



Academic Program Review

Program Name: Biochemistry and Neuroscience – Doctor of Philosophy

Academic Year 2025/2026

Recent Recommendations

Using your most recent review, please respond to all feedback and recommendations.

Response:

Previous feedback was positive, noting strong alignment with the SLOA plan. The program is mission-centric to both UAF and CNSM and remains unique within the state. Its highly collaborative structure further enhances its impact. Feedback also highlighted the program's success in enabling students to quantitatively demonstrate achievement of the SLO goals. Recommendations focused on curricular revisions and strategies to improve time to degree. Proposed changes for the next review period, including a reduction in course requirements, are under consideration and are expected to enhance time-to-degree outcomes.

Student Learning Outcomes

Describe the assessment of your student learning outcomes (SLOs). Discuss your findings, changes you are making, and what you hope to see as a result.

Response:

Biochemistry and Neuroscience Ph.D. students are evaluated at all major milestones, including annual committee meetings, the oral defense of the comprehensive exam, and the oral dissertation defense. Each assessment uses a nine-point rubric to determine whether students are performing below expectations (-1), on track (0), or above expectations (+1) for each learning outcome. See SI for Table 1 and Table 2.

Findings:

Average assessment data (Table 1, SI) shows students overall performance are well above expectations in technical (0.50) and quantitative abilities (0.50) and demonstrate strong performance in specific knowledge of literature (0.29), hypothesis development (0.36) and independence (0.29). Students are meeting expectations in ability to critically analyze literature (0.21), and general knowledge of their field (0.21) throughout the program. While average assessment data shows students remain on track, lower averages were observed for writing (0.14), and presentation skills (0.14). These results suggest that while students build robust technical and analytical foundations, greater emphasis is needed on communication, synthesis of knowledge, and scholarly writing.

Year-by-year assessment data (Table 2, SI) show distinct developmental trends across student learning outcomes. Early-stage students (year 1) show minimal proficiency across most categories, as expected for students who are completing coursework and establishing their research. There are increases in assessment scores in nearly all outcomes by the third year, when students are engaged in research, have completed advanced coursework in their field, and completed their comprehensive exams. There are sharp gains in technical and quantitative abilities, and large improvements in literature knowledge and hypothesis development by mid-program (year 3-4). This data reflects the point at which students begin to apply their training independently and demonstrate mastery of core skills. Performance trends in the fourth and fifth years are variable, with modest declines in several categories including technical, quantitative, and presentation skills. These fluctuations may reflect the transition from research and data collection to writing and synthesis. This is also noted by a sharp gain in critical analysis of literature in later years. Together, these trends suggest that students refine their interpretive skills as they prepare to write their dissertation. By the final stage of the program, students demonstrate a sharp increase in writing proficiency, reflecting successful development of scientific communication skills. However, other categories show reduced proficiency scores, consistent with the shift in students' focus to conceptual synthesis and manuscript preparation. Overall, the longitudinal data suggests that the developmental arc can be described by high technical and quantitative abilities by mid-program and writing and critical analysis strengthen in later years. These findings confirm that students are progressing appropriately through successive developmental stages of research independence. However, the data also highlights the need for continued emphasis on scientific communication skills.

In response to these findings, the program will:

1. Continue to support the writing-intensive colloquium (Chem 688) and intends to develop a paper-writing workshop that guide students in preparing manuscripts early in their training.
2. Encourage faculty mentors to implement biweekly written research updates or oral presentation progress discussions, improving both writing fluency and critical analysis.
3. Develop a standardized progress rubric to be completed at each committee meeting, providing clear feedback tied to each student learning outcome and documenting improvement over time.

Expected Outcomes:

We expect to see measurable gains in written communication and presentation scores over the next review period, bringing them into closer alignment with technical and quantitative competencies. Ultimately, these enhancements will further prepare graduates for success across academic, industrial, and governmental careers consistent with program goals.

Did you make any curricular changes based on your most recent SLOA? If so, discuss what changes were made. If no changes were made, please discuss the strengths of your curriculum based on the assessment of your outcomes.

Response:

Overall our curriculum remains strong as demonstrated by high assessment scores for student learning outcomes. Students publish their graduate work in peer-reviewed journals, present at regional and national conferences, and obtain funding through student-authored proposals. Graduates of the program are well-prepared for jobs in related fields. There were no curricular changes for the review period. There are proposed changes in the next review period, which include reducing the number of required credits. The proposed changes aim to accommodate lack of FTE faculty to teach core courses, as described in the previous review, and reduce time to graduation. Additionally, we hope to enhance graduate student learning experiences by promoting internship opportunities, collaborative research agreements within academia and industry, and graduate fellowships.

