

Data Informed Decisions 2024
Program Assessment and Reform
Department of Biology

The 2024 assessment results and 2023 AAA review and feedback were first presented to and discussed with the Biology Curriculum and Assessment Committee and department head, then presented to the Biology faculty in a fall semester faculty meeting. Questions can be directed to Lauren Lucas (Biology major Objectives 1&3) and Thayne Sweeten (Biology major Objective 2).

Biology Major & Composite Teaching Major

The curriculum map on the Assessment Plan page has been useful for new faculty when choosing course objectives and as a starting point for department-level discussions about how to scaffold and connect course content.

Soon we expect to start tracking progress on some of the Objective 1 and 3 subobjectives that currently have missing data, as new course instructors started contributing to this effort in 2023-2024.

We do not use data from IDEA SRIs to make department-level data informed decisions, as studies have found evidence of gender and cultural bias, within Science faculty in particular (<https://wp.stolaf.edu/iea/bias-in-course-evaluations/>). The IDEA SRIs also focus on students' perceived learning; instead, we focus on student performance data. We note that student evaluations of teaching work well for comparing a faculty member's own teaching trajectory over time, but not as a comparative metric across faculty. We also have decided not to disaggregate data beyond "early scores" and "late scores", as doing so can lead to harmful stereotypes, oversimplification of complex issues, and potential misuse of data; instead, course instructors teach to individual needs of students.

Overall, we envision a rigorous curriculum that also provides students with a sense of belonging as well as the foundation for successful careers after graduation. We plan to continue to discuss a curriculum that supports scaffolding and across-course collaborations.

Objective 1 regarding experimental and analytical skills

1a regarding practicing the process of science. Using the grading rubric based on Timmerman et al. (2011) across the curriculum is working well for students and faculty; it sets a clear expectation for how to practice science at an 'expert' level throughout the curriculum. Most students are mastering the steps of the scientific process by the time they are assessed beyond the introductory courses. The trends of weak positive correlations between early and late scores regarding drawing conclusions based directly on data and citing references caught our attention. These skills could be harder for students with less science experience coming into college. Intermediate and upper-division course instructors are now aware of these trends and can consider re-teaching these skills as they are used in class. The negative correlation trend

regarding writing about scientific methods between early and late scores also caught our attention. This fall, the BIOL 1615 and 1625 instructor has updated course lab manuals to reflect advice in *Writing science: how to write papers that get cited and proposals that get funded* (Schimel, 2012), which we think will set students up for successful methods-writing in their intermediate and upper-division courses.

1b regarding quantitative reasoning. So far, students are mastering these skills early on and later. We have encouraged instructors who teach to these subobjectives to meet to discuss whether all students show mastery at the beginning of all courses in ways beyond these assessments, and if not, how to assess these subobjectives in such a way that students can see their progress over time.

Objective 2 regarding biology content knowledge

Our graduating seniors score above the national average in all concepts and subdisciplines; however, we see a lot of attrition in the degree over time and a relatively small percentage of students are testing at the end of the program compared to the beginning. Therefore, we are concerned that there is some bias in the data towards students who are willing to take the test in their senior year and we have implemented a requirement that graduating seniors need to take the GenBio-MAPS test prior to graduation as a graduation requirement. This change will take time as it has been submitted through the university curriculum approval process and will be applicable for incoming freshmen. We are hopeful that this change will improve our confidence in the data as we continue to improve our assessment.

Objective 3 regarding professional practice skills, such as scientific communication

Using the grading rubrics based on Timmerman et al. (2011) and Sevian & Gonsalves (2008) across the curriculum is working well for students and faculty; they set clear expectations for how to communicate science at an 'expert' level throughout the curriculum. Most students are mastering scientific communication (written and oral) by the time they are assessed beyond the introductory courses. The trends of weak positive correlations between early and late scores regarding writing quality and using a clear choice of (oral) language caught our attention. It can be hard to help students improve poor writing or speaking quality in the relatively short amount of time they are in college, a skill that is honed since elementary school. We have asked instructors to incentivize the use of the Science Writing Center, which might help students further improve these skills.