CHEMISTRY (B.S.)

PLO Data for Chemistry: FA2024-SP2025

Program Learning Outcome 1

Apply key concepts and principles in analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.

Outcome Measure: ETS Major Field Test in Chemistry and Senior Exit Survey

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.

Aligned with DQP Learning Areas (circle one or more but not all five):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

ETS – MFT Chemistry percentiles	2016 n=5	2017 n=4	2018 n=5	2019 n=4	2021 n=6	2022 n= 7	2023 n= 6	2024 n= 8	2025 n= 2
Overall group mean	53rd	78th	42nd	64th	67th	85th	77th	59th	91st
Analytical mean	52nd	76th	23rd	57th	70th	74th	84th	59th	92nd
Biochemistry mean	52nd	64th	52nd	52nd	53rd	55th	57th	47th	59th
Inorganic mean	55th	66th	47th	65th	81st	72nd	68th	58th	90th
Organic mean	49th	76th	49th	59th	50th	86th	60th	40th	75th
Physical mean	69th	81st	51st	71st	59th	92nd	78th	70th	93rd

*ETS-MFT not administered in spring 2020 due to COVID-19.

Senior Exit Survey*	2017 n=3	2019 n=4	2021 n=4	2022 n= 6	2023 n= 3	2024 n= 7	2025 n= 2
% feel prepared or better in analytical chemistry	100%	75%	100%	100%	75%	85%	50%
% feel prepared or better in biochemistry	100%	75%	100%	100%	100%	100%	50%
% feel prepared or better in inorganic chemistry	67%	100%	100%	100%	100%	85%	50%
% feel prepared or better in organic chemistry	100%	100%	100%	83%	100%	100%	50%
% feel prepared or better in physical chemistry	100%	100%	75%	50%	33%	100%	50%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 or spring 2020 (COVID-19).

Conclusions Drawn from Data: Our students exceeded the 50th percentile for all sub-disciplines of chemistry, suggesting that our curriculum and pedagogy allow our students to apply key concepts and principles of chemistry. The exit survey data shows that our major is small, and that one of our two chemistry majors has impostor syndrome despite being a rock star.

Changes to be Made Based on Data: There are no substantial changes that need to be made at this point. However, we hope to grow our number of majors and collect data that will be a little more valuable.

Rubric Used: ETS Comparative Data Guides – MFT for Chemistry

Chemistry PLO Data

Program Learning Outcome 2
Use standard instrumentation and laboratory equipment to conduct scientific experiments and perform chemical characterization and analyses.

Outcome Measure: Faculty laboratory instructors' observation of students' use of various standard instruments in different courses (see below) and Senior Exit Survey.

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.

Aligned with DQP Learning Areas (circle one or more but not all five):
1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

% students able to use instrument with little or no guidance	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
GC CHE2096	100% (n=6)	COVID-19	COVID-19	Not assessed	100%	Not assessed	No majors in % 2027
GC-MS CHE3070	100% (n=9)	not offered	COVID-19	Instrument not working	Instrument not working	Instrument not working	100%
HPLC CHE3070	100% (n=5)	Instrument not working	COVID-19	100%	100%	100%	100%
IR CHE2096	83.3% (n=6)	COVID-19	COVID-19	Not assessed	100%	Not assessed	No majors in % 2027
NMR CHE3051	100% (n=3)	not offered	COVID-19	100% (n=5)	100%	Alternate year course	100%
UV-vis CHE4050	100% (n=4)	COVID-19	100% (n=4)	100% (n=5)	100%	100%	100%

Senior Exit Survey*	2017 n=3	2019 n=4	2021 n=4	2022 n=6	2023 n=3	2024 n=7	2025 n=2
% feel prepared or better	100%	100%	75%	100%	100%	100%	50%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 or spring 2020 (COVID-19).

Conclusions Drawn from Data: This data shows that our chemistry majors are getting robust, hands-on standard equipment training. This is very important because more and more of our students find jobs in biotech upon graduation and these skills are highly sought after by employers. It also shows that our major is small, and that one of our chemistry majors has impostor syndrome despite being a rock star.

Changes to be Made Based on Data: No changes proposed. The preponderance of "100%" scores should be viewed in the context of major size, and in comparison with all our majors. The chemistry majors nearly all participate in summer research, and students in CHE3051 and CHE3070 in particular use instrumentation quite heavily and independently. It is not surprising that all the students in these courses are able to use the instrument with little to no guidance.

Rubric Used: 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 (CHE4053)	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 (CHE3025)	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.

Chemistry PLO Data

Program Learning Outcome 3
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.

Outcome Measure: Data collection of student involvement in research, science clubs, and positions of responsibility and Senior Exit Survey.

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.

Aligned with DQP Learning Areas (circle one or more but not all five):
1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

Student Involvement	2018, n=5	2019, n=4	2021 n=4	2022 n= 6	2023 n=3	2024 n=7	2025 n=2
% participate in three or more department related activities	80%	100%	100%	100%	100%	100%	50%

*Data not collected in spring 2020 due to COVID-19.

Senior Exit Survey*	2019, n=4	2021, n=4	2022, n=6	2023, n=3	2024, n=7	2025, n=2
% feel prepared or better	100%	100%	100%	100%	100%	50%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 or spring 2020 (COVID-19).

Conclusions Drawn from Data: One of the two majors did not meet the criteria for success. This result is not statistically significant.

Changes to be Made Based on Data: No changes to program.

Rubric Used: Not applicable.

Chemistry PLO Data

Program Learning Outcome 4
Be prepared for post graduate studies or a science-related career.

Outcome Measure: Data collection of school acceptances or job offers prior to graduation, Senior Exit Survey, and Alumni Survey.

Criteria for Success (if applicable): 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.

Aligned with DQP Learning Areas (circle one or more but not all five):

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skills/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

Alumni Survey	2018-2019 n= 10	2019-2020 n= 25	2020-2021 n= 14	2021-2022 n= 14	2022-2023 n= 17
Placement Rate	90%	92%	100%	85.7%	88.2%

Senior Exit Survey*	2019, n=4	2021 n=4	2022 n= 6	2023 n= 3	2024 n= 7	2025, n=2
% feel prepared or better	100%	100%	100%	100%	100%	50%

*Senior exit survey not administered in Chemistry Senior Seminar during spring 2018 and spring 2020 (COVID-19).

Conclusions Drawn from Data: The alumni data shows that CHEM majors are successful at entering graduate/professional schools and obtaining jobs. As with previous PLOs, the senior exit survey shows that our major is small, and that one of our chemistry majors has impostor syndrome despite being a rock star.

Changes to be Made Based on Data: No changes to program.

Rubric Used: Not applicable.

Chemistry Seminar Exit Survey 2025 (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?