As of 2017, all Baccalaureate programs are required to embed communication outcomes within their SLOA Plans. This is optional for non-Baccalaureate programs.

Communication outcomes in the SLOA plan are: **Not Embedded**

Check the checkbox to certify completion of the following tasks:

- ☒ Upload supporting documents to the Supporting Documents folder. This includes artifacts, rubrics, and other documents related to your SLOA.
- ☒ Upload your most recent SLOA to the Supporting Documents folder, even if no changes have been made since the last review.

Have changes been made to your SLOA document since your last review? **No**

If so, please summarize what changes were made.

Response:

Changes were not made during this review period

High Impact Practices

Please indicate which high impact practices are currently being implemented in relation to the program's student learning outcomes.

- | | |
|--|---|
| ☒ Capstone Courses & Projects | ☒ Graduate Level Research |
| ☒ Collaborative Assignments & Projects | ☒ Writing-Intensive Courses |
| ☒ Diversity/Global Learning | ☒ Publications |
| ☐ ePortfolios | ☒ Communications |
| ☒ First-Year Seminars and Experiences | ☒ Scholarly Activities |
| ☐ Internships | ☐ Studios |
| ☐ Service or Community-Based Learning | ☐ Practicum |
| ☒ Undergraduate Research | ☐ Other |
| ☒ Labs | ☐ None of these |

Discuss how the HIPs in the program are reflected in the SLOA. If you have identified HIPs that are not included in the SLOA, please consider an update.

Response:

The program emphasizes graduate-level research, intensive writing experiences, collaborative projects across disciplines and education level, and scientific communication. These high-impact practices link student learning outcomes to measurable success.

1. Graduate-Level Research and Collaboration: The program structure is grounded in mentored research, aligning with SLOs related to proficiency in technical abilities, quantitative skills, and hypothesis development. Students participate in collaborative research groups where they present data, receive feedback, and co-author peer-reviewed publications. These activities also strengthen teamwork, leadership, and mentoring experiences, which are important for professional development. Specifically, we facilitate development of graduate-undergraduate researcher pairs, which adds an important diversity and learning component that enhances professional readiness.

2. Writing-Intensive Coursework, Scholarly Activities and Communication: Writing and communication are central to multiple SLOs, including specific knowledge of literature, critical analysis, writing, and presentation skills. The Chem 688 colloquium serves as a writing-intensive course where students write and revise proposals based on professional rubrics. The comprehensive exam also requires students to write and defend a research proposal, honing students' ability to communicate scientific ideas grounded in literature analysis.

3. Quantitative and Technical Proficiency: Student success data show advanced outcomes in technical and quantitative abilities, reflecting the program's data-driven emphasis. To ensure improvement over time, we continue to recommend COMM 601 or higher-level biostatistics courses and plan to incorporate data visualization in the colloquium. These elements reinforce research practices aligned with professional standards.

4. Oral Presentation and Communication: Oral exams, thesis defenses, and annual committee meetings serve as communication-focused HIPs, supporting the SLOs regarding presentation skills and general field knowledge. Students receive structured feedback at each stage, promoting iterative improvement in professional communication.

Student Success

Please reference the [Resources tab](#) for information on accessing the Student Success Data Dashboard and contacting your designated data liaisons.

Student Success Data Trends

Persistence: No Change

Pass Rates: No Change

Student Credit Hours: No Change

Majors: No Change

Degrees Awarded: No Change

Other Trends (if applicable):

Statistically relevant trends could not be analyzed with a small data set.

Achievement Disparities

Discuss any achievement disparities identified in your disaggregated student success data and explain how you plan to address them.

Response:

Assessment data by year in the program (Table 2, *SI*) reveal several developmental trends and achievement disparities across categories of competencies. Students demonstrate early growth in technical and quantitative skills and reach advanced proficiency by the third year. Critical analysis of literature and hypothesis development show delayed improvement, emerging with advanced proficiency in later stages of the program (year 5-6), reflecting the advanced conceptual development that research demands. In contrast, knowledge of literature peaks in the middle of the program (year 3) but declines in later years. This suggests engagement in current literature decreases as students prioritize their dissertation research. Presentation and writing skills remain consistently on track across years, although the trend may indicate persistent challenges in scientific communication or barriers to publication. These gaps are consistent with both faculty feedback and longitudinal assessment trends. Collectively, this indicates that although students develop advanced experimental and analytical skills, they often struggle with scholarly synthesis and scientific communication. To address these disparities, the program is proposing the following targeted strategies:

