

Chemistry B.S.

Annual Assessment Report
Department of Chemistry
2010-2011

Mission Statement: The mission of the Chemistry Departments at PLNU coincides with the University mission to Teach, Shape, and Send.

To Teach: Our commitment is to provide students the opportunity to build a broad foundation of knowledge and understanding of the discipline of chemistry, to develop skills in the process of science, and in the practice of critical thinking and quantitative analysis; skills that are required to apply their education to real world situations.

To Shape: In addition to the formal academic interactions, each student will have opportunities to enter into mentoring relationships with our faculty through advising, lab assisting, research activities, and departmental social functions. In this way we intend our student to grow and mature as professionals and as individuals, coming to understand team work and to value personal integrity. We also expect our students to be in dialogue with us about issues relating to their personal and professional goals, and the interface between science, society, and Christian faith.

To Send: The graduates of this department will be able to apply both their faith and scientific understanding to addressing real world problems in professions, such as medicine, allied health fields, education, and industry. They will feel confident that they are well prepared to make positive contributes in their world.

Departmental Goals:

1. Students completing the baccalaureate program in chemistry at PLNU will be prepared to pursue graduate studies in chemistry and closely related fields. They will also be able to successfully transition into entry-level positions in chemical or medical industries, or the enterprise of teaching.
2. Baccalaureate graduates of the chemistry program will have a foundational knowledge and fundamental understanding of those areas of chemical science deemed important by the American Chemical Society. These include Organic Chemistry, Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Biochemistry.
3. Graduates of the program will have acquired the skills necessary:

- i) To operate modern laboratory instrumentation (e.g. infrared spectrophotometer, gas and liquid chromatographs, mass spectrometer, ultraviolet-visible spectrophotometer, nuclear magnetic resonance spectrometer).
 - ii) To evaluate experimental findings and present them in a clear coherent fashion in written or oral form.
 - iii) To share their chemical understanding with others in formal and informal teaching situations.
 - iv) To design and carry out an independent research projects, draw conclusions from their findings and defend those conclusions to their faculty, peers, and the broader scientific community.
4. Graduates of the program will have a realistic sense of postgraduate life in their chosen profession.

Program Learning Outcomes:

- 1) Students will demonstrate a foundational knowledge of the principles of physical, analytical, and inorganic chemistry, including the structure of matter, fundamental chemical reactions, and the factors that regulate such processes.
- 2) Students will demonstrate facility with basic concepts and reactions of organic and biochemistry.
- 3) Students will demonstrate an understanding of the basic techniques of chemical investigation and the fundamental principles and operating procedures of the major instruments used in chemical characterization and analysis.
- 4) Students will participate in the life of the Chemistry Department by involvement in the chemistry club and/or in various positions of responsibility such as graders, tutors, and teaching assistants.
- 5) Students will develop career goals and define a path by which to achieve these goals.

Curriculum Map:

See attached spreadsheet.

Multi-Year Assessment Plan:

Our departments are still in the process of developing this plan.

Assessment Activities:

PLO 1 and 2

Students will be tested at various points in their college years to measure their acquisition of essential knowledge and understanding of certain areas of chemistry. Nationally normalized standardized exams prepared by the American Chemical Society will be used for this purpose. They will be administered according to the following schedule:

End of General Chemistry Sequence	General Chemistry ACS Exam
End of Organic Chemistry Sequence	Organic Chemistry ACS Exam
End of Analytical Chemistry	Analytical Chemistry ACS Exam
End of Physical Chemistry I	Thermodynamics ACS Exam

