The Department of Chemistry and Biochemistry
Assessment Report– MS Program Fall 2014

For clarity, the first part of this document contains general information on our graduate programs including statistics for both MS and Ph.D. degrees. We include statistics for both programs because students during the first two years of the graduate program are Ph.D. students and requirements are based on this status. Our program does not admit students directly into the MS option. Ph.D. students in consultation with their research advisors make the decision to switch to an MS track for reasons beyond the scope of this document. This decision to change graduate status typically happens after the second year (second semester) of graduate school. The second part of the document addresses the MS degree programs in our department.

The Department of Chemistry and Biochemistry has 76 graduate students enrolled in the Fall 2014 semester. Table 1 below provides the number of graduate students in the program based on entering class year. Of the total, 2 students are on a coursework MS track and 1 student is on a MS enroute to a PhD track. All other students are aiming to graduate with a Ph.D.

Table 1 – Number of Current Students According to Entering Year

2014	2013	2012	2011	2010	2009	2008	2006
11	14	15	13	12	4	6	1

Qualifying Exams

Every student that enters the Department in their first year is admitted to the Ph.D. program. No student enters the program at a Master degree level. All first year students take qualifying exams (proficiencies) required by the Department to demonstrate their preparedness for an advanced degree. In our Department, students are required to pass 3 proficiency exams in their first year of graduate school to remain in good standing with the department. The exams are offered 4 times a year and except for the structural and molecular biology exam, all exams are standardized American Chemistry Society (ACS) exams given in 5 different sub-disciplines. As graded in the past two years, the outcome for any exam can be a Full Pass (FP) Master Pass (MP) or a No Pass (NP). As determined by the ACS norms, a FP is set at the 55^{th} percentile, the MP is set at ~ 50^{th} percentile and scores below the 50^{th} percentile are considered a NP. The names and results for each student who took proficiencies in the entering classes of 2012, 2013 and 2014 appear in Appendix A. However, results are summarized below.

Entering Class of 2012- Of the 20 students that entered the Ph.D. program and took proficiencies, 18 students passed in their first year for a **90% success rate**. Two students did not pass the proficiencies and left MSU.

Entering Class of 2013- Of the 14 students that entered the Ph.D. program in 2013, all students passed their proficiency requirement in their first year for a **100% success rate**. One student who transferred into the program did not have to take the qualifying exams.
Entering Class of 2014- Of the 11 students that entered the Ph.D. program in the Fall of 2014 took their first round of exams in August of 2014. 4 students have 2 FPs, 2 students have 1FP or MP and the rest of the students have NPs to date.

Summary Qualifying Exam Passes (2012-2013)
N= 34
32 passes (94%)
2 fails (6%)

Comprehensive Exams

The Graduate School requires a comprehensive exam after 2/3 of a student's coursework has been completed. Typically our Department has students defend written and oral portions of the exam at the same time during the student's second year, second semester, of graduate school provided they are in good standing. See Appendix B for names of those students who took the exam in 2011, and 2012. Results are summarized below.

Entering Class of 2011- Fifteen students were in good standing to take the comprehensive exam. One student left with an MS (research based). Of the 14 students that took comprehensive exam, 13 students passed both exam portions for a 93% success rate and one student passed only the oral part of the exam (7%).

Entering Class of 2012- Seventeen students were in good standing to take the comprehensive exam. 1 student switched to an MS track and 2 students transferred to the new Materials Science PhD program. Of the 14 students that took the exam, 11 students passed both the oral and written portions of the exam for a 79% success rate, 2 students passed only the written portion of the exam (14% success rate) and 1 student has not taken the exam (7%).

Summary Comprehensive Exam (2011-2012)
N=28
24 passes (86%)
3 half passes (11%)
1 student has not taken the exam to date (3%)
2 students changed status to an MS track and did not take the comprehensive exam.
2 students transferred to the new MATSC program and did not take the comprehensive exam.

Graduation Rates

Table 2 summarizes our graduation success for the last six years. Included in Table 2 are the numbers of credits, average GPA and average number of years students took to graduate with either an MS or Ph.D. The names of students who graduated in the 2012, 2013 and 2014 appear in Appendix C.

Table 2- Graduation Statistics

Degree	N	Average Credits	Average GPA	Average #yrs to graduate
		2009		
MS	4	42.5	3.51	2.8
PhD	7	76.3	3.7	5.7
		2010		
MS	3	38	3.67	3
PhD	8	80.5	3.75	5.4
		2011		
MS	7	47.85	3.55	3.7
PhD	4	72.5	3.74	5
		2012		
MS	6	39.5	3.46	3.3
PhD	6	78.33	3.7	5.7
		2013		
MS	4	45.25	3.66	3.5
PhD	8	85.15	3.72	6.3
		2014		
MS	1			4
PhD	7			

Master's Degree Report-Program Learning Outcomes-Fall 2014

The Department's Graduate Program Committee met in the Spring of 2014 and started discussing assessment for our graduate programs. The following learning outcomes were established for both the coursework and thesis Masters of Science (MS) degrees.

For coursework masters' students:

1. Demonstrate mastery of subject content knowledge.
2. Demonstrate effective oral and written communication skills.
3. Demonstrate knowledge of basic lab safety and the requirements to assist in establishing a safe lab environment.
4. Understand ethical issues and responsibilities especially in matters related to professionalism and (if applicable) in matters related the laboratory setting and in writing and publishing scientific papers.

For thesis masters' students:

1. Demonstrate mastery of subject content knowledge.
2. Demonstrate effective oral and written communication skills.
3. Conduct independent research and analysis in their disciple and contribute substantive work in their field.
4. Demonstrate knowledge of basic lab safety and the requirements to assist in establishing a safe lab environment.

5. Understand ethical issues and responsibilities especially in matters related to professionalism, data collection, the laboratory setting and in writing and publishing theses, dissertations and scientific papers.

The Department of Chemistry and Biochemistry's assessment of the MS program was initiated in August of 2014. And despite having learning outcomes established we can only at this time make some generalizations on student learning.

In 2012, we had 6 students graduate with MS degrees: 4 students with research-based degrees and 2 students completed coursework degrees. The average number of years to receive the MS degree was 3.3 yrs. All students passed their defenses on the first attempt.

In 2013, 4 students graduated with MS degrees: 1 student with a research-based MS and 3 students with coursework degrees. The average numbers of years it took students to complete the degree was 3.5 yrs.

In 2014, we had one student graduate in the summer with a research based MS. Committee members were able to complete rubrics on the student during the defense in the area of content of knowledge and oral and written communication. This student averaged on the rubric scoring of 3.33/5 for content-based knowledge, 3.08/5 for oral and 2.91/5 for written skills. Clearly, this student was below our desired threshold response of at least 80% of students will be ranked level 4 and 5 in these outcome areas but we anticipate in the future that after collecting more data on our program, we can more effectively assess learning outcomes 1-3 for both of our MS programs. This student passed the defense on her first attempt.

We are 100% confident that students understand and will react responsibly when it comes to ethical issues and safety issues (Outcomes 3 and 4 for coursework MS and outcomes 4 and 5 for research based MS).

All entering students AY2013-2014 and AY2014-2015 (n=25) have completed ethics training with either the Graduate School and/or the Department of Chemistry and Biochemistry. All students have a training session in research compliance, ethics and legal issues with Justin Cook, Director from the Office of Research (MSU) during the Graduate School's orientation in August. This year (2014), our Department offered an ethics training course specific to research that all incoming graduate students were required to take. In addition to this classroom time, students completed an online training certification through the Collaborative Institutional Training Initiative (CITI) offered through the University of Miami (https://www.citiprogram.org/.) Students had to attend the classroom training session with Professor Marry Cloninger and pass the necessary CITI online training modules and quizzes in order to be a student in good standing in our department. This training will continue forward with every new entering graduate class.

All entering students AY2013-14 and AY2014-15 (n=25) participated in a 3-day teaching training orientation with Professor Chris Bahn. This training included a 45 minutes session on laboratory safety. We also had all students complete a (~ 2hr) fire safety training session with Skip Hoagland from Safety and Risk Management. Finally all students completed an online laboratory safety course through Safety and Risk Management and had to pass this course in order to be in good standing with the department. This training will continue forward with every new entering graduate class.

Conclusions

Given the immediacy of assessing the Masters' program in our department, we are confident that the learning outcomes can be demonstrated by students and that each outcome can be measured and assessed to determine if our program is succeeding. We cannot however at this time determine the effectiveness of our program overall due to not having the data available to us and to the low number of MS students (n=1) in the summer of 2014 -when we began collecting the data on learning outcomes 1-3.

We do know and as a department, proud of the following results: from our qualifying exams, better than 90% of our students in the past 2 years have passed the entry level exams in their first year of graduate school, 86% of all students have passed their comprehensive exams and we have graduated 11 MS students in the past 3 years. Those students defending a research based MS, have all passed on their first attempt.

We are proud of the fact that 100% of our students take online and classroom lab safety instruction and accordingly all students participate in some type of ethics training online and/or in the classroom.

We will not change anything about our MS programs in the next 2 years. We are well poised as a department to start data collection on the learning outcomes that we do not have data on. We know by 2016, we will have meaningful information that will help us answer the questions of what we learned about our Master program from the assessment report and how to respond to change if our program needs it. Finally, a graphical representation of the last 15 years for the percent of students that have graduated with either a MS or Ph.D. shows an important and promising trend in our department (Graph 1). From 1999-2005 the number of students that left the program without a degree is alarming. While some students left because they did not meet pass the qualifying exams, or left to pursue other graduate programs, a number of students left the programs for reasons that were not documented. However, as represented in Graph 1, from 2006 – 2014, the number of students that have left the program/entering year has simply decreased. We are excited about this trend as it means students are staying in the program to graduate with either a MS or Ph.D. and indirectly suggests the department is succeeding in reaching its mission to graduate students and provide them educational experiences that guide them for long term professional success.