

CHEMISTRY DEPARTMENT 2011 ANNUAL ASSESSMENT UPDATE

I. Mission Statement and Student Learning Outcomes

Mission Statement

The mission of the chemistry department at Westmont College is to provide a nationally competitive chemistry program that helps students become competent, thoughtful, and theologically reflective scientists, teachers, health-care providers, and citizens of our world.

Department Goals and Outcomes

1) Our students will be prepared for professional careers in chemistry.

- as skilled entry level employees in industry.
- as enthusiastic educators in elementary and secondary schools.
- as competent graduate students in chemistry, biochemistry, and chemical engineering.
- as motivated students in professional health programs.

Outcome: 75 % of our graduates will enter the career path of their choice as defined above.

2) Students will demonstrate a breadth and depth of knowledge in chemistry.

Outcome: The average performance on ACS National Exams will be at least in the 60th percentile, with 30% of the students scoring above the 80th percentile, in each course that has an exam. The average score on the Physical Science (PS) and Biological Science (BS) areas of the MCAT will be at the 60th percentile or higher.

3) Students will be skilled in working in the laboratory and will appreciate experiment design and problem solving by the time of graduation.

Outcome: At least 50% of our graduates will be involved in a summer research project; either at Westmont or another facility, and at least two graduates per year will complete a major honors project. Students will demonstrate their understanding of basic experimental design in a senior level physical chemistry laboratory assessment instrument.

4) Our students will develop a love of learning and an enthusiasm for chemistry as a science and a discipline.

Outcome: At least 50% of juniors and seniors will voluntarily participate in our chemistry club.

5) Our students will be experienced at reconciling Christian and secular scientific world views. They will be knowledgeable in the area of the interface between Christian Faith and science. They will have a perspective that integrates their scientific and theological beliefs into a seamless whole.

Outcome: Most students will attain at least a *satisfactory* score (according to our grading rubric) on their senior integration of faith and learning paper as graded by two department readers. 30% of our students will attain an excellent score or higher.

II. Follow up on Action Items Identified in Previous Reports.

The action items from the 2010 response to our annual report are listed below as well as the steps we have taken to address them

1) On the inclusion of future work in the appendices

We have removed yearly data from the appendix and now keep that data only in the archives.

2) On the sharpening and distinguishing between goals and outcomes.

We have developed outcomes for goals 4) and 5) and refined our language for all of our goals and outcomes so that they are clearly distinguished.

3) On the updating of our website.

The goals and outcomes on our departmental website now match those listed in this document.

4) On the results from the 2010 year focus.

As suggested by the program review committee, we have removed writing quality from the grading rubric for the sake of assessment (although we are still retaining it for the sake of assigning student grades). We have modified the way we report the scores to the evaluation of the senior faith/learning essay so that each student's scores in each of the subcategories is now recorded. We have also included the scores given by each of the two department readers as well as an average of the two. The two readers scored the essays independently of one another this year, and then met to discuss the results. In the case of a few students, the results were sufficiently different that the readers re-evaluated their scores. In the future, it might be helpful for the readers to discuss the strengths and weaknesses of each student's essay before assigning final scores.

5) On the collecting of ACS and MCAT data.

Each faculty member is responsible for administering the American Chemical Society (ACS) exam in their courses and reporting the results to the department chair. The pre-med advisor is responsible for collecting the MCAT data and reporting it to the department chair. The chair is responsible for tabulating the data and placing it in the department assessment archive under Assessment Data\Assessment Data\ACS and MCAT Results.

6) On the inclusion of the multi year plan in the appendix.

We have added our multi-year plan using the standard format as an appendix to this report.

7) On the organization of the Departmental PR Archive folder

We have organized our program review folder as requested.

III. 2010 Focus

Our 2010 focus is outcome 1) which reads: Our students will be prepared for professional careers in chemistry as: a) skilled entry-level employees in industry; b) enthusiastic educators in elementary and secondary school; and c) competent graduate students in chemistry, biochemistry, and chemical engineering. We propose to assess this objective by simply tracking what our graduates actually do after leaving Westmont.

We have tracked our graduates' career choices for the period 1999-2011, and the results are tabulated below.