- 1) Students took the ACS General Chemistry exam at the end of the General Chemistry sequence in the spring of 2011.
Criteria for success: The average score for the Chemistry majors will be higher than the 50%tile.
Results: The average score for the 3 Chemistry majors was 32.7/70.0 (44%tile) (**Criteria Not Met** but too few students in the class for the data to be statistically significant).
- 2) Students took the ACS Thermodynamics at the end of Physical Chemistry I in the fall of 2010.
Criteria for success: The average score for the Chemistry majors will be higher than the 50%tile.
Results: The average score for the 3 Chemistry majors was 39.0/50.0 (96%tile) (**Criteria Met** but too few students in the class for the data to be statistically significant).
- 3) Students took the ACS Organic Chemistry exam at the end of the Organic Chemistry sequence in the spring of 2011.
Criteria for success: The average score for the Chemistry majors will be higher than the 50%tile.
Results: The average score for the 10 Chemistry majors was 48.0/70.0 (74%tile) (**Criteria Met** but too few students in the class for the data to be statistically significant).

PLO 3

1) All students will use the following instruments or devices in their educational experience. They will be required to operate each instrument and interpret the information acquired. Some students will gain sufficient experience on certain instruments to be certified as an expert user. This can be accomplished either by serving formally as an instructor for other students or by extensive experience (logging 40 hours or more) with an instrument during a research project.

First Year	electronic balances burets and pipets pH meters computer spreadsheet (Excel)
Second Year	instruments used in the first year plus infrared spectrophotometer (IR) nuclear magnetic resonance spectrometer (NMR) absorption spectrophotometer (UV-Vis) gas chromatograph (GC)
Third/Fourth Years	instruments used in the first two years plus Gas Chromatograph/Mass Spectrometer (GC-MS) High Pressure Liquid Chromatograph (HPLC) Atomic Absorption Spectrophotometer (AA)

Criteria for success: At least 75% of the department's graduates will achieve expert user status on at least one instrument. Hands on instrument use occurs in the laboratory component of required courses and proficiency will be verified by a faculty at the end of each academic year.
Results: PLO not assessed 2010-11

2) Students will participate in the undergraduate research program

Criteria for success: At least 50% of the chemistry major graduates will have worked on an undergraduate research project. Their progress in this endeavor will be evaluated by their supervising faculty members, and the presentation of their work to the scientific community.
Results: PLO not assessed 2010-11

PLO 4

1) Students will participate in the life of the Chemistry Department as TA's, tutors, or graders.

Criteria for success: 80% of the department's graduates will work as lab assistants or tutors during their sophomore, junior, or senior years. In this context, they will formally and informally explain various concepts of chemistry to other undergraduate students. Teaching assistant evaluations will be conducted at the end of each term and supervising faculty members will also evaluate their performance.

Results: PLO not assessed 2010-11

PLO 5

- 1) In addition to normal advising and counseling, graduates will interact with department alumni and attend selected professional meetings to gain exposure to the broader world of chemistry.

Criteria for success: In the Junior and Senior years, 75% of the chemistry majors will attend the annual meeting of the Research Associates alumni support group. In addition, 75% of the students will attend at least one regional or national professional meeting and 50% will make presentations at such meetings.

Results: PLO not assessed 2010-11

Summary of Data Collected and Use of Results:

Only PLO's 1 and 2 were assessed this year. These data will be discussed at departmental meetings in the fall. Given the small sample size of these data, we do not currently plan to make any further changes in the program.

Some chemistry courses will however undergo a significant change next year. After surveying the programs of twenty other comparator schools we decided to bring our offerings more in line with the majority of those schools by consolidating the organic chemistry experience into the sophomore year and slightly expand the amount of analytical chemistry we require. This results in a corresponding reduction in the elective units within the major. We will track ACS exam scores into the future to see if this change strengthened the major.

PLO 3-5: Data will be collected and analyzed on these in the future.

Department Learning Outcomes

- 1) *Students will demonstrate a broad knowledge of chemistry and develop an increasingly sophisticated*

understanding of chemistry related concepts and theories.

- 2) *Students will mature as emerging professionals and will design and execute a plan that moves them toward their career goals.*
- 3) *Graduates will be prepared to engage a complex world with spiritual maturity and professional abilities*