Online Assessment Tracking Database

Sam Houston State University (SHSU)
2014 - 2015

Chemistry MS

Goal **Develop Presentation Skills**

The ability to communicate research and knowledge are fundamental presentation skills in chemistry.

Objective (L) **Demonstrate Presentation Skills**

Students completing CHEM 5100 will, at least once during their tenure as graduate students, demonstrate the ability to make a research presentation.

Indicator **Acceptable Student Seminar Peer-Reviewed Presentation**

During their tenure as graduate students, all students will present at least one departmental seminar. The faculty, through the peer-review evaluation rubric, will determine the presentation's acceptability.

Criterion **At Least One Seminar Presentation**

All graduate students in chemistry are required to take CHEM 5100 at least once during their tenure as graduate students. To pass CHEM 5100, students are required to receive an acceptable peer-rating on a required research presentation. Within the course, each student evaluates all other student presentations. The rubric is the last page of the syllabus.

Finding **Acceptable Presentations And Improved Critiques**

A new Faculty member was assigned the CHEM 5100 Seminar course starting Spring 2015. The addition of an early-semester discussion of the importance of critical suggestions to improvement of presentations and of the example comments in the syllabus rubric led to generally useful critiques as determined by the professor. All (100% of 16) presentations were deemed suitable by the student peer evaluators (as determined by a median score of at least 21 out of 30 points) and by the course professor (assigned score of at least 70 out of 100). The professor deemed the student comments to be almost entirely positive and helpful, but at times still overly brief. Students should put more time into the critiques.

Action **Improve Time Allotted For Writing Critiques**

After each presentation, a set time period (5 or 10 minutes) should be allotted for writing up comments. Students will be required to spend this time thinking and writing up critiques. By doing this, the students will not benefit from finishing overly quickly by being extremely brief.

Goal **Deliver A Curriculum With Appropriate Discipline Specific Knowledge**

The program will address the discipline specific knowledge dictated by professional societies and/or professionals in the workforce.

Objective (L)

Demonstrate Advanced Biochemistry Knowledge And Skills

CHEM 5372 "Advanced Biochemistry I" addresses detailed biochemistry concepts from a chemical perspective. It covers all major macromolecules, but with a strong focus on enzymes using cytochrome P450s as the model enzyme to explore in detail. Students are expected to understand enzymes and how they are studied at a level that allows critical analysis of primary literature in this field.

Indicator

Ability To Understand And Critically Analyze Primary Literature In Enzyme Biochemistry

Each student will present an appropriate literature article (selected by the student and approved by the instructor). On the final exam, each student will be required to answer questions on five (5) different papers discussed during the semester (out of 24 total). Each question will require the student to first summarize the paper's major findings, then to explain how a technique used in the paper works, then critically evaluate what the authors did not include in the paper that they should have or could have. The students will not know the nature of the questions before the exam, just that there will be one question for each article.

Criterion

Mastery As Demonstrated On Final Exam Questions

80% of students will score at least 80% (12 of 15 points) on 80% of the exam questions (4 out of 5 questions each student answered on this section of the final exam). Scoring will be done by the instructor.

Finding

Observed Mastery Of Advanced Biochemistry Of Enzymes

During the Fall 2014 semester, 100% of students (24) met the criteria. This is consistent with the instructor's overall evaluation that this was an unusually successful set of students. He deems it unlikely that this would be the case in other semesters.

Action

Increase Level Of Material And Stringency Of Criteria

During the next course offering, additional detailed material about spectroscopic methods used to study enzymes will be added as the students are capable of handling more material (although the fall 2014 semester was not deemed deficient, there is more material that can be added). Further, the criteria for success in the assessment will be increased to 85% of students scoring at least 85% on 100% of the literature questions.

Objective (L)

Demonstrate Understanding Of The Peer Review Process In Scientific Publications

The process of peer-review of manuscripts for the scientific literature is a fundamental part of science. Students in Analytical Spectroscopy (CHEM 5368, taught every 2 to 2.5 years) read and discuss published peer-reviewed literature articles

throughout this course (there is no assigned textbook). One of the objectives of this course is for students to learn the nuts and bolts of the systematic process of scientific peer-review. Mastery of the requirements for modern high quality technical scientific publication is required to meet one of the primary objectives of this graduate course in chemistry.

Indicator

Examination Of Student Understanding Of Scientific Peer Review

All students in the class are required to understand and correctly order the sequence of events, identify the players in the process (authors, editors, and reviewers), detail the feedback nature of the review process, and be able to critique both technical writing, figures, schematics, or imagery required in chemical publications.

Criterion

85% Of Graduate Students Meet Expectations

Eighty-five percent of graduate students taking the final exam in the class will score within one standard deviation of the mean or higher on a written question on the final designed to evaluate their mastery of the Indicator.

Finding

CHEM 5368 Results

Using a scientific manuscript that had been recently peer-reviewed from work carried out in the instructor's research group, the Spring 2015 CHEM 5368 course was modified to include a detailed description of the steps in the peer-review process, including the temporal variables involved in the process, the subject journal's editor's comments, comments from the anonymous reviewers, and examples of how the (ultimately accepted) manuscript was modified in response to the review process. And as the previous Action requires, a test question involving the peer-review process was included and the results showed an increase in student success from 85% scoring within 1 standard deviation (in Spring 2013) to 90% (in Spring 2015).

Action

Monitor Progress

Monitor the progress of the students and consider tightening the criterion. We raised it from 80% in 2012-2013 to 85% in the current year.