1. Writing and Critical Analysis:
 - a. Continue the writing-intensive colloquium requirement to reinforce formal scientific writing and presentation skills.
 - b. Partner with the Biology Department to offer students the opportunity to enroll in the manuscript writing course (BIOL F604), which emphasizes data-driven writing and quantitative analysis. In this course, students use their own research data to prepare a publication-ready manuscript, strengthening both their ability to apply rigorous statistical and analytical methods in communicating scientific results.
 - c. Encourage mentor-based writing accountability by asking students to submit biweekly written research updates or present short summaries to their research groups. This structure not only strengthens writing fluency but also enhances students' capacity for critical reflection on their data and literature context.
 2. Quantitative Skills:
 - a. Quantitative performance remains stable but shows limited growth. Students have expressed mixed feedback about COMM 601, currently the only statistics course available without prerequisites. We will continue to recommend COMM 601 for students without prior quantitative training, while encouraging those with pre-requisite coursework to pursue upper-level statistics or data analysis courses in mathematics, biology, or environmental sciences.
 3. Monitoring Student Progress:
 - a. Admission and retention data suggest that a small number of students struggle to make satisfactory progress despite available support. To better document and address this, the program is considering implementing an expanded rubric for annual committee meetings. The rubric would assign a progress rating (e.g., A-C) and provide structured feedback to students on key milestones.
 - b. The committee may recommend remedial actions or early competency exams like those used in other graduate programs to ensure readiness for continuation in the program.
 4. Admissions:
 - a. To continue to ensure that incoming students are adequately prepared for the academic rigor a Ph.D. program demands, the program also intends to update admission requirements to clearly outline prerequisite coursework expected for entry. This will create transparent criteria at the application stage that align incoming students' backgrounds with program expectations.
 - b. To ensure that incoming students are adequately prepared for the program, the committee intends to develop a set of screening questions for the interview and pre-admission phase of application review. These questions will help assess prospective students' foundational knowledge, research interests, and readiness for the program.
- Collectively, these interventions aim to reduce achievement disparities, strengthen critical and written communication, and establish transparent, data-informed mechanisms for assessing and supporting graduate student progress.

Closing the Loop

Please discuss how your student learning outcomes are reflected in high impact practices and student success data.

Response:

Assessment data confirm that students achieve excellence in technical and quantitative skill development. The program's targeted interventions are focused on improving writing, critical

analysis, and communication to ensure balanced mastery across all student learning outcomes. Planned enhancements include a standardized progress rubric with graded outcomes to increase transparency and accountability, ensuring that students receive clear feedback tied to developing each SLO.

To close the loop, the program has implemented writing-intensive experiences through the Chem 688 Colloquium and intends to implement writing workshops for early-stage graduate

students and encourage mentor-supervised research updates. These enhancements, grounded in high-impact practices such as collaborative research, writing, and communication training, ensure continuous improvement and quantifiable gains in student success.

Academic Program Profile

The following questions help show how your program supports the university's mission, connects with other UA programs, engages with the community, contributes through service courses, and supports student success after graduation. Please use this section to highlight the value your program brings to students, the university, and beyond.

UAF's Mission:

The University of Alaska Fairbanks is a Land, Sea, and Space Grant university and an international center for research, education, and the arts, emphasizing the circumpolar North and its diverse peoples. UAF integrates teaching, research, and public service as it educates students for active citizenship and prepares them for lifelong learning and careers.

In what ways does your program advance UAF's mission?

Response:

The Ph.D. Program in Biochemistry and Neuroscience advances the University of Alaska Fairbanks' mission of excellence through transformative learning, innovative research, and community outreach and engagement. The program prepares the next generation of scientists through rigorous training and research in molecular and systems neuroscience, protein structure, function, and modulation, and innovative drug design. Building on UAF's strengths in Arctic research, students investigate the molecular foundations of adaptation and discovery through studies of plant-soil microbiome-driven drug discovery, nutrition of sled dogs as human sentinels, developing neurotropic virus-based drug delivery platform to improve human health, and the biochemistry and neuroscience of hibernation. The program advances Alaska's research capacity and contributes to a prepared scientific workforce.

How is your program related to others in the UA system?

Response:

The program is a contributor to the Biomedical and One Health community at UA. The program's focus on molecular mechanisms of health and disease compliments the missions of several adjacent programs that promote collaborative research, shared coursework in graduate programs, and co-mentorship. Our students engage with the Institute of Arctic Biology (IAB), the Department of Biology and Wildlife, and the Center for One Health that fosters integrative approaches to biomedical research. The program aligns with the Department of Veterinary Medicine, where shared interests in infectious disease, neurobiology, and nutrition advance the goals of One Health. Collaborative opportunities with the Center for Alaska Native Health Research (CANHR) may strengthen our capacity for community outreach and engagement with a focus on biomedical research. Interdisciplinary connections with the Department of Fisheries and Marine Sciences and the programs they offer may support research that explores the impact of ecosystems on environmental health.

Who are your key community or external partners?

