Description and Methodology

This is the second report out on student attainment of the Program Learning Outcomes from the three programs we support in the Life Sciences division. Data in this report is from AY22/23.

For context:
The Life Sciences Assessment (LSA) is a tool built in Canvas.   Creating the assessment in Canvas has allowed us to set up the parameters (time, question randomization etc) to keep it as standard as possible over many sections. Students have 40 minutes to complete the assessment. There are 24 broadly relevant content questions, and one demographic question. In some sections students take the assessment during class or lab time, and in some sections they do it as homework. The same assessment is used in online, hybrid, in person, 16wk and 8wk courses. We have not been tracking course modality, or disaggregating data by course modality, but that might be possible in the future since data is collected by section.

The LSA is included in all our Canvas Master courses, and is also available on Canvas Commons so it can be easily imported into Canvas shells.

The assessment is set up as a Practice Quiz so the scores do not impact the Gradebook. Instructors have the option to offer extra credit for completing Assessment and a sample assignment is shared out to all instructors to help them incorporate the LSA into their Canvas course or course schedule. In the Life Sciences division we rely heavily on Course Lead instructors and they have been instrumental in coordinating the roll out of this assessment and the collection of the data from all sections of their course.

Item Analysis data is exported from Canvas Quizzes. How-to Videos and QRG's were created to assist Adjunct instructors with this step. The Item Analysis from Canvas provides a question by question breakdown of each course section's performance. The resulting .csv files are collected and the data is aggregated. To allow us to do a pre/post comparison of students moving through our pathways we looked at our Allied Health pathway courses and our STEM pathway courses and determined if a course was a "beginning-of-pathway" or "end--of-pathway" course. Then we aggregated data together accordingly.

Table 1

Pathway	Beginning of Pathway courses	End of Pathway courses
Allied Health	BIO156 + BIO201	BIO202 + BIO205
STEM	BIO181	BIO182

To capture data from our Non-Majors classes where there is not a course progression or set sequence, we decided to create a mock pre-post comparison, where in the Fall semesters students enrolled in any non-majors BIO course (BIO100, 105, 109, 145, 160) take the LSA in

weeks 1-3 of the semester and in Spring semesters students take the LSA in weeks 14 - 16 of the semester.

Each pathway has a set of PLO's

STEM Pathway PLO's

Table 2

PLO#1	At the end of the pathway students will be able to analyze given scientific information to answer empirical questions
PLO#2	At the end of the pathway, students are able to interpret information displayed in a line and bar graphs.
PLO#3	At the end of the pathway, students are able to analyze information displayed in a diagram to draw conclusions about a process.
PLO#4	At the end of the pathway, students are able to deconstruct the information provided in written questions in order to correctly answer the question

Allied Health Pathway Draft PLO's (currently under revision)

Table 3

PLO#1	At the end of the pathway students will be able to analyze given scientific information to answer empirical questions
PLO#2	At the end of the pathway, students are able to interpret information displayed in a line and bar graphs.
PLO#3	At the end of the pathway, students are able to analyze information displayed in a diagram to draw conclusions about a process.
PLO#4	At the end of the pathway, students are able to deconstruct the information provided in written questions in order to correctly answer the question

Questions in the LSA were aligned to particular PLOs

Table 4

	Allied Health	**STEM**
PLO#1	Measured by overall score	Measured by overall score
PLO#2	Aligns to Q3, 6, 9,13	Aligns to Q3, 6, 9,13

PLO#3	Aligns to Q1,12,14,23	Aligns to Q1,12,14,23
PLO#4	Aligns to Q5, 10	Aligns to Q5, 10

Data was summed across all sections of all grouped courses (per Table 1) so that the total number of students who got the questions aligned to each PLO correct could be calculated. The results for FAll 23 were as follows:

STEM Pathway PLO analysis

Fall 2023 n=67

	BIO181	BIO182
PLO1	0.496	0.601
PLO2	0.659	0.812
PLO3	0.386	0.557
PLO4	0.591	0.629

Comparison with last CATS:

Fall 2021 n=117

	BIO181	BIO182
PLO1	0.510	0.607
PLO2	0.696	0.765
PLO3	0.494	0.617
PLO4	0.381	0.629

For example, in Fall 2023, 49.6% of students had met PLO1 at their entry to the STEM pathway, and 60.1% had met PLO1 upon their exit of our STEM pathway. This shows a 10% increase in students meeting PLO#1 at the end of the BIO181/BIO182 course sequence.

Allied Health Pathway PLO analysis
Fall 2023 n=207

	156/201	202/205
PLO1	0.540	0.615
PLO2	0.704	0.769
PLO3	0.477	0.560
PLO4	0.560	0.575

Comparison with last CATS:

Fall 2021 n=446

	156/201	202/205
PLO1	0.547	0.615
PLO2	0.720	0.758
PLO3	0.494	0.546
PLO4	0.541	0.574

Analysis and Discussion

Our entering student populations in each respective pathway are remarkably similar, 2 years apart. In all pathways analyzed, students show an increase in all outcomes measured. Greatest gains are seen in the STEM pathway, however, students enter the STEM pathway with lower scores (as measured by our tool) than the Allied Health Pathway, so it could be argued that there is more room for improvement.   At the end of either pathway, students score similarly in PLO#1 and PLO#2 (overall measure; graphing skills). Students completing the STEM pathway score higher on PLO#3 and PLO#4 (diagrams; reading) than students completing the Allied Health pathway. Overall we see the least improvement in PLO#4 (reading complex questions).   (Note: none of this data has been tested for statistical significance)

We have developed a reasonably efficient way to collect large assessment data sets and to analyze it in a way that is meaningful for our division.   Some weaknesses remain in our methodology, however we have widespread adoption of the assessment tool and reporting of data with our FT faculty members. We would like to roll it out to adjunct faculty next, which will be logistically more challenging, but hopefully possible.

This AY23/24, a major project for our division is updating our PLO's for each of our three pathways and redesigning the LSA tool to more accurately align with our stated PLOs. That work is ongoing and we plan on rolling out the new LSA tool in Fall 2024.

We have not had success with collecting data from our non-majors pathway. This is a logistics and dissemination issue and should be fixable with some dedicated outreach and education to all the instructors in each pathway. This will be a focus for the division chair and course leads for the AY24/25

The constant evolution and refinement of this large scale division-wide assessment evidences closing the loop of assessment as we have learned from our experiences and sequentially modified our methodology.   After our first data analysis, reported in the 2022 CATS, instructors modified curriculum to create more activities and assessments that address our stated program learning learning outcomes - for example creating an additional graphing module for BIO181 sections.   We are now in the process of reviewing our program learning outcomes and redesigning our assessment tool to measure them more efficiently.   For our next iteration, we hope to use the new assessment tool, to implement the assessment in both FT and adjunct taught sections, and collect data from our non-majors pathway.