Objective (L)

Demonstration Of Quantitative Proficiency In The Calibration And Validation Of Chemical Sensors

CHEM 5385 (Nanoscience and nanosensing) provides an introduction to calibrated measurements of concentration within the context of nanoscience and nanosensing. The course begins by setting up a framework for calibrated measurements of concentration and then examines how the fabrication, design, function, and applications of nanosensors fit into and influence that framework. Readings are assigned from both textbooks and the primary literature. A key objective of the course is that students be able to quantitatively analyze raw sensor data for the purpose of making calibrated measurements of concentration, and that they be able to validate these measurements.

Indicator

Mastery Of Sensor Calibration And Validation Concepts

All students in the course will demonstrate their level of mastery of the concepts of sensor calibration and validation by their performance on a midterm examination devoted to these topics.

Criterion

Performance On Relevant Midterm Examination In CHEM 5385

80% of the students will score within 20% of the number of points of the highest scoring student on the relevant midterm exam, provided that the highest score obtains at least 85% of the available points. If the highest score is less than 85% of the available points, then the criterion will be that 80% of the students will score greater than 68% of the points on the exam.

Finding

Assessment Results From Fall 2014

91% of the students met the criteria on the relevant midterm exam in the Fall 2014 iteration of the course. The high score on this exam was 100%.

Action

Development Of A Greater Range Of Explanatory Examples Based On The Primary Literature

In future offerings of this course, more student exercises exploring potential pitfalls of calibration and how these can be identified in the validation procedure will be developed, along with a greater range of supporting problems based on new reports from the primary literature on nanosensors and nanosensing. The rigor and breadth of the relevant midterm exam will be correspondingly expanded.

Objective (L)

Demonstrate Advanced Organic Chemistry Knowledge And Skills

Organic reaction mechanisms is a broad area of organic chemistry that requires an understanding of the basic structural-electronic properties of organic molecules. CHEM 5362 is focused on the examination of alkylation, oxidation, reduction, substitution, elimination, rearrangement, and electrocyclic processes. As each topic is covered, in-class and out-of-class problems are assigned to give each graduate student ample practice and experience at applying the material. Since application is the central focus, all work involves open access to course materials.

Indicator

Mastery Of Advanced Organic Chemistry Knowledge

All students in this course will demonstrate their mastery of organic reaction mechanisms and their application to specific reactions through multiple applied problem sets and periodic topic focused examinations. Evaluation of the student's work is based on the appropriateness and acceptability of their answers based on current literature.

Criterion

Final Exam Performance In CHEM 5362

All (100%) of the students will score within 10% of the points of the mean percentage or higher and within

20% of the points of the high score on the final examination.

Finding

CHEM 5362 Results

During the Spring 2015 semester, 100% of the students scored within 10% of the points of the mean or higher and 93% were within 20% of the points of the high percentage for the class on the final.

Action

Inclusion Of Small Group Activities For Short In-class Presentations

In future offerings of the class, an increased number of small problem sets will be required in order to emphasize the necessity of applications to the understanding of the mechanism and use of organic reactions.

Previous Cycle's "Plan for Continuous Improvement"

The master's program is different than our undergraduate programs in a variety of ways. Most importantly for assessment purposes, with the exception of our seminar class (CHEM 5100), graduate research (CHEM 6398) and thesis (CHEM 6099), our courses are not offered every year. They aren't necessarily offered every other year--the frequency varies based on the instructors other demands and the needs of the students in the program.

For the seminar, sample critiques and comments will be provided at the beginning of the course.

For the course on polymer chemistry, the next time the course is offered, the instructor will require students to evaluate and summarize their peers' presentations, and these will be shared anonymously to the whole class.

For CHEM 5374, the next time the course is offered, the instructor will emphasize how students should create a sigma only molecular orbital energy diagram for octahedral metal complexes through homework assignments.

For physical organic chemistry, the next time the course is offered, the instructor will require peer evaluation of student presentations.

For industrial biochemistry, the next time the course is offered, the instructor will increase the emphasis on complex problem solving through the use of individual homework and group classroom assignments.

Please detail the elements of your previous "Plan for Continuous Improvement" that were implemented. If elements were not implemented please explain why, along with any contextual challenges you may have faced that prevented their implementation.

For the seminar, the instructor for the course changed beginning with the spring 2015 semester.

Analytical spectroscopy was offered this cycle (and was addressed in the 2012-2013 "Plan for Continuous Improvement") and one of the intstructor's manuscripts was used as an example of the review process (including editor and referee comments).

Organic reaction mechanisms was also offered this cycle (and was addressed in the 2012-2013 Plan). It isn't known if the instructor followed through with outlining the requirements for the final examination at the beginning of the semester. The students performed well in the class.

For the four courses mentioned in last year's Plan (above), they were not offered during the 2014-2015 year, so the changes could not be implemented this year, which is why the Plan stated "the next time the course is offered".

Plan for Continuous Improvement - Please detail your plan for improvement that you have developed based on what you learned from your 2014 - 2015 Cycle Findings.

As pointed out previously, the master's program is different that our undergraduate programs in a variety of ways. Most importantly for assessment purposes, with the exception of our seminar class (CHEM 5100), graduate research (CHEM 6398) and thesis (CHEM 6099), our courses are not offered every year. They aren't necessarily offered every other year--the frequency varies based on the instructors' other demands and the needs of the students in the program.

For the seminar, the instructor plans on providing a set time period at the end of the presentation to give the students enough time to provide thoughtful critiques.

For CHEM 5372 "Advanced Biochemistry I", the next time the course is offered, the instructor will provide additional material about spectroscopic methods used in enzymatic studies, and the criterion will be raised.

For Nanoscience and Nanosensing, the next time the course is offered, there will be more student exercises exploring problems with calibration and validation, as well as more supporting problems from the primary literature.

The next time analytical spectroscopy is offered the criterion may be raised even further.

The next time organic reaction mechanisms is offered the instructor intends to increase the number of small problem sets required of the students.