

Assessment Plan

Western Michigan University

Chemistry

Mission Statement: To provide an environment conducive to teaching, learning, research, and scholarship for both undergraduate and graduate students. Our programs will educate students to become critical thinkers and problem solvers, while enabling them to meet the future challenges of a complex and diverse global society. Each program is designed with a specific goal in mind.

Outcome: Graduate Outcome: Basic Research Skills

Graduates should have the basic research skills necessary for placement in appropriate positions.

Track: Doctor of Philosophy in Chemistry
Master of Science in Chemistry

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
The instructor will evaluate the Master student's ability to retrieve information from the literature. This will be a different rating from that used in Outcome #1 where the ability to integrate the information after retrieval will be assessed. In addition, the research seminar will be evaluated by the entire faculty for research skills and the thesis defense evaluated by the thesis committee members.	CHEM 505		Yes
Doctoral program students will be assessed via CHEM 505 and the dissertation defense will be evaluated as just described for the Masters student. In addition, the proposal committee members will evaluate the proposal for research skills. This will be an important aspect of the evaluation for research skills since the student is asked to develop their own research hypothesis and develop experiments to test the hypothesis.	CHEM 505 and dissertation defense		Yes
Alumni Survey	We will once again survey graduates of the graduate program, as we will do for the undergraduate program. Questions on the survey will be specifically directed to the 4 learning outcomes.	Graduates will be surveyed 2 and 5 years after they graduate.	Yes

Outcome: Graduate Outcome: Critical thinking skills

Graduates should have developed critical thinking skills.

Track: Doctor of Philosophy in Chemistry
Master of Science in Chemistry

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
Masters students will be required to present two seminars before the entire department. One will be a critique of a paper in the literature (described above in Outcome #1), and the other will be a research seminar on their work. The research seminar will be given well in advance of the thesis defense and before all research is completed. Faculty will rate each seminar on the critical thinking skills exhibited by the student using the system previously described. In addition, the graduating student must defend their thesis before their thesis committee.			Yes

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
Members of the thesis committee will rate the critical thinking ability demonstrated by the student during this defense using the numerical scale.			
Doctoral students will also do a critique seminar and defend their dissertation during a public presentation. Evaluations will be done as described for Masters students. In addition, the proposal described in Outcome #1 will be evaluated for the critical thinking involved in forming the hypothesis that is proposed. As before, each member of the defense committee will do this evaluation.			Yes

Outcome: Graduate Outcome: Effective Oral Communication

Graduates should be able to effectively communicate chemical principles and chemical information in a oral format.

Track: Doctor of Philosophy in Chemistry
Master of Science in Chemistry

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
Masters students oral communication will be assessed using the critique seminar, research seminar, and the thesis defense. In order to better evaluate the oral communication and give students better feedback, the evaluation process will be divided into three sections outlined. a. Organization and Presentation b. Background and Development of Basic Principles c. Summary of Results, Conclusions, and Ability to Answer Questions All faculty present will do the evaluation of these presentations.			Yes
Doctoral students will be evaluated as described for the Masters students. In addition, the proposal will be evaluated by the defense committee for oral communication. The oral presentation will be evaluated by each member using the three criteria stated: a. Organization and Presentation b. Background and Development of Basic Principles c. Summary of Results, Conclusions, and Ability to Answer Questions			Yes

Outcome: Graduate Outcome: Effective written communication

Graduates should be able to effectively communicate chemical principles and chemical information in a written format.

Track: Doctor of Philosophy in Chemistry
Master of Science in Chemistry

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
Masters students will be evaluated using written assignments in CHEM 505 and the written thesis. The instructor of CHEM 505 will rate each graduate student while each member of the			Yes

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
thesis committee will rate the thesis.			
Doctoral students will be evaluated as described for the Masters students. In addition, the proposal will be evaluated by the defense committee for written communication. A written evaluation score will be given by each committee member.			Yes

Outcome: Graduate Outcome: Knowledge to synthesize and integrate chemicals

Graduates should be able to synthesize and integrate chemical knowledge.

Track: Doctor of Philosophy in Chemistry
Master of Science in Chemistry

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
Masters Program students will present a critique seminar of a published paper from an area of chemistry. This will require the student to synthesize both the information in the paper and the background information into an oral presentation. Students will present this seminar to the entire department. Faculty will be asked to rate the student on how well the student integrated the information from the multiple sources (primary paper and background information) into the presentation using the numerical assessment described above. Students will also take CHEM 505 (Chemical Literature) which contains assignments that require integrating information from multiple sources into a coherent paper. The instructor will rate each graduate student as described and data will be combined.	CHEM 505		Yes
Ph.D. Program ? Doctoral students will also present a critique seminar and take CHEM 505 and these will be used to assess their ability to synthesize and integrate chemical information. Doctoral students will also have two other measures of this outcome. One will be required to take cumulative exams (CUME). These exams will consist of either questions regarding a paper in the literature, or questions about a specific topic they are asked to research on their own. Students will either pass or fail each exam and results will be kept on each category to determine how well our students integrate material in published papers compared to how well they integrate material they research on their own. The second measure will be an original proposal in which the students research a particular area of chemistry and develop a hypothesis to test. The student will then write a research grant proposal on this topic and defend it in front of a committee of 4 or 5 faculty members. Each faculty member will evaluate the proposal on the basis of how well the student integrated the available literature information into his or her proposal using the numerical scale.			Yes

