

Report of Student Learning and Achievement
Concordia University Irvine
School of Arts and Sciences – Biology, Chemistry, and Biochemistry Program

For Academic Year:	2024-2025
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School of Arts and Sciences Mission
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Biology, Chemistry, and Biochemistry Program Purpose

The School of Arts and Sciences strives to educate its students within the multi-faceted context of the liberal arts. Firmly rooted in the Christian tradition of Concordia University Irvine, the School confidently and freely explores both the riches of the past and the knowledge of today. The School cultivates within all students a disciplined and coherent worldview to prepare them to be active and effective leaders in today's world.

The Biology, Chemistry and Biochemistry Department strives to develop wise and honorable citizens capable of excelling as witnesses of Christ and in their vocations within the biological and physical sciences or elsewhere.

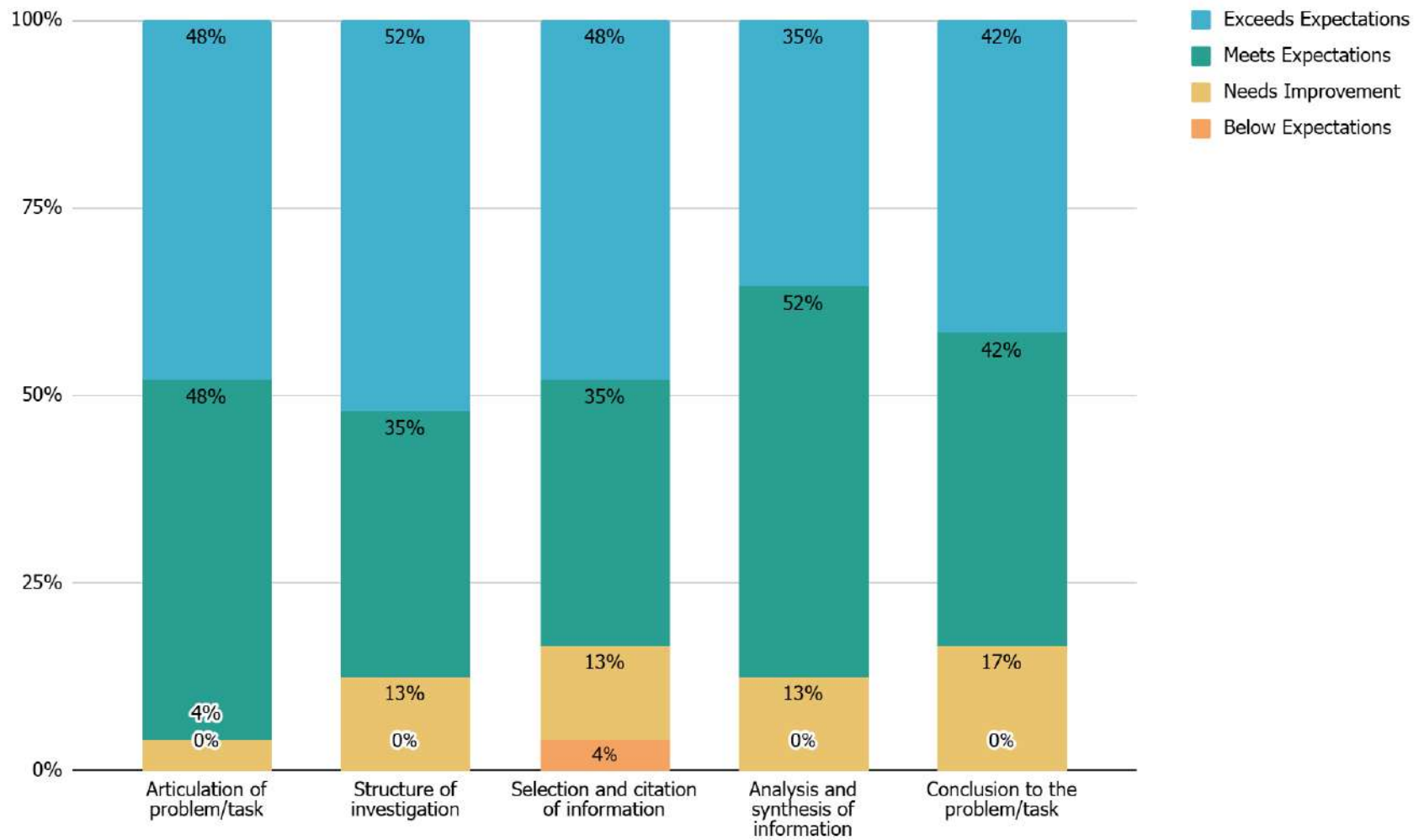
Graduates with a Bachelor's degree in biology will be able to articulate their understanding of the natural world, address pressing social and scientific challenges from a Christian perspective, and continue to recognize their worldviews in order to gain the ability to confidently approach, analyze, and solve academic, social, and theological challenges with which students improve their understanding of the natural world, their own faith, and their role in society.

The study of Chemistry and Biochemistry endeavors to develop students who possess high-level numerical, computational, experimental, and analytical abilities seeking to prepare students to formulate, investigate, analyze and articulate solutions to major scientific, technological, environmental, and health problems in the natural sciences. In concert with the Great Commission, the study of physical sciences embraces the idea that its curricula should actively encourage and prepare students to develop theologically sound and scientifically solid connections between the Christian faith and the discipline.

Program Learning Outcomes (PLOs)
Biology
1. Demonstrate competency in written and oral communication.
2. Demonstrate competency of content in genetics and cell, molecular, and organismal biology.
3. Apply appropriate mathematical and statistical analysis to data.
4. Read, analyze, and critique primary scientific literature.
5. Demonstrate competency in basic scientific laboratory techniques.
6. Articulate a Christian worldview from a Lutheran perspective on various scientific topics.
Chemistry and Biochemistry
1. Chemical Knowledge: Describe and utilize key facts and concepts in chemistry.
2. Literature Awareness: Read and critique peer-reviewed scientific literature.
3. Scientific Method: Apply scientific methods to investigate, formulate, analyze, and solve problems involving chemistry.
4. Problem Solving: Articulate and validate strategies and processes necessary to solve numerical and logical problems.
5. Chemistry Writing: Construct a written cogent and logical scientific argument that adheres to an appropriate scientific style.
6. Articulate Chemistry Concepts: Use multiple tools (e.g., graphs, numerical data, and mathematical/symbolic notation) to represent chemical ideas.
7. Chemistry Presentation: Give a succinct oral presentation on a topic in chemistry.
8. Faith-Science Integration: Identify and develop theologically sound and scientifically rigorous connections between the Christian faith and chemistry.
9. Community Service: Collaborate on chemistry-themed community service projects.

Program Assessment Overview Aligns with ULO: Systematic Inquiry			
PLOs Assessed	Evidence and Assessment Instrument	Performance Objectives (Targets/Criteria) Measures:	Results for Measures of Student Learning:
BIO PLO #2: Demonstrate competency of content in genetics and cell, molecular, and organismal biology.	BIO 499 - Senior Thesis Paper	75% or better of students assessed meeting or exceeding expectations on each <i>Systemic Inquiry</i> ULO rubric criteria	Percentage of students who met or exceed expectations: Articulation - 96% Structure - 88% Selection - 83% Analysis - 88% Conclusion - 83%
BIO PLO #4: Read, analyze, and critique primary scientific literature.	BIO 499 - Senior Thesis Paper	75% or better of students assessed meeting or exceeding expectations on <i>Selection & Citation of Information and Analysis</i>	Percentage of students who met or exceed expectations: Selection - 83%
BIO PLO #5: Demonstrate competency in basic scientific laboratory techniques.	BIO 499 - Senior Thesis Paper	75% or better of students assessed meeting or exceeding expectations on <i>Structure of Investigation</i>	Percentage of students who met or exceed expectations: Structure - 88%
BCHE/CHE PLO #3: Scientific Method: Apply scientific methods to investigate, formulate, analyze, and solve problems involving chemistry.	BIO 499 or CHE 499 - Senior Thesis Paper	75% or better of students assessed meeting or exceeding expectations on both criteria : <i>Structure of Investigation and Analysis and Synthesis of Information</i>	Percentage of students who met or exceed expectations: Structure - 88% Analysis - 88%
BCHE/CHE PLO #4: Problem Solving: Articulate and validate strategies and processes necessary to solve numerical and logical problems.	BIO 499 or CHE 499 - Senior Thesis Paper	75% or better of students assessed meeting or exceeding expectations in at least all <i>Systematic Inquiry</i> rubric criteria.	Percentage of students who met or exceed expectations: Articulation - 96% Structure - 88% Selection - 83% Analysis - 88% Conclusion - 83%