Response:

Numbcorp; <https://www.numbcorp.com> and Monell Chemical Senses Center

What role do your services courses play, if any?

Response:

We do not offer courses focused on services.

How do your graduates succeed after leaving the program?

Response:

All of our graduates during 2023-2025 obtained jobs in their field or in a directly related field. One of our primary aims is to increase opportunities for students to enter biomedical research and healthcare related fields to meet the rising demand for health services in Alaska.

Submitter and Collaborator Names:

Julia Duncan, Kelly Drew, Maegan Weltzin, William Howard, William Simpson

Submitter Email:

jmduncan2@alaska.edu

Committee Review

Program Name: **Biochemistry and Neuroscience -
Doctor of Philosophy**

Academic Year 2025/2026

Overall Recommendations

The college or school committees set the tone for helping each program feel seen during this process. We have provided you with feedback tags to attach to this program review. Please select as many as applicable.

- | | |
|---|--|
| ☐ Insufficient Narratives | ☐ Report Incomplete |
| ☐ Address Achievement Gap | ☒ Consider Curricular Revisions |
| ☐ Develop Online Offerings/Options | ☒ Improve Time to Degree |
| ☐ Increase Enrollment | ☐ Increase Graduates |
| ☐ Increase Retention/Persistence | ☐ Strengthen Advising Practices |
| ☒ May be asked to share Effective Practices | ☐ Recommendation to University-Wide Committee |

Explanation of Overall Recommendations

Response:

The program provided feedback from its last full-program review in 2023, which included both commendations and recommendations. Commendations included strong alignment with the SLOA plan, being mission centric, and collaborative structure. Recommendations included the need for curricular revisions and strategies to improve time to degree completion. While it was noted that there are proposed changes in the works to address these recommendations, there was no detail on the specific plan and how it would result in the desired outcome. For the next full-program review in 2027, this should be documented more clearly as the recommendation will remain.

Student Learning Outcomes Feedback

- | | |
|---|--|
| ☐ Strong | ☐ Developing |
| ☒ Requires Minor Revision | ☐ Requires Major Revision |

Student Learning Outcomes Assessment Feedback

- | | |
|---|---|
| ☒ Strong Alignment with SLOA Plan | ☒ Clear, Concise Presentation of Findings |
| ☒ Compelling Learning Story | ☐ Missing a Direct Measure |
| ☐ Missing Active Verbs | ☐ Missing Curricular Connection |
| ☐ Missing Collaboration within Department | |

SLOA Feedback Narrative:

Provided five SLOs, each of which is clearly defined. Each SLO has a clear set of criteria, procedures for assessment, and implementation plan. The program did provide a strong narrative overview of how they are addressing each SLO and included relevant data/evidence in the narrative and as an appendix in the supporting documents folder. It will be important to provide all relevant artifacts/rubrics (rubrics are noted in the SLOA plan but not included) as supplementary documents to document the assessment process.

Noted that the program did not make any curricular changes since the last review in 2023. However, the program did identify proposed changes to address the recommendations, which also included a need to accommodate the lack of FTE faculty to teach core courses.

The program provided a nice discussion on how SLOs are reflected in the HIPs and student success data. Documenting continuous improvement and the closing of the loop are important components of the program review process, not just as an exercise, but to demonstrate that assessment results are used to make meaningful, evidence-based changes that enhance program quality and student learning. This process ensures accountability, fosters a culture of ongoing improvement, and provides clear evidence to accreditors and stakeholders that actions lead to measurable outcomes. For the full-program review in 2027, should include evidence to document this outcome.

Student Success and Equity Feedback

Narrative:

The program effectively and in detail, identified trends showing strong student performance in technical and quantitative skills early on, with greater challenges emerging later in the program in areas such as critical analysis and hypothesis development. To address this, the program has proposed several key strategies to strengthen research and writing skills, including partnerships with other departments to provide writing and research support for students, and the use of rubrics and interview questions to clarify expectations and offer milestone feedback. These planned initiatives aim to meet a range of student needs and provide meaningful academic support across diverse learning styles. Achievement and equity gaps were not identified, largely due to the small size of the current student cohort.

The program plans to introduce a set of screening questions during admissions to clearly communicate program expectations and ensure strong alignment between students' preparation and program requirements. While no specific inclusive practices were mentioned, the program demonstrates a strong focus on student success, particularly in addressing research and writing challenges that arise later in the curriculum. The proposed strategies are well thought out and, if effectively implemented, should lead to meaningful improvements in student outcomes. Graduates are already finding relevant employment opportunities, indicating positive program results. The program shows strong early promise but should be prepared to report detailed evidence of these strategies' implementation and impact in the 2027 full program review.

High Impact Practices Feedback

Narrative:

Reviewer Names: