Weber State University
Biennial Report on Assessment of Student Learning

Cover Page

Department/Program: Botany and Plant Ecology
Academic Year of Report: 2022 and 2023 (covering Summer 2021 through Spring 2023)
Date Submitted: November 15, 2023
Report author(s): Dr. Bridget Hilbig

Contact Information:

Phone: 801 626-6176
Email: bridgethilbig@weber.edu

Additional contributors (include sections and contact information if feedback is desired):

Evidence of Learning Grids: James Cohen, Sue Harley, Kerri Mocko, Annita Peterson, Heather Root, Sonya Welsh

Table of Contents

The Institutional Effectiveness website hosts a page for each program that displays assessment reports and information. All available biennial assessment and program review reports are located at the bottom of the program's page on our site. As a part of the biennial report process, we ask that you please review your page for completeness and accuracy, and indicate below the changes that need to be made in sections A-E.

Program page link: https://www.weber.edu/ie/Results/Botany.html

A. Mission Statement

Information is current; no changes required: Yes ____ No _X_

The mission of the Botany and Plant Ecology Department at Weber State University is to create an environment for students from diverse backgrounds to blossom as scientists, to root themselves as ecologically conscious citizens, and to grow into thoughtful botanists. We accomplish this by recognizing that botany is one of the few scientific disciplines that explicitly touches each culture; therefore, we strive to value and respect the diversity of cultural knowledge that shapes our understanding of the plant world. We offer a variety of high quality classroom, laboratory, and field experiences across the discipline. Our botany graduates find employment in academia, industry, or government.

B. Student Learning Outcomes

(Please include certificate and associate credential learning outcomes)

Information is current; no changes required: Yes _X_ No__

C. Curriculum Grid

(Please review your current curriculum grid and verify that at least one course has been identified for each outcome in which you expect your students to demonstrate the desired competency of a graduating student. This could be shown in a variety of ways: classroom work, clinical or internship work, a field test, an ePortfolio, etc. You may request access to the Google Sheet on our site if that is easiest, or we can make the updates. Please reach out to oie@weber.edu if you wish to have access)

Information is current; no changes required: Yes ____ No_X_

As noted above, there has been significant turnover in the department in the past two years. This will continue with another faculty retiring in Spring 2024 and two faculty searches for those existing lines this year and the following. As new hires with different areas of expertise have started some courses have shifted their focus slightly. This has resulted in changes in the course assessment as new outcomes are being introduced in, emphasized, or are a primary focus of the course. The following figure contains the courses have shifted their outcomes slightly. The red represents outcomes that have changed since the curriculum grid was developed. In addition, two new courses have been added BTNY 3810 and 4810.

Botany Courses: 2000 and higher	Botany Program Learning Outcomes																			
Core Courses Required	Goal 1: Breadth across three major sub-disciplines of Botany					Goal 2: Core Competencies				Goal 3: Skills										
	A1	A2	B	C1	C2	A	B	C	D	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	
BTNY 3204 (Plant Physiology)	1	0	3	2		3	2	1		0	2	3	3					3	0	
BTNY 3624 (Taxonomy of Vascular Plants)		1		2	3	3	0								3				0	
BTNY 3473 (Plant Geography)	1		1	2	3	3	3	3	3					2	0	2			0	
BTNY 3810 (Intro UT Flora)				3	3	3									3					
BTNY 4810 (Field Studies UT Flora)				3	3	3									3	2	3			

D. Program and Contact Information

Information is current; no changes required: Yes ____ No__X__

Contact Information:

Dr. Bridget Hilbig
Weber State University
1415 Edvalson St., Dept. 2504
Tracy Hall, Rm 415
(801) 626-7434

Botany and Plant Ecology Department Website

E. Assessment Plan

We have traditionally asked programs to report on outcome achievement by students at the course level. We are encouraging programs to consider alternative assessment approaches and plans that are outcome-based as opposed to course-based, though course-based assessment can continue to be used. A complete assessment plan should include:

- a timeline (which courses or which outcomes will be assessed each year),
- an overall assessment strategy (course-based, outcome-based, reviewed juries, ePortfolio, field tests, etc.)
- information about how you will collect and review data
- information about how the department/program faculty are engaged in the assessment review.

Information is current; no changes required: Yes _ No_X

The assessment plan for which courses will be assessed in what academic years needs to be slightly amended. Botany has only 6 tenure track lines, however in these academic years a faculty resigned (January 2022), a faculty member retired (spring 2023), and another member was on sabbatical for the 22-23 year. We have hired one replacement and are in the process of hiring a second replacement. Due to this turnover some courses have switched years they were taught, several were taught by adjuncts, and some courses listed are no longer being offered as there is no one to teach them (e.g. Medicinal Plants). In addition, we used to teach some courses every semester and those courses are now being changed to once a year offerings (e.g. Botany Capstone). Lastly, BTYN 2600 is a hybrid course cross-listed in five departments and required for several majors in the COS, including the new Environmental Sciences major. The course has been restaffed and likely restructured outside of the Botany department. The figure to the right represents changes to the schedule of course assessments for courses within Botany and Plant Ecology.

BTNY Course	2021-2022	2022-2023	2023-2024	2024-2025
2104 (Plant Form & Function)	X	X	X	X
2114 (Evolutionary Survey of Plants)	X	X	X	X
2121 (Career Planning)	X	X	X	
2203 (Home & Garden)	X			
2303 (Ethnobotany)		X		X
2413 (Natural Resource Management)	X			X
2600 (Lab Safety)				
2750 (Topics in Science and Society)			X	
3105 (Anatomy of Vascular Plants)		X		
3153 (Biology of the Plant Cell)		X		
3204 (Plant Physiology)		X		
3214 (Soils)	X		X	
3303 (Plant Genetics)		X		X
3454 (Plant Ecology)		X		X
3473 (Plant Geography)	when taught			
3504 (Mycology)			X	
3583 (Medicinal Plants)	when taught			
3624 (Taxonomy of Vascular Plants)	X		X	
3643 (Intermountain Flora)		X		
4113 (Plant Evolution)	when taught			
4750 (Topics in Botany)	when taught			
4950 (Advanced Field Botany)	X			X
4990 (Botany Capstone Seminar)		X		X

F. Student Achievement

Please come back to this section later. The dashboard is being updated and is not yet on Site Manager. OIE will send out an email when it is ready.

