Core Competency Assessment
Department of Biology
AY 2024-2025

Term: Spring 2025
Course: BIOL 376L Genetics Laboratory

Course SLOs:

- Gain familiarity with laboratory procedures in a modern genetics and genomics facility.
- Identify best practices for data management in a laboratory setting.
- Interpret genetics and genomics peer review papers.
- Concisely summarize results of a genetics and genomic analysis in a manner appropriate for a scientific communication.
- Connect theoretical knowledge with contemporary issues and innovations in genetics

Assignment: Research paper

In this semester-long project, students will conduct an in-depth literature review on a genetics-related topic of their choice (from a list provided or with instructor approval). The goal is to analyze current research, identify knowledge gaps, and synthesize findings into a comprehensive review paper. This assignment emphasizes critical thinking, scientific writing, and an understanding of contemporary issues in genetics. This is an independent project requiring a polished 6-8 page paper (excluding references) written in a scientific format (e.g., APA or CSE).

Learning Outcomes By completing this assignment, students will: 1. Develop the ability to identify and research a specific topic in genetics. 2. Analyze and critically evaluate primary research literature. 3. Organize complex scientific information into a coherent narrative. 4. Improve scientific writing and communication skills. 5. Gain experience providing and incorporating peer feedback. 6. Connect classroom learning to real-world applications and innovations in genetics. See provided assignment rubric below.

Methodology: Two readers from the Biology Department read fourteen (n = 14) papers using the Information Literacy Rubric.

Results:

Spring 2025	Document Conventions	Appropriateness of Sources	Evaluating Sources* (Critical Thinking)	Integrating Sources* (Critical Thinking)
Paper 1				
Reader 1	3	4	3	3
Reader 2	3	3	3	3
	3.00	3.50	3.00	3.00
Paper 2				
Reader 1	3	4	3	3
Reader 2	3	3	3	3
	3.00	3.50	3.00	3.00
Paper 3				
Reader 1	4	4	4	4
Reader 2	4	4	4	4
	4.00	4.00	4.00	4.00
Paper 4				
Reader 1	3	4	4	3
Reader 2	4	4	4	3
	3.50	4.00	4.00	3.00
Paper 5				
Reader 1	3	4	3	4
Reader 2	3	4	3	3
	3.00	4.00	3.00	3.50
Paper 6				
Reader 1	4	4	4	4
Reader 2	4	3	3	4

	4.00	3.50	3.50	4.00
Paper 7				
Reader 1	4	3	3	3
Reader 2	3	3	3	3
	3.5	3.00	3.00	3.00
Paper 8				
Reader 1	2	2	3	2
Reader 2	2	2	3	2
	2.00	2.00	3.00	2.00
Paper 9				
Reader 1	3	2	3	4
Reader 2	3	2	3	3
	3.00	2.00	3.00	3.50
Paper 10				
Reader 1	3	4	3	3
Reader 2	3	3	3	3
	3.00	3.50	3.00	3.00
Paper 11				
Reader 1	2	3	3	3
Reader 2	2	3	3	3
	2.00	3.00	3.00	3.00
Paper 12				
Reader 1	4	4	4	4
Reader 2	4	4	4	4
	4.00	4.00	4.00	4.00
Paper 13				
Reader 1	3	4	3	4
Reader 2	3	3	3	4

	3.00	3.50	3.00	4.00
Paper 14				
Reader 1	3	4	3	3
Reader 2	3	3	3	3
	3.00	3.50	3.00	3.00
AVERAGES *n* = 14	3.142 R1: 3.142 R2: 3.142	3.357 R1: 3.571 R2: 3.142	3.250 R1: 3.285 R2: 3.214	3.285 R1: 3.357 R2: 3.214
Inter-Rater	85%	57%	92%	85%

Observations:

This writing assignment asked students to research a genomics-related topic and produce an opinion-based synthesis paper. Unlike a traditional literature review, the goal was to develop a clear thesis statement and support it with evidence drawn from scholarly sources, culminating in a forward-looking argument or "future directions" perspective.

Initially, students struggled to conceptualize the assignment. Many had difficulty proposing a focused topic and articulating a defensible thesis. Although I provided a list of genomic themes as a starting point, their early submissions often consisted of loosely connected ideas—many of which appeared to be generated by AI tools. These drafts lacked coherence and failed to demonstrate critical engagement with the material. As a result, I asked students to resubmit their proposals after offering additional instruction on thesis development and the scope of research questions appropriate for an argumentative synthesis.

By the time the final assignment was submitted and evaluated for core competency, most students had grasped the structure and intent of a research-based opinion paper. They were able to identify relevant sources—often through Google Scholar—and compile annotated bibliographies as an intermediary step. However, many still relied heavily on general internet sources, and the appropriateness of these materials varied. Turnitin reports revealed some instances of plagiarism, and it was occasionally unclear whether students had used AI-generated content or simply leaned too heavily on web-based summaries. One indicator of AI use was the presence of placeholder citations in their reference lists (e.g., "n.d." or incomplete metadata), which lacked academic rigor.

