At least 80% of students will meet or exceed the standard of 75%

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

CHEM426 – Goal was met. Of the 8 students evaluated, 7 exceeded the standard for the overall course grade.
Two students did not meet the standard for the poster/research paper requirement.

Learning Outcome Met? (Based on Criteria)

Yes

Package History

| Date | User | Action |
|----------------------|-----------------------------------|--|
| 7/3/2023 12:14:55 PM | Kevin Rhoads | Submitted 'Student Learning Assessment Report' |
| 7/3/2023 12:15:43 PM | Thomas Giarla | Received |
| 7/3/2023 12:15:43 PM | School of Science - Asst. Dean | Received |
| 7/3/2023 12:15:43 PM | Institutional Effectiveness | Received |
| 7/3/2023 12:15:43 PM | Provost and Senior Vice President | Received |
| 7/3/2023 12:15:43 PM | School of Science - Dean | Received |
| 7/3/2023 12:15:43 PM | Lucas Tucker | Received |
| 7/3/2023 12:21:29 PM | Margaret Madden | Decision Approved |