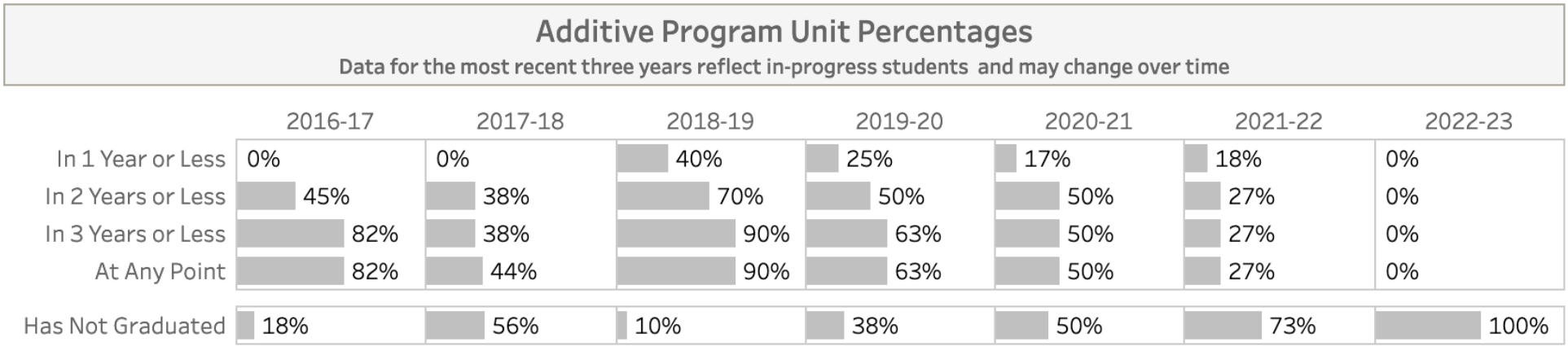
Percent and number of students completing degrees within 2 years of achieving 90+ credit hours (or just time to graduation for graduate programs) and a reflection on that metric.

Here are instructions on how to access this information:

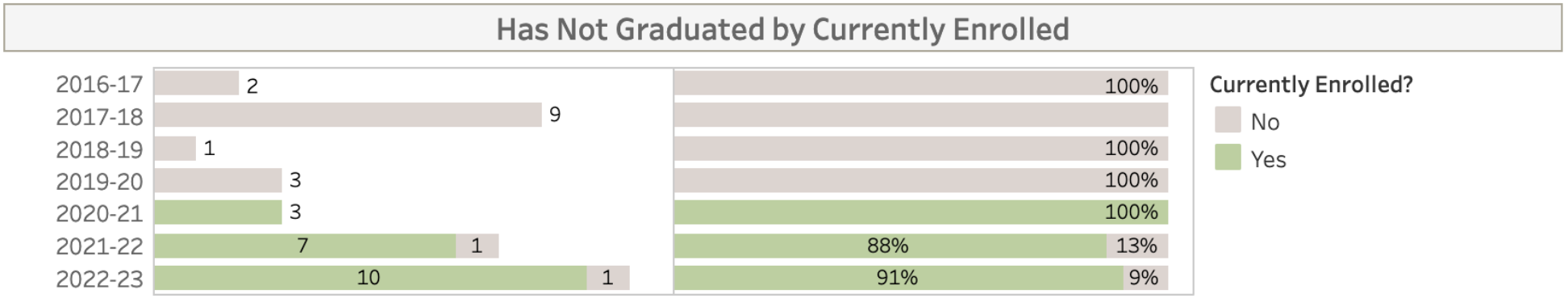
1. Log into the eWeber portal
2. Search for, and select the app, "Report Gallery"
3. Agree to the FERPA warning
4. In the Report Gallery search for Program Review Undergraduate - you can enter that text into the search bar or you can scroll downthe list of dashboards until you find it.
5. Select the tab at the top labeled "Time to Grad" at the top of the page.

6. Select your Program Unit and Program Level on the right side
7. Select Priority 1 under Priority

You should now be in the right settings for understanding your program's time to graduation. Please reflect on what you are seeing, discuss any highlights or concerns, and outline what initiatives the program is doing to address the numbers shown. If you require assistance or have questions, please email oie@weber.edu. You may use a screenshot of the information shown in the dashboard as a part of your report.



From 2016-17 through 2020-21, the botany major program averaged a 46.7% completion within 2 years of 90CH. The last two years of data are years that were significantly disrupted by COVID19. Across the nation students faced increasing food and housing costs, financial hardships, inflation, uncertainty about the future, and access issues that hindered their academic performance and well-being (Lederer et al. 2020). In a small department, these hardships can manifest in seemingly large swings in retention and years to graduation data when presented as a percentage but may be very reasonable when looking at the raw counts. For instance, in 2022-23 the total number of Botany students who reached 90 CH but have not graduated was just 11 students. Of those 91%, or 10 students are currently enrolled in courses (figure below). So, while they may have taken less coursework in Covid years, or maybe a small break, those students are here and are making progress on their degrees. This highlights that we have been actively advising and working with these students for better retention and timely graduation . Another challenge with this percentage data is that we often get new majors from very different fields (e.g. we've have several musical theater majors declare a botany program recently). Those students come into the major close to the 90CH prior to declaring their major in botany, but have few courses towards the major. One student declaring botany with 90CH outside of the STEM fields can dramatically impact our percentage of completion in 2 year because there are courses in botany, chemistry, and math that are in a series required for the major. Despite these challenges with this type of data, changes in the requirements for the major, that was implemented with the 2020-2021 catalog combined with active advising in the department should reduce time to graduation in non-pandemic years.



