

Assessment Plan: Chemistry B.S. Majors

Overview: PLO 1, 2, 3 will be assessed yearly; PLO 4 will be assessed every 1 and 5 years.

PLO 1: Students will apply key concepts and principles in analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.

This PLO will be measured directly via summative assessment during the senior year. Students will take the ETS Major Fields Test in Chemistry as part of the capstone course in chemistry, Chemistry 4095 (Chemistry Seminar). This PLO will also be measured indirectly via self-reporting on a senior exit survey (see below) administered in the capstone course in chemistry, Chemistry 4095 (Chemistry Seminar).

Criteria for success: The overall group mean on each subsection of the ETS exam (Analytical, Biochemistry, Inorganic, Organic, Physical) will be at or above the 50th percentile. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

Rubric: ETS Comparative Data Guides – MFT for Chemistry

PLO 2: Students will use standard instrumentation and laboratory equipment to conduct scientific experiments and perform chemical characterization and analyses.

This PLO will be measured directly via faculty laboratory instructors' observation of their students' use of various standard instruments in different courses (see below). This PLO will also be measured indirectly via self-reporting on a senior exit survey (see below) administered in the capstone course in chemistry, Chemistry 495 (Chemistry Seminar).

GC: Chemistry 2096 (Organic Chemistry II)

GC-MS: Chemistry 3070 (Instrumental Analysis)

HPLC: Chemistry 3070 (Instrumental Analysis)

IR: Chemistry 2096 (Organic Chemistry II)

NMR: Chemistry 3051 (Organic Structure Elucidation) UV-

vis: Chemistry 4050 (Advanced Biochemistry)

Criteria for success: At least 80% of students will be able to use each of the various instruments with little or no guidance. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

Rubric: The following scale will be used.

Instrument	4	3	2	1
GC (CHE2096)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.
GC-MS (CHE3070)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.
HPLC (CHE3070)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.
IR (CHE2096)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.
NMR (CHE3051)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.
UV-vis (CHE4050)	Able to use instrument independently.	Able to use instrument with little guidance.	Able to use instrument with guidance.	Unable to use instrument even with guidance.

PLO 3: Students will participate in the life of the Chemistry Department by involvement in one or more of the following areas: research, chemistry club, and/or various positions of responsibility serving as graders, tutors, stockroom workers and/or teaching assistants.

This PLO will be measured directly via data collection of student involvement in research, science clubs, and positions of responsibility at the end of each semester or summer. The total number of activities each student was involved in will be tabulated, counting each semester and summer as a separate involvement. This PLO will also be measured indirectly via self-reporting on a senior exit survey (see below) administered in the capstone course in chemistry, Chemistry 4095 (Chemistry Seminar).

Criteria for success: At least 80% of our students will participate in three or more department related activities (research, science clubs, positions of responsibility) during their time at PLNU. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

Rubric: Not applicable.

PLO 4: Students will be prepared for post-graduate studies or science-related careers.

This PLO will be measured directly via data collection of school acceptances or jobs obtained. This PLO will be measured indirectly via self-reporting on an alumni survey (see below). This PLO will also be measured indirectly via self-reporting on a senior exit survey (see below) administered in the capstone course in chemistry, Chemistry 4095 (Chemistry Seminar).

Criteria for success: At least 80% of our graduates will be accepted to graduate or professional schools or obtain jobs in science-related careers. At least 80% of alumni surveyed will be accepted to graduate or professional schools or obtain jobs in science-related careers. At least 80% of students surveyed will feel prepared or better in meeting this PLO.

Rubric: Not applicable.

Chemistry Seminar Exit Survey 2015 (Chemistry Major)

1) What is your current career goal?

- a) Professor
- b) Teacher
- c) Health professional – please specify
- d) Biotechnology or pharmaceutical industry
- e) Academic or government lab
- f) Graduate student – please specify field or specialty
- g) Other – please specify

2) Rank how well prepared you were to meet the following program learning outcomes (goals) that were set for your major.

I. Students will apply key concepts and principles in analytical chemistry.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

II. Students will apply key concepts and principles in biochemistry.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

III. Students will apply key concepts and principles in inorganic chemistry.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

IV. Students will apply key concepts and principles in organic chemistry.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

V. Students will apply key concepts and principles in physical chemistry.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

VI. Students will use standard instrumentation and laboratory equipment to conduct scientific experiments and perform chemical characterization and analyses.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

VII. Students will participate in the life of the Chemistry Department by involvement in one or more of the following areas: research, chemistry club, and/or various positions of responsibility serving as graders, tutors, stockroom workers and/or teaching assistants.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

VIII. Students will be prepared for post graduate studies or a science-related career.

unprepared / somewhat unprepared / prepared / well prepared / extremely well prepared

3) Were you involved in the PLNU chemistry summer research program?

