Program (Major, Minor, Core): MS (thesis-based)  
Department: Chemistry  
College/School: A&S  
Person(s) Responsible for Implementing the Plan: Scott Martin (chair) and Dana Baum (graduate program director), along with all graduate faculty mentors – Arnatt, Baum, Bracher, Buckner, Edwards, Jelliss, Kirkpatrick, Kiss, Kowert, Lewis, Martin, McCulla, Serfis, and Znosko  
Date Submitted: November 15, 2015

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<th>Program Learning Outcomes</th>
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<td>What do you expect all students who complete the program to know, or be able to do?</td>
<td>Where is the outcome learned/assessed (courses, internships, student teaching, clinical, etc.)?</td>
<td>How do students demonstrate their performance of the program learning outcomes? How does the program measure student performance? Distinguish your direct measures from indirect measures.</td>
<td>How does the program use assessment results to recognize success and &quot;close the loop&quot; to inform additional program improvement? How/when is this data shared, and with whom?</td>
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Students will identify the principles of modern chemistry and demonstrate their application to their particular field of interest (analytical, biochemistry, inorganic, organic or physical chemistry). Students are expected to 1) perform advanced quantitative calculations using experimental data; 2) have an advanced recognition of the physical and chemical properties of substances based on an understanding of atomic, molecular and supramolecular structure and 3) connect observations with prior information including an advanced knowledge of predicting/identifying chemical/biochemical reaction products.

Students complete a coursework sequence tailored to their research project and guided by their faculty mentor. Upon completion of course requirements (normally in year 2), students undergo an oral examination.

Courses are graded by faculty based upon a rubric.

Oral examinations: students demonstrate knowledge by answering questions posed by faculty members who are on their committees. Questions assess student knowledge of chemistry topics covered in their course work and research area. After the examination, committee members discuss the student’s performance and assess if the student demonstrated knowledge that would be expected for a student at a comparable level.

Coursework offerings are evaluated every 2 years by the chair and program director by reviewing the performance on oral exams and comprehensive exams.

Outcomes of oral examinations at the end of a student’s studies (positive results leading to a degree) are shared at the annual faculty retreat.
Students will demonstrate an ability to apply chemical principles and techniques in a laboratory setting – including experimental, theoretical, and computational methods. This includes students being able to: 1) independently design experiments to investigate a scientific hypothesis, 2) carry out experiments safely, using proper equipment and techniques, and 3) independently conduct data analysis.

Yearly student reviews are completed by student (self-evaluation) and mentor. During their 2nd year of studies, students prepare a written update on their research progress to date, with experimental data included. Students prepare a final thesis with defense that is based upon their research findings. Throughout their studies, students prepare abstracts for meeting presentations and work on manuscripts submitted for peer review (publication is expected).

Mentors give student feedback in yearly reviews that include research/lab goals for the next year. These are also reviewed by the graduate program director. For research progress updates, faculty committee members read the update and provide feedback to the research mentor. Submitted manuscripts are reviewed by accomplished scientists in the relevant research area. Peer reviewers provide feedback on the manuscript and assess if the manuscript is acceptable for publication in the journal the manuscript was submitted to. The thesis committee evaluates the research and votes to pass or not pass the student.

The yearly review gives the student honest feedback on their research performance and how they are progressing towards their degree milestones. The 2nd year research progress update provides written feedback to both the student and the mentor about research output and direction. The timing of this update gives MS students time to address issues prior to completion of degree.
Students will demonstrate an ability to communicate chemical principles and techniques and apply their experiences in the greater world in which we live.

At completion of their studies, students give an oral presentation on their research. It is the expectation that students will also present a poster or a talk on their research at a scientific conference. Graduate courses also have an oral presentation as one of the course requirements.

Oral presentations given at the end of studies are public presentations; feedback is mainly provided by the research mentor and committee. Presentations given at scientific conferences are public. Oral presentations given as part of course requirements are evaluated by the course instructor using an established rubric.

Indirect measure: All students are interviewed at the completion of their degree program by the Graduate Program Director in order to get their perceptions on how course content and their research experience has prepared them to be scientific professionals.

Oral presentations within the department (degree defense) are evaluated by research mentor and committee members. Verbal feedback is provided to the student during closed meetings following the presentations. Faculty observations of student presentation skills are discussed at faculty meetings and are used to enact steps to improve student performance. Indirect measure: The faculty review and discuss the exit interview responses at the annual retreat. We decide if there need to be changes made in our course content and other offerings geared towards graduate students to prepare them for their career paths.
1. It is not recommended to try and assess (in depth) all of the program learning outcomes every semester. It is best practice to plan out when each outcome will be assessed and focus on 1 or 2 each semester/academic year. Describe the responsibilities, timeline, and the process for implementing this assessment plan.

Outcome #1 will be evaluated every 2 years, when the chair, graduate program director and graduate faculty evaluate the graduate course offerings in terms of their effectiveness of preparing students for the comprehensive exams and other defenses.

Outcomes #2 and 3 all revolve around multiple points in the track of masters student so these requirements will be re-evaluated every 4 years.

2. Please explain how these assessment efforts are coordinated with Madrid (courses and/or program)?

The Madrid campus does not have any graduate programs in chemistry or undergraduate chemistry degree options.

3. The program assessment plan should be developed and approved by all faculty in the department. In addition, the program assessment plan should be developed to include student input and external sources (e.g., national standards, advisory boards, employers, alumni, etc.). Describe the process through which your academic unit created this assessment plan. Include the following:

a. Timeline regarding when or how often this plan will be reviewed and revised. (This could be aligned with program review.)

The coursework components of this plan will be evaluated every 2 years. The other components (exam results etc) will be evaluated every 4 years.

b. How students were included in the process and/or how student input was gathered and incorporated into the assessment plan.
A group of 5 graduate students was assembled to provide feedback on a version of the graduate assessment plan. The group consisted of two 4th year students (who are also the department representatives to the university's graduate student association), one 3rd year student, one 2nd year student, and one 1st year student. Dr. Dana Baum met with these 5 students. She first described the purpose of the assessment plan and read over the plan with the students. Dr. Baum then asked for feedback on the plan, noting any comments and suggestions. These notes were then shared with the faculty committee working to construct the assessment plans.

c. What external sources were consulted in the development of this assessment plan?

   none

d. Assessment of the manageability of the plan in relation to departmental resources and personnel

   The plan is manageable with our current faculty and department resources.