

Institutional Effectiveness Report

Name of Program/Department: Chemistry Department

Year: 2015-2016

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Mission Statement

The mission of the chemistry department is to provide a dynamic and inquiry based curriculum in chemistry that provides knowledge and skills needed for students to be successful in their professional and life-long endeavors. Accordingly, the department offers introductory, foundation, and in-depth chemistry courses that satisfy the liberal arts requirements, pre-professional, basic chemistry degree, or the American Chemical Society approved degree. The department encourages undergraduate research and forming ties within the scientific community.

Program Learning Outcomes (PLOs)

Graduates with a Chemistry degree from Francis Marion University will:

PLO #1 – Demonstrate that they have the knowledge and skills needed that will allow them to communicate effectively in both oral and written form.

PLO #2 – Demonstrate that they can think critically.

PLO #3 – Demonstrate an understanding of core concepts, methods and limits of scientific inquiry that will allow them to effectively solve problems in chemistry.

PLO #4 – Demonstrate that they can competently apply their knowledge.

PLO #5 - Demonstrate an understanding of safe laboratory skills (including proper handling of materials and chemical waste) for particular laboratory experiments.

Executive Summary

Presented in this report are the Chemistry Department's Mission, Program and Student Learning Outcomes, the assessment and results of each, and action items for academic year 2016-2017. Achievement of our senior Chemistry majors on communication skills, concept knowledge and critical thinking skills was assessed with Capstone writing assignments, cumulative exams, the ACS *Diagnostic of Undergraduate Chemical Knowledge (DUCK)* Exam, ratings of presentations in senior-level courses. Students in 499 Chemistry Senior Capstone on average, performed at the 68% level when producing capstone writing assignments that assessed their understanding of key chemical compounds. Our goal was 80% for this SLO (# 1). Therefore,

our target was not achieved. Graduating students demonstrated their understanding of Chemical concepts by scoring at the 16th Percentile, on average on the ACS Diagnostic of Undergraduate Chemical Knowledge (DUCK) exam. Our goal was for the 50th Percentile for SLO # 2. Therefore, our target was not achieved. Students in 499 Chemistry Senior Capstone, on average, performed at the 85% level when demonstrating competency in presenting technical information via both oral and written communications. Our goal for SLO # 3 was 80%. Therefore, our target was achieved. All of students enrolled in Chemistry 201 demonstrated an Understanding of laboratory safety procedures at the 70% level or above. Our goal for this SLO (# 4) was 70%. Therefore, our target was achieved.

To address concerns identified in the evaluation of data from the 2015-2016 academic year, the Chemistry Department developed an action plan to be implemented during the 2016-2017 academic year. Based on the data from 2015-2016, the faculty members in the Department of Chemistry decided to enhance the writing rubrics to better evaluate writing skills. Next, the Department will deploy an online component of the Capstone course on the Blackboard platform that will enable students to access review materials and practice tests during the year to prepare for the DUCK administration. Even though the target was met for SLO 3.0, the Department decided to deploy activities that will improve student outcomes. Even though the target was met for SLO 4.0, the Department decided to deploy activities to improve student outcomes. These activities will include enhanced presentation and research paper rubrics, electronic deployment of an exit interview and questionnaire, and the establishment of new benchmarks with expected movement toward exemplary status.

Student Learning Outcomes (SLOs)

SLO# 1.0: Students in the Chemistry Senior Capstone course, on average, will perform at the 80% level or above when producing capstone writing assignments that assess their understanding of key chemical compounds.

SLO# 2.0: Graduating Chemistry students will, on average, perform at the 80% level or above when demonstrating their understanding of Chemical concepts by performing at the median of a nationally normed assessment.

SLO #3.0: Students in the Chemistry Senior Capstone course, on average, will perform at the 80% level or above when demonstrating competency in presenting technical information via both oral and written communications.

SLO #4.0: 100% of students enrolled in Chemistry 201 will demonstrate an Understanding of laboratory safety procedures at the 70% level or above.

Assessment Methods

SLO# 1.0: Students in the Chemistry Senior Capstone course, on average, will perform at the 80% level or above when producing capstone writing assignments that assess their understanding of key chemical compounds as measured by four (4) writing assignments administered over the course of the semester and measured by a departmentally developed rubric.

SLO# 2.0: 80% OF Graduating Chemistry students will demonstrate their understanding of Chemical concepts by scoring at the 50th Percentile, on average on the *ACS Diagnostic of Undergraduate Chemical Knowledge (DUCK)* exam.