- a) Yes – describe what role this experience played in your learning of chemistry
 - b) No – describe why not
- 4) Do you have any suggestions related to the summer research program?
- 5) What were one or two aspects of the chemistry curriculum that might have been improved?
- 6) Do you feel prepared to take the next step academically?
- a) Yes – describe what experiences (classes) helped you to get there
 - b) No – describe what additional or different experiences would have helped
- 7) If you were starting over as a freshman next fall, would you make any different decisions about your major, or about elective course choices, etc.?
- 8) Are there chemistry courses that PLNU does not offer that you would have liked to take?
- 9) Do you feel like you are a part of the chemistry department community? Why or why not?

Alumni Survey 2015

The Biology and Chemistry Departments would greatly appreciate your feedback as a PLNU alum on your experience as a Biology or Chemistry major. This 15-question survey should take about 15 minutes to complete. If you provide your email address, we will also enter you into a drawing for one of three \$100 Amazon cards as a thank you for your time!

- 1) What year did you graduate from PLNU?
- 2) What was your major?
 - a) Biology-BA
 - b) Biology-BS
 - c) Chemistry
 - d) Biology-Chemistry
 - e) Environmental Science
- 3) What is your highest degree earned?
 - a) BA/BS
 - b) MA/MS
 - c) PhD
 - d) MD/DO
 - e) PA
 - f) DDS
 - g) DVM
 - h) OD
 - i) PharmD
 - j) Other – please specify
- 4) What is your current professional situation?
 - a) Professor
 - b) Teacher
 - c) Health professional
 - d) Biotechnology or pharmaceutical industry
 - e) Academic or government lab
 - f) Graduate student – please specify field or specialty
 - g) Other – please specify
- 5) Rank how well we prepared you to meet the following goals that were set for your major. (Only PLOs for specified major selected in #2 will appear.)
 - a) Unprepared
 - b) Somewhat unprepared
 - c) Prepared

- d) Well prepared
 - e) Extremely well prepared
- 6) Were you involved in the PLNU biology or chemistry summer research programs?
- a) Yes – describe how this experience is impacting your career.
 - b) No
- 7) Which classes or experiences do you appreciate more now as opposed to when you had just graduated?
- 8) Is there any course, topic, or skill you've repeatedly encountered that you wish you had been taught at PLNU? Please explain.
- 9) If you are pursuing a career in environmental science, do you wish you had substituted an internship experience for a science elective while you were at PLNU?
- a) I am not pursuing a career in environmental science.
 - b) I did an internship.
 - c) Yes, I wish I had done an internship while at PLNU.
 - d) No, I did not need to do an internship while at PLNU.

Comments?

- 10) Do you wish you had taken any of the following options at PLNU?
- a) BIO130/140 (Human Anatomy & Physiology)
 - b) Upper-division anatomy class
 - c) No, I didn't need an Anatomy class

Comments?

- 11) What were one or two aspects of the biology curriculum that might have been improved to better prepare you for your profession or for further studies?
- 12) What were one or two aspects of the chemistry curriculum that might have been improved to better prepare you for your profession or for further studies?
- 13) Have you done any of the following? Check all that apply.
- a) Recommended PLNU to a prospective student
 - b) Promoted PLNU to another person
 - c) Been involved with the alumni association
 - d) Donated to Research Associates
 - e) Other – please specify.

- 14) Since you left PLNU, have you ever had a conversation in which you had to integrate Christian faith with scientific knowledge? Did you feel prepared scientifically? Did you feel prepared theologically? Check all that apply. Please describe the situation and your feelings about your preparation.
- a) I've never had such a conversation.
 - b) I felt prepared scientifically.
 - c) I didn't feel prepared scientifically.
 - d) I felt prepared theologically.
 - e) I didn't feel prepared theologically.
- 15) Since you left PLNU, have you made any decisions that were influenced by your knowledge of creation care and sustainability? If so, did you feel prepared to make those decisions from a scientific understanding of sustainability?
- a) I do not tend to make decisions based on sustainability considerations.
 - b) I often feel unprepared to make those decisions as it is rarely clear to me which options would best benefit the planet.
 - c) I usually feel prepared to make those decisions as I am generally confident in my understanding of how my choices affect, and which options are best for the planet.
 - d) I feel very comfortable in my scientific knowledge of how various decisions will affect the earth, either negatively or positively.
- 16) Please provide your email address to be entered into the drawing for an Amazon gift card. Your email address will not be associated with your responses on this survey.