Program Assessment Results



Summary of Program Assessment Findings

Articulation of problem or task: 96% of students met or exceeded expectations, representing 46 of 48 scores. The 2 scores that did not meet or exceed expectations were split between 2 students who were scored as “Meets Expectations” from one reviewer and “Needs Improvement” from the second reviewer.

Structure of Investigation: 88% of students met or exceeded expectations, representing 42 of 48 scores. The 6 scores that did not meet or exceed expectations represent three students who were scored as “Needs Improvement” by both reviewers.

Selection and Citation of Information: 83% of students met or exceeded expectations, representing 40 of 48 scores. The 8 scores that did not meet or exceed expectations included 4 students with scores split between “Meets Expectations” from one reviewer and “Needs Improvement” from the second reviewer, 1 student who received “Needs Improvement” from both reviewers, and 1 student who received “Below Expectations” from both reviewers.

Analysis and Synthesis of Information: 88% of students met or exceeded expectations, representing 42 of 48 scores. The 6 scores that did not meet or exceed expectations included 4 students who were scored as “Meets Expectations” from one reviewer and “Needs Improvement” from the second reviewer, and 1 student who received “Needs Improvement” from both reviewers.

Conclusion to the Problem or task: 83% of students met or exceeded expectations, representing 40 of 48 scores. The 8 scores that did not meet or exceed expectations included 4 students who each received “Needs Improvement” from both reviewers.

Summary of Achievement Outcomes

Aligns with ULO: Systematic Inquiry

2024-2025 PLO Assessed	Student Evidence: Senior Thesis Paper	Student Evidence: N/A
Criterion Measured	Performance Target Was...	Performance Target Was...
Articulation of Problem / Task	Met	
Structure of Investigation	Met	
Selection and Citation of Information	Met	
Analysis and Synthesis of Information	Met	
Conclusion to the Problem / Task	Met	

Program Proposed Course of Action for Improvement in Learning Outcomes

We plan to make improvements to the alignment between the ULO criteria being used to assess our PLOs, especially when it comes to internship reflection papers, which did not end up being particularly well-matched to our PLOs. This may require the use of a different assignment for assessment, or a re-evaluation of the specificity of our PLOs.

- BIO PLO #2: It may be helpful to review the PLO and ULO alignment for future assessments.
- BIO PLO #4: We are largely satisfied with the results of this assessment. The use of primary literature is stressed in the majority of our major courses, but we may be able to provide better guidance on how to incorporate non-scientific literature when appropriate.
- BIO PLO #5: We are largely satisfied with the results of this assessment. However, it may be helpful to find an alternative way to assess laboratory techniques in the future.
- BCHE/CHE PLO #3: We are largely satisfied with the results of this assessment. However, it may be helpful to find an alternative way to assess use of the scientific method for students who choose to complete an internship instead of a research thesis project.
- BCHE/CHE PLO #4: We are largely satisfied with the results of this assessment.