G. Evidence of Learning

There are a variety of ways in which you can choose to show evidence of learning, including the traditional Evidence of Learning Rubric, the updated Evidence of Learning worksheet, a narrative describing your assessments and evidence of student learning, or other tools such as ePortfolios, Signature Assignments, juried reviews, and so on, or a combination of any of these.
Whichever method you choose, please include:

1. Each learning outcome addressed in the course, and an interpretation of the outcomes as necessary to help outside reviewers understand the learning goals
2. The methods used to assess learning for each outcome – ideally, each outcome will be measured with at least two different methods, e.g., multiple quiz questions and a signature assignment, multiple exam questions and lab reports, course discussions and homework assignments, etc.
3. The threshold of acceptable performance – preferably a multi-stepped threshold, such as "80% of students will score 80% or better on the set of quiz questions" – and brief explanation for why that target was selected
4. The results of the assessment for each outcome. If possible, include specifics such as the number of students who meet, exceed, or fall short of the threshold.
5. A reflection on, or interpretation of, the findings. For example, if 100% of students correctly answer all quiz questions, might they need to be too easy?
6. A plan of action to address the findings, even if the threshold was met, and/or reflection on changes made as a result of (or in the interim since) the last biennial report.
7. How you plan to monitor and assess the success of changes you will make/have made ("close the loop").

<u>If individual faculty who provide data or participate in the assessment of these courses would like feedback or support from GEIAC or the Office of Institutional Effectiveness, provide their names and contact information here:</u>

Types of Assessment

1) Course-based assessment
    a. This is the format we have traditionally suggested programs use for assessment. The familiar 'evidence of learning worksheets' are included in the template and can also be accessed from the IE website.
2) Outcome-based assessment
    a. Moving from course-based to outcome-based assessment has the potential for programs to gather and reflect upon data that are more meaningful, and to connect assessment findings from throughout the program. The approach may be much easier for associates and certificate programs where only select students in classes are earning the credential. For more information email (oie@weber.edu)

    b. Reporting options include:
        i. A traditional evidence-of-learning worksheet with an outcome (across multiple courses) as the focus (instead of a course with multiple outcomes).
        ii. A report that is more narrative-based.
        iii. Other tools such as an ePortfolio in which key or signature assignments have been identified by the faculty, and uploaded by the student with their reflection. The key or signature assignments are aligned to student learning outcomes. (ePortfolio is an excellent assessment tool for certificates and associate degrees.)
        iv. There are other approaches such as juried reviews, physical portfolios, field tests, etc.

3) General Education course assessment needs to continue to be reported at the course level using either the traditional template or a more narrative-based format. See the Checklist and Template page for area-specific worksheets as well.

Note: if you cannot download templates directly from this document, please visit our template page for downloads.

Evidence of Learning: Courses within the Major

Botany Learning Thresholds:
2000-Level Courses: 80% of students achieve at least 70%
These courses serve as introductory courses for the botany major, botany minor, field botany certificate, and AS Biology as well as support courses for various College of Science majors
Upper Division Botany courses: 90% of students achieve at least 80
These courses serve the botany major, botany minor, and field botany certificate. Some also attract students from other College of Science majors.

Course: **BTNY 2104 (Plant Form and Function)** Semester taught: **Spring 2023** Sections included: **CRN 31330**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Cellular, Developmental, Genetics, & Molecular. Students are able to describe and explain fundamental topics about the chemical and molecular machinations operating within all biological processes.	Measure 1: Thirteen multiple choice questions on Exam 1.	Measure 1: 80% of students achieving 70 % or higher on these questions	Measure 1: 55% of students (n=20) scored 70% or higher on these questions.	Measure 1: Threshold was not met.	Measure 1: Several students had not completed practice quizzes on this material prior to the exam. (Quizzes count for 10% of the final grade.)	Measure 1: Emphasize the importance of the practice quizzes for preparing for exams.
	Measure 2: Eight multiple choice questions plus 15 matching questions on Exam 2.	Measure 2: 80% of students achieving 70 % or higher on these questions	Measure 2: 75% of students (n=20) scored 70% or higher on these questions.	Measure 1: Threshold was not met, but the students did better with the material on this topic on this exam.	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 3: Seven lab and other class activities on this LO	Measure 2: 80% of students achieving 70 % or higher activities	Measure 2: 80% of students (n= 20) scored 70% or higher on all seven of the activities.	Measure 2: The threshold was met.	Measure 2: No curricular or pedagogical changes needed at this time	
Cellular, Developmental, Genetics, & Molecular. Students are able	Measure 1: Twelve multiple choice questions plus two problems to solve on Exam 2.	Measure 1: 80% of students achieving 70 % or higher on the exam that	Measure 1: 70% of students (n= 20) scored 70% or higher on the exam	Measure 1: The threshold was not met, but the problems involved chi squared analysis of genetic crosses. Many	Measure 1: Several students had not completed practice quizzes on this material prior to the exam. (Quizzes count for	Measure 1: Emphasize the importance of the practice quizzes for preparing for exams.