Outcome: Undergraduate Outcome: Ability to solve basic chemical problems

Graduates should have the ability to solve basic chemical problems using the knowledge they have acquired.

Track: Biochemistry Major
Chemistry Secondary Education Major
Geochemistry Major
LEC Chemistry Major

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
This outcome will be determined at the 100 - 300 levels with embedded questions in the final exam. Specific questions requiring problem solving ability will be included.			Yes
Additional assessment of this outcome will be done in capstone courses at the 500 level (CHEM 520, 551, and 575). These courses are either exclusively laboratory courses or contain a significant laboratory component. Part of these courses require students to solve chemical problems using the knowledge they have acquired in their training. Instructors of these courses will assess the problem solving ability of each chemistry major using a 1 ? 10 rating system with 10 being exemplary and 1 being not acceptable. (This scale will be used for all further assessments in this plan.) Written comments detailing why the particular rating was given will be encouraged. The results will be tabulated to give an average for the class in every case in which there are at least 5 students involved. If the course contains fewer than five students, results from two different semesters will be averaged.			Yes

Outcome: Undergraduate Outcome: Broad based knowledge of chemical principles.

Graduates should have a broad-based knowledge of basic chemical principles.

Track: Biochemistry Major
Business-Oriented Chemistry
Chemistry Secondary Education Major
Geochemistry Major
LEC Chemistry Major

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
The important chemical principles that will be measured are those recommended by the American Chemical Society and shown in Appendix A. Questions directly corresponding to these principles will be embedded in the final exam of each 100 ?300 level course required of all chemistry majors. Appendix A shows the specific topics that will be covered for each 100 ? 300 level course taken by our majors. Data will be collected for each question and scored as the number of respondents who answered correctly.			Yes
A pretest/post-test format will be used in the required 400 and 500 level courses. Students in each of these courses will be given a test the first day of class. The exam will contain two types of questions. The first type of question will test their knowledge of basic information they should remember from previous courses. This will enable us to determine retention of this basic chemical information. The second type of question will be on material covered in the course that they are about to take. It is expected that students will do poorly on these questions since they probably have not been exposed to the material. This type of question is important, however, in establishing a baseline for interpretation of the results from the embedded questions in the final exam. As with the 100 ? 300 level courses, embedded questions will be included on the final exam that test the basic principles outlined by the ACS. A			Yes

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
subset of these will cover the same basic principles that were tested the first day of class. Two sets of data will be collected from the final exam. As with the 100 ? 300 level courses, the number of respondents that answered each embedded question correctly will be recorded. In addition, data will be collected from the topics covered on both the pretest and post-test. The data will be recorded as percent increase in knowledge (percentage correct on final exam ? percentage correct on pretest).			

Outcome: Undergraduate Outcome: Written Communication

Graduates should be able to effectively communicate chemical principles and chemical information in a written format.

- Track:** Biochemistry Major
 Business-Oriented Chemistry
 Chemistry Secondary Education Major
 Geochemistry Major
 LEC Chemistry Major

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
Writing intensive and capstone courses will be used to assess this outcome. In all cases, students are required to write the results of experiments they have performed in a scientific report. Results will be tabulated to give a single value assessing the writing capability of our students.	Writing: CHEM 436, 520, 551, 575 reports will be rated from 1 - 10. 10 being exemplary and 1 being not acceptable.		Yes
Alumni Survey	Question addressing if Alumni feel they learned what they needed for employment.	Each year on Alumni and 5 years post graduation.	Yes

Outcome: Undergraduate Outcome: Oral Communication

Graduates should be able to effectively communicate chemical principles and chemical information in oral presentations .

- Track:** Biochemistry Major
 Business-Oriented Chemistry
 Chemistry Secondary Education Major
 Geochemistry Major
 LEC Chemistry Major

Outcome Status: Active

Means of Assessment			
Assessment Method	Criterion	Schedule	Active
Oral presentations by students are required to present the results of experiments they have performed.	CHEM 550, 554, 575 will be assessed by the instructors from 1 - 10. 10 being exemplary and 1 being not acceptable.		Yes
Alumni Survey	Question addressing if Alumni feel they learned what they needed for employment	Each year on Alumni and 5 years post graduation.	Yes