Despite these challenges, students demonstrated growth in several areas. Their grammar and organization improved significantly across multiple drafts, and most were able to structure their papers around a thesis and set of guiding questions. They used sources to answer these questions effectively, though many struggled to integrate their own perspectives or articulate future directions in a meaningful way.

According to the grading rubric, students performed well in categories such as Format & Organization and Use of Evidence, but showed mixed results in Analysis. For the core competency evaluation, their performance ranged from fair to good in Document Conventions, Evaluating Sources, and Integrating Sources. The most consistent weakness was in Appropriateness of Sources, particularly in distinguishing between peer-reviewed literature and general web content.

Overall, while the assignment introduced a new genre of writing for many students, it provided a valuable opportunity for them to engage with scientific literature, practice synthesis, and begin developing their own academic voice. The iterative nature of the assignment—combined with targeted feedback—helped foster meaningful learning, even if some aspects of critical analysis and source selection remain areas for continued growth.

Recommendations for improvement (closing the loop):

Based on this assessment and the experience of evaluating student writing for core competencies, several recommendations have emerged to strengthen future instruction and support student development:

(1) Encourage Enrollment in Science Writing Courses. Many biology students benefit from taking the Science for Writing course, though it is not universally required. I will actively recommend this course to my student advisees, especially those who struggle with synthesis, thesis development, and source integration.

(2) Increase Instructional Scaffolding to Mitigate AI Reliance. To reduce overreliance on AI-generated content, I plan to continue offering structured guidance and iterative feedback throughout writing assignments. This “hand-holding” approach proved effective this year and will remain a key strategy moving forward.

(3) Break Down Assignment Components More Deliberately. Students need clearer support in understanding the expectations of each writing stage. In future iterations:

- I will introduce thesis statement development and formulation of key research questions before students submit their proposals.
- The annotated bibliography will be split into two phases: an initial round to explore sources, followed by the proposal, and then a second round to refine and justify source selection.

(4) Collaborate with BIOL 195 Instructor for Early Science Writing Exposure. I plan to work with the instructor of BIOL 195: Becoming a Biologist, a freshman seminar focused on professional development. Integrating science writing skills early in the biology curriculum may better prepare students for upper-division courses like genetics, where synthesis and argumentation are essential.

These changes aim to reinforce core competencies in writing, critical thinking, and source evaluation, while also fostering students' ability to express original ideas and engage with scientific literature meaningfully.

Biology 376L Research Paper Grading Rubric

"**Outstanding" "Superior" "Progressing"**

Format:	3	2	1
· Text is in 12 pt. font, single spaced, is between 6-8 pages in length not including references · Title is clear and concise · Resources are properly cited using APA (inline citations), and a reference section is present · Slang, jargon, and wordiness are avoided including *as to, due to, in order to, it is suggested that, first of all, the fact that, with regard to,* etc. · Grammar and syntax are acceptable, and spelling and plurals are correct	Meets all criteria at high level; easy to read	Meets some criteria; some confusing words and phrasing; didn't follow all instructions	Meets few criteria; often unclear; didn't follow any instructions
Organization:	3	2	1

· Writing is clear, logical, and organized around a **developed thesis statement** · The student's **objectives (key questions) are stated early-on** and sufficient background material is provided in introduction · Each paragraph begins with a clear and focused **topic sentence** · Section Headers and Subsections are defined clearly	Meets all criteria at high level; organization & thesis are clear, organization easy to follow	Meets some criteria; uneven; some lapses in clarity	Meets few criteria; often unclear or undeveloped
Evidence:	3	2	1
· Arguments are well developed and contain information from multiple sources · Concepts, methods, and conclusions from papers are **presented accurately** · Each Section and Subsection has 1 or more key points · The use of **evidence is relevant** support for the stated objectives/central thesis and key points	Meets all criteria at high level; evidence is well chosen and strongly supports thesis arguments	Meets some criteria; evidence is mostly sound but is not relevant in one or two instances	Meets few criteria; evidence is not relevant to arguments or is absent
Analysis:	3	2	1

· Important aspects of papers and material are ***compared and contrasted*** · Strengths and weaknesses of the papers are identified, described briefly, and commented on in the larger context of what you have learned in this course · Suggestions of improvement accompany criticisms · Relevance of papers main objective/conclusion are expressed · Student provides a clear and concise synthesis that generates new ideas and insights	Meets all criteria at high level; demonstrates strong insight into material; synthesizes concepts from lab discussion (papers) and lecture material seamlessly	Meets some criteria; development of analysis is strong but could have gone a bit deeper	Meets few criteria; analysis isn't fully developed