2009-2010 Yearly Program Assessment report for
the Department of Chemistry Undergraduate Program.

I. Assessment Activities:

A. Program Goals

1. The program seeks to provide a high quality education for both our major and non-major students. This is our singular goal as educators.

2. Learning Outcomes/Data Collection.
The Department has historically used three tools to assess the program, A, B and C below. However, if the need arises for us to take a more detailed look at specific issues related to the performance of the Department, a detailed study of the problem is undertaken and the results are presented to the faculty. In this period we underwent an external review, and those results will be detailed in the next year's report.

A. Final Exams in General Chemistry
The Department of Chemistry is committed to gradually increasing the tools by which to follow the progress of our students through our programs. Because our largest attrition rates occur within the first courses students take in chemistry, we are starting to tabulate final exam scores in General Chemistry 211 and 212. While not a true standardized exam, the final in these courses is departmental and undergoes relatively few changes over the years. We believe its addition will aid the Department in monitoring student progress through the curricula.

B. Standardized *American Chemical Society Exam in Organic Chemistry*. The Department of Chemistry uses this mathematically objective method of evaluating the progress of its students as they matriculate through our program. At the end of their second semester of organic chemistry (typically the Spring semester of the sophomore year) a national exam written by the American Chemical Society (ACS) is given. We plan to use this tool in conjunction with the Principles of Chemistry Scores (Section A, above) to further investigate and improve retention through this critical portion of our curricula.

C. The Department bases its success, in part, on its ability to successfully prepare its graduates to pursue employment or further their education. It is difficult to keep track of every graduating senior once they leave campus, but we generally are able to track 80-90% of them. We were able to track fewer graduates than normal in this reporting period (67%).

Table 1	Number of students	Percent of students
Seniors Graduating in 2009-2010	24	100%
Admitted to Ph. D. programs	0	
Admitted to pharmacy, medical, veterinary or law school	5	21%
Admitted to Master's in Forensics	2	8%
Admitted to Other Master's programs	2	8%
Admitted to the Department Chemistry's Master's program	1	4%
Additional Education	2	8%
Industrial employment		
Attempting Admission to Medical School	2	8%
High School Teaching		
Unknown	8	33%

D. The fourth measure of our success lies in the number of students whose research (e.g. Capstone) is presented to the chemical community. In chemistry, the following methods are standard for dissemination of research: (i) having a research paper published in a peer reviewed national or international journal (ii) presenting a paper at a national meeting of the American Chemical Society or (iii) presenting a paper at a regional or local meeting of the ACS. Because of the natural time lag associated with the publication of research in journals, students from earlier years will be carried over into this year and those from this year will appear in later years.

Table 2.	Number of students
Student co-authors in journal papers	4
Student presenters at national meetings	1
Student presenters at regional meetings	0
Students presenters at local or state meetings	5
Students co-authoring posters/papers at national meeting (not presenting)	9

Note: It is difficult to comply with Board of Trustee Initiative 3 because there is no national standard measure available for students graduating with an undergraduate degree in chemistry. The only quantitative data available is the GPA of the graduate. This value can be normalized using a student's composite ACT score when they enter our program. We will make every effort to obtain similar data from other schools or obtain a national standard to which we will compare our students. A simple ratio of ACT score to final GPA would provide a numerical value for comparison. The collection of data for annual reports will primarily consist of results from exit surveys and normalized GPAs.

3. Results

A. General Chemistry Final Exams

We are including data from the CHM 211 final exams for the past 5 years. Complete final exam data from Fall 2005 to present is presented in Table 3.

Table 3 CHM 211 Final Exam Scores

Score	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2009
90%+	4.4	4.5	7.3	3.0	5.6	3.2
80	20.8	18.3	19.9	9.0	11.1	16.5
70	27.8	22.8	25.3	15.7	18.1	20.7
60	19.0	20.3	20.3	19.8	21.1	20.1
0- 59	30.8	37.1	27.2	52.6	44.1	39.4
N	321	197	246	268	270	309
Mean	70	65	68	57	67	64

*Percentage of students in this range.

The final exam averages were fairly constant through the previous 6 years, the middle 4 of which used the same final exam. The distribution of student scores is consistent with previous years. last year, our Department used online homework in all sections of 211 in the fall and spring semesters. Unfortunately, student comments on the homework were nearly universally negative and it was discontinued. In the past year we introduced CHM 111 (see section E) as a method of improving student performance. Also, one section of CHM 211 employed personal response devices (clickers) and students reported liking their inclusion. It is too early to conclude, however, that they had a positive impact on student performance.

B. Results of *ACS Exam in Organic Chemistry*:

Of the 113 students taking the final exam in CHM 356 during the 2009-2010 academic year, 64.6% made above the 50^{th} percentile, 4.4% were above the 90^{th} percentile, and 17.7% above the 75^{th} percentile (Table 3). The number in the 50^{th} percentile, 64%, is not radically different, though slightly higher than what we generally what we have been seeing over 8 years (Table 5).

Table 4 ACS National Exam Scores

Year	# Students	50thile	75%ile	90%ile
2006-7	106	59	14	6
2007-8	115	51	19	9
2008-9	134	58	14	6
2009-10	113	65	18	4

Table 5 Historical pattern of the 50%ile

Year	Number of Students	50%ile
2001-2	107	43
2002-3	131	34
2003-4	116	39
2004-5	120	45
2005-6	151	53
2006-7	106	59
2007-8	115	51
2008-9	134	58
2009-10	113	65
AVG	N=1093	50

C. Results of Tracking Graduates.

We find no other tool as useful in our assessment of the Department as is following our students in the first 6 months following their graduation. Table 1 summarizes the results for the previous academic year. The total number of graduates for the year was 24. This number is equal to the average number of graduates over the last 6 years (24), and significantly lower than the total for last year (36). The same pattern was observed in two years prior to that, when the number of majors dropped from 33 to 22.

Over the last decade or so we are usually able to track about 80% of our graduates, but the last two years we have not done as well. Last year, we were only able to track 42% and this year 66%. This needs to be watched, and may simply be a reflection of the economy. Since students who go on to further education in the field. Or work in the chemical sciences are usually easy to track, it is likely that the several who are not tracked have simply taken jobs locally. It can also be noted that a significant percentage of these untracked students do their Capstone experiences out of the department (e.g. internships, and under the supervision of MUSOM faculty), and they only appear to give their presentation to the department.

D. Results from Research Productivity of Seniors.

The Department believes student presentations and publications to be an important measure of its success. The University requires a Capstone experience from all graduating seniors. It would be easy to develop “busy work” projects for them, however we believe that

participating in faculty directed research provides significant benefits to both students and their mentors. Thus, the number of presentations and publications are a measure of the quality of both a student's achievement and the quality of the research in the Department. Furthermore, peer pressure ensures that research which is presented at a meeting of faculty peers be novel and of high quality. The results of the period are presented in Table 2. We are proud to have 15 undergraduate names appearing on technical presentations this year, which is up from 10 last year. At these meetings, students meet professionals from all over the country, and it also hones their ability to answer technical questions concerning their work, which is an extremely valuable skill when interviewing for employment. We also had 4 undergraduates appear as co-authors on journal articles, last year we had none.

E. Closing the Loop on Prior Assessments

Several previous assessment reports discussed our examination of high school records of incoming students and a correlation between deficits in their high school grades and ACT scores and success in CHM 211. In the spring of 2010 a new CHM 111 course that was designed to prepare students for CHM 211 was proposed and approved for addition to the curriculum. Two sections were offered in the fall semester and the results of this group will be discussed in next year's 5 year program review.

II. Plans for the current year:

The number of graduates and their distribution over within our 4 majors is something that we are planning to track. An interesting pattern has developed in which the number of majors has alternated over the past 4 years.

We underwent an external program review in December. This review examined both our graduate and undergraduate programs, including the curricula. When we receive the final report, the Department will develop an implementation plan in the Spring and Fall of 2009.

III. Assistance Needed:

The Department's operating budget is inadequate to its task. For example, comparatively little of the lab fees charged to students are actually returned to the Department for the purpose of operating and maintaining those labs. Students remark, with disturbing frequency, that their high schools were better equipped. Chemistry is a technology dependent discipline, however we have been able to purchase only one new piece of software (in the past year) in nearly a decade. In our 5 year program review (2006) we noted that the Department significantly outspends our financial allocation each year. This year the Department received its first significant budget increase in years, but the prospect of decreased lab fees in the Spring may negate much of the gain.

A lack of funds to support graduate stipends also hurts the undergraduate program. Our laboratories cannot effectively function without teaching assistants. As a result we must recruit undergraduates to serve this function. Students opting for this course credit take fewer upper division content based courses. Because the Department has funding for only 1½ graduate students nearly all of our labs have undergraduate teaching assistants. This results in lower quality instruction and prevents the Department from experimenting with some kinds of new teaching methods because of the lack of qualified GAs.

IV. What one most important thing has the Department/program learned through this process?

The Department has used assessment for years to gauge the need for programmatic changes and to test the efficacy of changes made. As such, the formal university program has not provided direct benefit to the Department. Having said that, this process has provided the Department with significant quantities of data that we are now using in recruiting and proposal writing.