SLO #3.0: Students in the Chemistry Senior Capstone course, on average, will perform at the 80% level or above when demonstrating competency in presenting technical information via both oral and written communications as measured by departmental faculty members using a standard rubric.

SLO #4.0: 100% of students enrolled in Chemistry 201 will demonstrate an Understanding of laboratory safety procedures at the 70% level or above as measured by a cumulative exam on laboratory safety.

Assessment Results

SLO# 1.0: Students in 499 Chemistry Senior Capstone on average, performed at the 68% level when producing capstone writing assignments that assessed their understanding of key chemical compounds as measured by four writing assignments administered over the course of the semester and measured by a departmentally developed rubric. Our goal was 80% for SLO # 1. Therefore, our target was not achieved.

SLO# 2.0: Graduating students demonstrated their understanding of Chemical concepts by scoring at the 16th Percentile, on average on the ACS Diagnostic of Undergraduate Chemical Knowledge (DUCK) exam. Our target was for the 50th Percentile for SLO # 2. Therefore, our target was not achieved.

SLO #3.0: Students in 499 Chemistry Senior Capstone, on average, performed at the 85% level when demonstrating competency in presenting technical information via both oral and written communications as measured by departmental faculty members using a standard rubric. Our target for SLO # 3 was 80%. Therefore, our target was achieved.

SLO #4.0: 100% of students enrolled in Chemistry 201 demonstrated an Understanding of laboratory safety procedures at the 70% level or above as measured by a cumulative exam on laboratory safety. Our target for SLO # 4 was 70%. Therefore, our target was achieved.

Action Items

SLO# 1.0: Students in 499 Chemistry Senior Capstone on average, performed at the 68% level when producing capstone writing assignments that assessed their understanding of key chemical compounds as measured by four writing assignments administered over the course of the semester and measured by a departmentally developed rubric. Our goal was 80% for SLO # 1. Therefore, our target was not achieved.

Writing assignments are designed as a tool to assess the student's ability to think critically on key content areas in chemistry. Four writing assignments were administered to seven chemistry majors, and 68% of those were passing. Based on the data from 2015-2016, the faculty members in the Department of Chemistry decided to enhance the writing rubrics to better evaluate writing skills. The Department also decided to enhance the learning experience by infusing more inquiry based learning into the curriculum and to better communicate high expectations to students.

SLO# 2.0: Graduating students demonstrated their understanding of Chemical concepts by scoring at the 16th Percentile, on average on the ACS Diagnostic of Undergraduate Chemical Knowledge (DUCK) exam. Our target was for the 50th Percentile for SLO # 2. Therefore, our target was not achieved.

Seven students took the ACS Diagnostic of Undergraduate Chemical Knowledge (DUCK) exam and the average was the 16th percentile. Based on the data from 2015-2016, the Department will deploy an online component of the Capstone course on the Blackboard platform that will enable students to access review materials and practice tests during the year to prepare for the DUCK administration.

SLO #3.0: Students in 499 Chemistry Senior Capstone, on average, performed at the 85% level when demonstrating competency in presenting technical information via both oral and written communications as measured by departmental faculty members using a standard rubric. Our target for SLO # 3 was 80%. Therefore, our target was achieved.

All seven chemistry majors who were enrolled in the Senior Chemistry Capstone gave a chemistry presentation. Out of a total of 27 grades given to these students by the chemistry faculty, 23 met or exceeded expectations. Even though the target was met, the Department decided to explore ways to improve student outcomes in this area. First, Presentation and term Paper Rubrics have been enhanced. Next, the Department has established new benchmarks with expected movement toward exemplary status. Lastly, the Department will electronically deploy and compile an exit interview and questionnaire to enable indirect measurement of this outcome.

SLO #4.0: 100% of students enrolled in Chemistry 201 demonstrated an Understanding of laboratory safety procedures at the 70% level or above as measured by a cumulative exam on laboratory safety. Our target for SLO # 4 was 70%. Therefore, our target was achieved.

The faculty members in the Department of Chemistry met to discuss these findings, and even though the target was met, the Department decided to explore ways to improve student outcomes in this area. Consequently, the faculty members developed an evaluation process that was less dependent on exam scores and more reflective of what students knew, how they thought about, and how they practiced safety procedures in a laboratory setting. The faculty members also decided to enhance the learning experience by infusing more inquiry based learning into the curriculum and to better communicate high expectations to students.