							Total to	Percent to
	Total						Chem	Chem
Year	Grads	Industry	Grad School	Med/Dent	Teach	Other	Career	Career
1999	5		2	1	1	1	4	80
2000	14	2	6	5	1		14	100
2001	5		1	2	1	1	4	80
2002	5			4	1		5	100
2003	15	1	4	2	2	6	9	60
2004	11	2	3	2	3	1	10	90.90909
2005	11	1	1	7	1	2	10	90.90909
2006	11	2	3	2	2	3	9	81.81818
2007	12	2	3	2		6	7	58.33333
2008	8			6		2	6	75
2009	15		3	4		8	7	46.66667
2010	14		5	1	1	8	7	50
2011	13	1	5	5		3	11	84.61538
							AVERAGE	76.7886

Industry = number of graduates going to work in chemical or chemical related industry

Grad School = number of graduates going to chemistry or chemistry related graduate programs

Med/Dent = number of graduates going to medical or dental school

Teach = number of graduates going into secondary or higher education

- A) The department discussed the results of tracking our graduates at two department meetings. Students clearly choose their own career paths, and at a liberal arts college, that career path might wander far from their major area. We all agree that a chemistry major at a liberal arts college could be a good foundation for a wide variety of careers, and we certainly do not want to limit our definition of success for our graduates to a career in chemistry or chemistry-related field. Nonetheless, we agree that the results of tracking our graduates provide good evidence that we are indeed *preparing* our graduates for professional careers in chemistry. In other words, the fact that 75% of our graduates go on to professional careers that involve chemistry is in itself evidence that we are preparing them for those careers. We feel highly satisfied with the results of tracking our graduates and find those results to be compelling evidence that we are meeting goal 1.
- B) The department also discussed how to “count” the careers that graduates choose. For example, one graduate initially went on from Westmont to teach high school chemistry. Several years later, she chose a different career path that did not involve chemistry. However, her initial career choice, and her ability to get a job in that career choice, demonstrates that she was prepared for that career. Consequently, we agreed to count her as a graduate that went on to a chemistry career. Because of this conversation, we have chosen to define the students that we “count” as having a career in chemistry as any student who within seven years of graduation chooses one of the career paths defined in goal 1 and stays in it for at least one full year. We feel that the ability of the student to engage that career choice for at least one year is valuable evidence that helps demonstrate their preparation for that career choice.

IV. Next Steps

- A) Next year, we will focus on outcome 2 (Students will demonstrate a breadth and depth of knowledge in chemistry). Each faculty will continue to administer the ACS Exams in each of our courses where it is available and we will also continue to track student’s scores on the MCAT. These data are collected by the department chair and posted to the chemistry assessment archive website.
- B) The department discussed the results of the ACS exams in each course given during the 2010/2011 academic year (which are not of the focus of the current review). The department noticed that the ACS exam scores in the Organic Chemistry course were lower than we would have liked. To address this issue, the Organic Chemistry Professor has agreed to further analyze the results of the exam. Specifically, he will analyze the questions missed by large numbers of students in order to discern any patterns in the topics addressed by those questions. This analysis will form a feedback loop that will allow the professor to further emphasize those topics in the current academic year.
- C) In 2013, we will focus on outcomes 3 and 4. To that end, we continue to track summer research students and administer questionnaires to gauge their experience. The current year’s results are posted in our archive. In addition, we plan to initiate a new assessment tool for goal 3). Professor Contakes and Professor Everest will together develop an instrument to administer during the second semester of physical chemistry lab (CHM 133) to assess the outcome for goal 3. By that time in their career in the chemistry department, most chemistry majors will have had most of our laboratory courses, and should be able to demonstrate their understanding of experimental design and problem solving.

- D) The department also discussed the current results of efforts to assess goal 5 (which is also not the focus of the current review). We did administer the assessment instrument to our students in our seminar class (CHM 195) and the results are posted on our departmental assessment archive. However, the department felt that the essay results were not really reflecting the kinds of abilities we want to assess. We decided to change the prompt for the essay from *Describe the relationship between your work as a scientist and your life as a Christian* to *Describe the relationship between scientific knowledge and the Christian Faith*. The former prompt was resulting in student essays that were more of a reflection on their life's journey instead of reflections on what they had learned about the integration of science and faith. The new prompt and rubric have been posted to the department assessment archives.
- E) The department also discussed the assessment instrument for goal 4. For the moment, we will track our student's participation in the chemistry club as evidence for this goal. However, we also discussed the possibility of developing an additional tool, such as exit survey, for this purpose. For the moment, that additional tool will remain in the background, but we have agreed to discuss it further as our assessment efforts continue.

Appendices:

A) Chemistry Department Multi-Year Assessment Plan