Report due 11/15/2023

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
to describe and explain fundamental topics about the centrality of genetic systems' governance of life's actions from the cellular to the phyletic.		included this LO		introductory level students struggle with questions that are essentially "story problems".	10% of the final grade.)	
	Measure 2: Seven lab and other class activities on this LO	Measure 2: 80% of students achieving 70 % or higher activities	Measure 2: 85% of students (n= 20) scored 70% or higher on all seven the activities	Measure 2: The threshold was met.	Measure 2: No curricular or pedagogical changes needed at this time	Measure 2:
Anatomy, Physiology, & Organismal. Students are able to describe and explain fundamental topics about the coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms	Measure 1: Exam 3 was on this topic. The exam was a mix of multiple choice questions, anatomy identification photos, and essay questions.	Measure 1: 80% of students achieving 70 % or higher on Exam 3.	Measure 1: 79% of students (n= 19) scored 70% or higher on the exams	Measure 1: Threshold was met. The students who missed the threshold had scores below 50%.	Measure 1: Several students had not completed practice quizzes on this material prior to the exam. (Quizzes count for 10% of the final grade.)	Measure 1: Emphasize the importance of the practice quizzes for preparing for exams..
	Measure 2: Eleven lab and other class activities on this LO	Measure 2: 80% of students achieving 70 % or higher activities	Measure 2: 80% of students scored 70% or higher on all eleven activities.	Measure 2: The threshold was met.	Measure 2: No curricular or pedagogical changes needed at this time	
Ecology and Evolution. Students are able to describe and explain fundamental topics about the	Measure 1: Three multiple choice questions on Exam 1.	Measure 1: 80% of students achieving 70 % on the questions	Measure 1: 75% of students (n = 20) scored 70% or higher on the questions	Measure 1: Threshold was not met.	Measure 1: Several students had not completed practice quizzes on this material prior to the exam. (Quizzes count for 10% of the final grade.)	Measure 1: Emphasize the importance of the practice quizzes for preparing for exams.

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
dynamic interaction of living systems with each other and their environments	Measure 2: One data analysis problem on Exam 1.	Measure 2: 80% of students achieving 70 % on the problem	Measure 2: 60% of students (n= 20) scored 70% or higher on the problem	Measure 2: Threshold was not met.	Measure 2: Several students had not completed practice quizzes on this material prior to the exam. (Quizzes count for 10% of the final grade.)	Measure 2: Emphasize the importance of the practice quizzes for preparing for exams.
	Measure 3: Two lab activities on this LO. One of the activities covered 8 weeks of the semester and included weekly data collection.	Measure 3: 80% of students achieving 70 % or higher activities	Measure 3: 84% of students (n = 19) scored 70% or higher on the activities	Measure 3: The threshold was met.	Measure 3: No curricular or pedagogical changes needed at this time	
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Four multiple choice questions on Exam 1 about this LO.	Measure 1: 80% of students achieving 70% or higher on these questions	Measure 1: 79% of students scored 70% or higher on these questions.	Measure 1: The threshold was met.	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: Three lab and other class activities on this LO	Measure 2: 80% of students achieving 70 % or higher activities	Measure 2: 84% of students (n = 19) scored 70% or higher on the activities	Measure 2: The threshold was met.	Measure 2: No curricular or pedagogical changes needed at this time	
Quantitative Reasoning. Students will represent diverse experimental data sets graphically and apply statistical methods to them.	Measure 1: One problem worth 7 points on Exam 1 on this LO.	Measure 1: 80% of students achieving 70 % or higher on the question	Measure 1: 60% of students scored 70% or higher on question	Measure 1: Threshold was not met, but all students scored at least some points on the question.	Measure 1: Provide additional practice problems	.
	Measure 2: Three lab and other class activities on this LO	Measure 2: 80% of students achieving 70 % or higher activities	Measure 2: There was a lot of variability in the number of students who	Measure 2: The threshold was met.	Measure 2: Provide more scaffolding to assist more students in completing these analyses.	

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
			completed each activity and the percentage who met the threshold: 84% (n=19), 93% (n=14), 64% (n=11). The percentages average to 80%.			
Microscopy Techniques	Measure 1: Five multiple choice and four lab practical questions on this LO on Exam 2.	Measure 1: 80% of students achieving 70 %	Measure 1: 80% of students (n = 20) scored 70% or higher on the questions	Measure 1: The threshold was met	Measure 1: Measure 2: No curricular or pedagogical changes needed at this time	Measure 1:
	Measure 2: One lab activity on just principles of microscopy	Measure 2: 80% of students achieving 70 % or higher activities	Measure 2: 80% of students (n = 20) scored a 70% or higher on the activities	Measure 2: The threshold was met.	Measure 2: No curricular or pedagogical changes needed at this time	
Lab Safety	Measure 1: Online module with quiz. The material was prepared by the American Chemical Society.	Measure 1: 80% of students achieving 70 % or higher on exams that included this LO	Measure 1: 100% of students (n = 21) scored a 70% or higher on the exams	Measure 1: The threshold was met.	Measure 1: No curricular or pedagogical changes needed at this time	

Course: **BTNY 2114, Evolutionary Survey of the Plant Kingdom** Semester taught: **Fall 2021** Sections included: **1**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Anatomy, Physiology, & Organismal. Students are able to describe and explain fundamental topics about the coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms	Measure 1: A set of 15 multiple choice questions and two essay questions from Quiz 3 -Fungi and Algae	Measure 1: 80% of students achieving 70 % or higher on Quiz 3	Measure 1: 100% of students scored a 70% or higher on Quiz 3	Measure 1: Threshold was met, but it is unclear which questions on the exams were missed as exams were returned.	Measure 1: No curricular or pedagogical changes needed at this time	.
	Measure 2: A set of 15 multiple choice questions and one essay questions from Quiz 5 - Gametogenesis	Measure 2: 80% of students achieving 70 % or higher on Quiz 5	Measure 2: 78 % of students scored a 70% or higher on Quiz 5	Measure 2: Threshold was not met, but only two students received a grade lower than 70%. I also drop the lowest score on these assignments and this was the last quiz so those students may not have study since the score could be dropped.	Measure 2: No curricular or pedagogical changes needed at this time	
Ecology and Evolution. Students are able to describe and explain fundamental topics about the dynamic interaction of living systems with each other and their environments	Measure 1: A set of 15 multiple choice questions from Quiz 1	Measure 1: 80% of students achieving 70 % or higher on 9 multiple choice questions on Quiz 1	Measure 1: 78% of students scored a 70% or higher on Quiz 1.	Measure 1: Threshold was not met. Only two students scored below a seventy percent on this assignment. With only 9 students enrolled the threshold means that 8 of 9 need to preform above a 70%. All other students demonstrated an understanding of the learning objective	Measure 1: No curricular or pedagogical changes needed at this time.	
	Measure 2: Lab Notebook 4- it includes 4 assignments in this learning outcome	Measure 2: 100% of students scored a 70% or higher on Lab Notebook 4	Measure 2: 89% of students scored a 70% or higher on Lab Notebook 4	Measure 2: Threshold was met. Students were able to describe and explain fundamental topics about the dynamic interaction of living systems with each other and their environments	Measure 2: No curricular or pedagogical changes needed at this time	
Ecology and Evolution. Students are able to describe and	Measure 1: A set of 25 multiple choice questions, 2 lab practical questions,	Measure 1: 80% of students scored a 70% or higher on Exam	Measure 1: 89% of students scored a 70% or higher on Exam	Measure 1: Exam 1 had materials on the process of science, photosynthesis, and evolution, with 80% of the exam being on the transformative role of	Measure 1: No curricular or pedagogical changes needed	

explain fundamental topics about the transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.	and 3 short answer questions from Exam 1	1	1	evolution..	at this time	
	Measure 2: A set of 15 multiple choice questions from Quiz 1	Measure 2: 80% of students scored a 70% or higher on Quiz 1	Measure 2: 100% of students scored a 70% or higher on Quiz 1	Measure 2: Threshold was not met. Only two students scored below a seventy percent on this assignment. With only 9 students enrolled the threshold means that 8 of 9 need to preform above a 70%. All other students demonstrated an understating of the dynamic interactions of living systems with each other and their environments	Measure 2: No curricular or pedagogical changes needed at this time. I think the thresholds are unrealistic for small class sizes.	
	Measure 3: A set of 6 multiple choice questions and 2 essay questions from Exam 3	Measure 3: % of students scored a 70% or higher on Exam	Measure 3: 100% of students scored a 70% or higher on Exam 3	Measure 3: Threshold was met, but scores are from a compilation of many questions including some outside of this learning objective	Measure 3:	
	Measure 4: A set of 9 multiple choice questions and 9 matching from Exam 4	Measure 4: 80% of students achieving 70 % or higher on Exam 4	Measure 4: 100% of students scored a 70% or higher on Exam 4	Measure 4: Threshold was met. Students demonstrated how evolution explains both the unity and diversity of life	Measure 4: No curricular or pedagogical changes needed at this time	
	Measure 5: Oral presentation on evolution in pop culture	Measure 5: 80% of students achieving 70 % or higher on oral presentation	Measure 5: 100% of students scored a 70% or higher on the oral presentation	Measure 5: Students successfully demonstrated an understanding of the transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life	Measure 5: No curricular or pedagogical changes needed at this time	
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: A set of 2 multiple choice questions and 5 lab practical questions on Exam 1	Measure 1: 80% of students achieving 70 % or higher in Exam 1	Measure 1: 89% of students scored a 70% or higher on Post lab Exam 1	Measure 1: Students successfully demonstrated an understanding of the process of science	Measure 1: No curricular or pedagogical changes needed at this time	I need to include more assessment on this as I dropped some to focus more on the Ecology and Evolution objectives.

Communication. Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences	Measure 1: An oral presentation on evolution in pop culture	Measure 1: 80% of students achieving 70 % or higher on oral presentation	Measure 1: 100% of students scored a 70% or higher on the oral presentation	Measure 1: Students successfully demonstrated oral communication skills	Measure 1: No curricular or pedagogical changes needed at this time	
Laboratory Skills Students will demonstrate mastery of course appropriate laboratory skills, such as basic lab skills, molecular techniques, microscopy, and safety.	Measure 1: A set of 12 lab practical questions on Exam 2	Measure 1: 80% of students achieving 70 % or higher on Exam 2	Measure 1: 89% of students scored a 70% or higher on Exam 2	Measure 1: Students successfully demonstrated basic light microscopy skills	Measure 1: Separate the exam score and lab practical score	
	Measure 2: A set of 5 lab practical questions on Exam 3	Measure 2: 80% of students achieving 70 % or higher on Exam 3	Measure 2: 89% of students scored a 70% or higher on Exam 3	Measure 2: Students successfully demonstrated basic light microscopy skills.	Measure 2. Separate the exam and lab practical	
Data Management Skills Students will demonstrate the ability to maintain accurate and complete records of their work in formats such as lab notebooks and the ability to use various software applications such as ARCGIS and spreadsheets.	Measure 1: A set of 6 laboratory assignment in Lab Notebook Collection 1	Measure 1: 80% of students achieving 70 % or higher on 6 laboratory notebook assignments	Measure 1: 100% of students scored a 70% or higher on 6 laboratory notebook assignments	Measure 1: Students successfully demonstrated the ability to maintain accurate and complete records of their work	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: A set of 5 laboratory assignment in Lab Notebook Collection 2	Measure 2: 80% of students achieving 70 % or higher on 5 laboratory notebook assignments	Measure 2: 100% of students scored a 70% or higher on 5 laboratory notebook assignments	Measure 2: Students successfully demonstrated the ability to maintain accurate and complete records of their work	Measure 2: No curricular or pedagogical changes needed at this time	
	Measure 3 : A set of 3 laboratory assignment in Lab Notebook Collection 3	Measure 3: 80% of students achieving 70 % or higher on 3 laboratory notebook assignments	Measure 3: 89% of students scored a 70% or higher on 3 laboratory notebook assignments	Measure 3: Students successfully demonstrated the ability to maintain accurate and complete records of their work	Measure 3: No curricular or pedagogical changes needed at this time	

*Direct and indirect: at least one measure per objective must be a direct measure.

Course: BTNY2121 Career Planning for Botanists Semester taught: **Spring 2023** Sections included: **31369, n = 10**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Communication. Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences	9 written assignments including a cover letter and resume, one oral presentation about career possibilities.	90% of the students achieving 70% or higher.	100% of the students met this threshold	The students met this LO well.	No changes needed.	This is consistent with past years' performance.

*Direct and indirect: at least one measure per objective must be a direct measure.

Additional narrative:
This one-credit course focuses on communication with potential employers and development of their career trajectories. As such, focus is more on the communication of students' skills and experience than interpreting specific scientific experiments. All students performed well at meeting this LO.

Course: **BTNY 3303, Plant Genetics** Semester taught: **Spring 2022** Sections included: **CRN 36035**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Cellular, Developmental, Genetics, and Molecular 1. Students are able to describe and explain fundamental topics about the chemical and molecular machinations operating within all biological processes.	Measure 1: Exam 3 which consisted of 9 essay questions on molecular processes	Measure 1: 90% of students scoring 80% or higher. (With a class of seven, if one student fails to meet the 80% threshold, the class as a whole is under 90% achieving the threshold.)	Measure 1: 5 of 7 students (71.4%) scored 80% or higher.	Measure 1: The 2021-2022 academic year followed the year that classes were remote due to the covid pandemic. Some students missed multiple class sessions due to their own illness or quarantining due to exposure to covid. While they were able to attend lectures remotely, they missed lab activities that reinforced or demonstrated the lecture material.	Measure 1: This was the first time the course was taught as a 4 credit, 3 + 3 class with 3 h of lecture and a 3 h lab period each week. (Prior to that, it was a 3 credit class that was 2 + 2.) It is taught alternate years, so at this point it is wait and see how the students due without the covid pandemic impacting their lives.	
	Measure 2: Quiz on fundamental molecular processes	Measure 2: 90% of students scoring 80% or higher.	Measure 2: 5 of 5 students who took the quiz (100%) scored 80% or higher.	Measure 2: The two students who did not do well on Exam 3 did not take the quiz.	Measure 2: Lower performing students tended to not do short homework assignments and quizzes that would prepare them for exams.	

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Cellular, Developmental, Genetics, and Molecular 2. Students are able to describe and explain fundamental topics about the centrality of genetic systems' governance of life's actions from the cellular to the phyletic.	Measure 1: Exam 3 which consisted of 9 essay questions on genetic systems	Measure 1: 90% of students scoring 80% or higher. (With a class of seven, if one student fails to meet the 80% threshold, the class as a whole is under 90% achieving the threshold.)	Measure 1: 5 of 7 students (71.4%) scored 80% or higher.	Measure 1: The 2021-2022 academic year followed the year that classes were remote due to the covid pandemic. Some students missed multiple class sessions due to their own illness or quarantining due to exposure to covid. While they were able to attend lectures remotely, they missed lab activities that reinforced or demonstrated the lecture material.	Measure 1: This was the first time the course was taught as a 4 credit, 3 + 3 class with 3 h of lecture and a 3 h lab period each week. (Prior to that, it was a 3 credit class that was 2 + 2.) It is taught alternate years, so at this point it is wait and see how the students do without the covid pandemic impacting their lives.	
	Measure 2: Six quizzes on heredity	Measure 2: 90% of students scoring 80% or higher	Measure 2: 7 of 7 students (100%) scored 80% or higher on the quizzes that they took.	Measure 2: Students who missed class (see above) often did not make up missed class work that was graded.	Measure 2: See above.	
	Measure 3: Three labs that focused on genetic systems	Measure 3: 90% of students scoring 80% or higher	Measure 3: 7 of 7 students (100%) scored 80% or higher on the labs.	Measure 3: Students who missed a lab period were able to complete lab reports due to the pooling and sharing of data.	Measure 3: See above.	
The Process of Science. Students will use observational	Measure 1: Four labs. Two of the labs took more than one lab period.	Measure 1: 90% of students scoring 80% or higher	Measure 1: 7 of 7 students (100%) scored 80% or higher on	Measure 1: Students who missed a lab period were able to complete lab reports due to	Measure 1: See above.	

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
strategies to test hypotheses and critically evaluate experimental evidence.			the labs	the pooling and sharing of data.		
Quantitative Reasoning. Students will represent diverse experimental data sets graphically and apply statistical methods to them.	Measure 1: Two homework assignments in which students were provided with Excel files with data to process.	Measure 1: 90% of students scoring 80% or higher	Measure 1: 6 of 7 students (85.7%) scored 80% or higher on the assignments.	Measure 1: One student consistently did poorly on anything that required using a spreadsheet. This is not the only class that has been a challenge for them in this way.	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: One lab in which students collected heredity data and did statistical analysis.	Measure 2: 90% of students scoring 80% or higher	Measure 2: 6 of 7 students (85.7%) scored 80% or higher on the lab report.	Measure 2: One student often did poorly when using statistics. (see above)	Measure 2: No curricular or pedagogical changes needed at this time	
Lab: Molecular Competency	Measure 1: Ten labs	Measure 1: 90% of students scoring 80% or higher	Measure 1: 7 of 7 students (100%) scored 80% or higher on the assignments on the labs that they turned in.	Measure 1: Students who missed a lab period were able to complete lab reports due to the pooling and sharing of data.	Measure 1: No curricular or pedagogical changes needed at this time	
Lab: Safety Competency	Measure 1: Online module with quiz on lab safety. Materials were from the American Chemical Society.	Measure 1: 90% of students scoring 80% or higher	Measure 1: 6 of 7 students (85.7%) scored 80% or higher on the quiz.	Measure 1: With a class of seven, if one student fails to meet the 80% threshold, the class as a whole is under 90% achieving the threshold.	Measure 1: No curricular or pedagogical changes needed at this time	
Data Management: Software Applications	Measure 1: Two assignments using genome analysis websites.	Measure 1: 90% of students scoring 80% or higher	Measure 1: 7 of 7 students (100%) scored 80% or higher on the assignments.	Measure 1: Students followed their instructions and were successful in navigating the websites to produce useful analyses.	Measure 1: No curricular or pedagogical changes needed at this time	

Course: BTNY 3105 (Plant Anatomy) **Semester taught: Spring 2023** **Sections included: 31373**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	**Method of Measurement**	**Target Performance**	**Actual Performance**	**Interpretation of Findings**	**Action Plan/Use of Results**	**"Closing the Loop"**
Cellular, Developmental, Genetics, & Molecular: The centrality of genetic systems' governance of life's actions from the cellular to the phyletic	Measure 1: Two exam essay questions	Measure 1: 90% of students scoring 80% or higher	Measure 1: All students met the target	Measure 1: Students excelled at comparing and contrasting concepts	Measure 1: No action needed	
	Measure 2: Lab practical question (microscope slide and follow-up written portion) on the developmental process in which a stem transitions from primary to secondary growth	Measure 2: 90% of students scoring 80% or higher	Measure 2: 90% of students scored 80% or higher	Measure 2: Nine out of ten students scored between 80 and 100% while one scored below	Measure 2: No action needed	
Anatomy, Physiology, & Organismal: The coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms	Measure 1: Species monograph written report	Measure 1 90% of students scoring 80% or higher	Measure 1: 80% of students scored 80% or higher	Measure 1: Most students did an exceptional job on their written report; one did not invest enough time and another report lacked organization	Measure 1: Require a rough draft version	
	Measure 2: Lab practical question (microscope slide and follow-up written portion) on the anatomy and physiology of C3 and C4 photosynthesis	Measure 2: 90% of students scoring 80% or higher	Measure 2: 20% of students met the target; most students received half-credit for this question	Measure 2: Students scored well on the anatomical portion but performed poorly in explaining the anatomy	Measure 2: Review or re-teach the physiology of C3 and C4 photosynthesis; students did not retain these fundamentals from other courses	
Ecology & Evolution: The dynamic interaction of living systems with each other and their environments	Measure 1: Lab practical question (microscope slide and follow-up written portion) on the structure-function of a desert adapted leaf	Measure 1: 90% of students scoring 80% or higher	Measure 1: 100% of students achieved the goal	Measure 1: Students understood connections between the structure of the tissue systems in a leaf and the plant's living environment	Measure 1: No action needed	

Report due 11/15/2023

	Measure 2: Two exam essay questions	Measure 2: 90% of students scoring 80% or higher	Measure 2: 9 out of 10 students scored between 80 and 100% while one always scored below	Measure 2: Students understood how anatomy reflects adaptation to environment	Measure 2: No action needed	
The Process of Science: Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Lab practical question where students identify cells and tissues in a section using staining protocols	Measure 1: 90% of students scoring 80% or higher	Measure 1: 100% of students achieved the goal	Measure 1: Students demonstrated mastery of using anatomical lab techniques to evaluate internal structure	Measure 1: No action needed	
	Measure 2: Lab work on unknown species assessing organ anatomy	Measure 2: 90% of students scoring 80% or higher	Measure 2: All students met the target	Measure 2: Students excelled at applying sectioning and staining protocols to their species monograph lab projects	Measure 2: No curricular or pedagogical changes needed at this time	
Quantitative Reasoning: Students will represent diverse experimental data sets graphically and apply statistical methods to them.	Measure 1: Class discussion of experiment on trichome density and reflectance in *Encelia*	Measure 1: 90% of students scoring 80% or higher	Measure 1: 80% of students met the target	Measure 1: Target was not met due to attendance issues	Measure 1: Have a different class meeting time or use lab time for discussions	
	Measure 2: Lab handout on xylem	Measure 2: 90% of students scoring 80% or higher	Measure 2: 90% of students met the target	Measure 2: 9 out of 10 students excelled analyzing xylem anatomy; one student missed several labs	Measure 2: No action needed	
Communication: Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences	Measure 1: Class discussion on sectioning and staining techniques	Measure 1: 90% of students scoring 80% or higher	Measure 1: 80% of students met the target	Measure 1: Target was not met due to attendance issues	Measure 1: Have a different class meeting time or use lab time for discussions	
	Measure 2: PowerPoint presentation of species monograph	Measure 2: 90% of students scoring 80% or higher	Measure 2: 90% of students met the target	Measure 2: 9 out of 10 students excelled with their presentation while one lacked content	Measure 2: Provide an example of student work	

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Cellular, Developmental, Genetics, and Molecular 1. Students are able to describe and explain fundamental topics about the chemical and molecular machinations operating within all biological processes.	Measure 1: Six essay exam questions over two exams	Measure 1: 90% of students scoring 80% or higher	Measure 1: 50% (3/6) of students scored 80% or higher	Measure 1: Target threshold was not met. (With 6 students, if just 1 does not meet the target, the class will be under 90% for meeting the target.)	Measure 1: Lower performing students tended to not do short homework assignments and quizzes that would prepare them for exams.	Quizzes and short homework assignments were available in past iterations of this class but were not used to determine grades. After the class was last taught two years ago, I made them worth 10% of the final grade for this course offering. Low performing students still do not do them.
Cellular, Developmental, Genetics, and Molecular 2. Students are able to describe and explain fundamental topics about the centrality of genetic systems' governance of life's actions from the cellular to the phyletic.	Measure 1: Eight essay exam questions over two exams	Measure 1: 90% of students scoring 80% or higher	Measure 1: 66.7% (4/6) of students scored 80% or higher	Measure 1: Target threshold was not met. (With 6 students, if just 1 does not meet the target, the class will be under 90% for meeting the target.)	Measure 1: Lower performing students tended to not do short homework assignments and quizzes that would prepare them for exams.	Quizzes and short homework assignments were available in past iterations of this class but were not used to determine grades. After the class was last taught two years ago, I made them worth 10% of the final grade for this course offering. Low performing students still do not do them
	Measure 2: Oral report on a specific type of plant cell based on information in the primary research literature.	Measure 2: 90% of students scoring 80% or higher	Measure 2: All students met the target.	Measure 2: All students (5/5 who did the assignment) successfully communicated the hypothesis, methodology, results, and conclusions of published research on a specialized plant cell.	Measure 2: No curricular or pedagogical changes needed at this time	

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
	Measure 3: Three essays directed toward for a general audience that were based on information in the primary research literature on model organisms, plant movements, and symbiosis.	Measure 3: 90% of students scoring 80% or higher	Measure 3: The average score for each student met the target. Four students met the target for each of the three essay topics.	Measure 3: All students successfully interpreted and communicated the scientific literature for a general audience.	Measure 3: No curricular or pedagogical changes needed at this time	
Anatomy, Physiology, & Organismal Students are able to describe and explain fundamental topics about the coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms	Measure 1: Eighteen essay exam questions over three exams	Measure 1: 90% of students scoring 80% or higher	Measure 1: 55.6% (5/9) of students scored 80% or higher	Measure 1: Target threshold was not met. (With 6 students, if just 1 does not meet the target, the class will be under 90% for meeting the target.)	Measure 1: Lower performing students tended to not do short homework assignments and quizzes that would prepare them for exams.	Quizzes and short homework assignments were available in past iterations of this class but were not used to determine grades. After the class was last taught two years ago, I made them worth 10% of the final grade for this course offering. Low performing students still do not do them
	Measure 2: Oral report on a specific type of plant cell based on information in the primary research literature.	Measure 2: 90% of students scoring 80% or higher	Measure 2: All students met the target.	Measure 2: Measure 2: All students (5/5 who did the assignment) successfully communicated the hypothesis, methodology, results, and conclusions of published research on a specialized plant cell.	Measure 2: No curricular or pedagogical changes needed at this time	
	Measure 3:	Measure 3:	Measure 3:	Measure 3:	Measure 3:	

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
	Three essays directed toward for a general audience that were based on information in the primary research literature on model organisms, plant movements, and symbiosis.	90% of students scoring 80% or higher	The average score for each student met the target. Four students met the target for each of the three essay topics.	All students successfully interpreted and communicated the scientific literature for a general audience.	No curricular or pedagogical changes needed at this time	
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Oral report on a specific type of plant cell based on information in the primary research literature.	Measure 1: 90% of students scoring 80% or higher	Measure 1: All students met the target.	Measure 1: All students (5/5 who did the assignment) successfully communicated the hypothesis, methodology, results, and conclusions of published research on a specialized plant cell.	Measure 1: No curricular or pedagogical changes needed at this time	
Communication. Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences	Measure 1: Oral report on a specific type of plant cell based on information in the primary research literature.	Measure 1: 90% of students scoring 80% or higher	Measure 1: All students met the target.	Measure 1: All students (5/5 who did the assignment) successfully communicated the hypothesis, methodology, results, and conclusions of published research on a specialized plant cell.	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: Three essays directed toward for a general audience that were based on information in the primary research literature on model organisms, plant movements, and symbiosis.	Measure 2: 90% of students scoring 80% or higher	Measure 2: The average score for each student met the target. Four students met the target for each of the three essay topics.	Measure 2: All students successfully interpreted and communicated the scientific literature for a general audience.	Measure 2: No curricular or pedagogical changes needed at this time	

Report due 11/15/2023

Course: BTNY3204 (Plant Physiology) **Semester taught: Fall 2022** **Sections included: 20732**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	**Method of Measurement**	**Target Performance**	**Actual Performance**	**Interpretation of Findings**	**Action Plan/Use of Results**	**"Closing the Loop"**
Cellular, Developmental, Genetics, & Molecular: The chemical and molecular machinations operating within all biological processes	Measure 1: Two essay questions in exams	Measure 1: 90% of students scoring 80% or higher	Measure 1: 75% of students scored 80% or higher	Measure 1: Three out of four students scored between 80 and 100% on these questions while one always scored below. With such a small class, all students would need to score at least in the 80% range to achieve this goal	Measure 1: Get a larger class for a better assessment of learning	
	Measure 2: Exam question requiring students to order mechanistic steps and use to answer follow-up written questions	Measure 2: 90% of students scoring 80% or higher	Measure 2: 50% of students scored 80% or higher	Measure 2: Two out of four students scored between 80 and 100% while two scored below	Measure 2: Make sure students know what to expect for question format	This was a new type of question that needs to be introduced in sample exam questions or practice problems
Anatomy, Physiology, & Organismal: The coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms	Measure 1: Two essay questions on exam	Measure 1 90% of students scoring 80% or higher	Measure 1: 100% of students scored 80% or higher	Measure 1: Students had a solid understanding of connections between the functioning of cells and their effect at the organismal level	Measure 1: No action needed	
	Measure 2: Lap reports on respiration and photosynthesis	Measure 2: 90% of students scoring 80% or higher	Measure 2: 75% of students scored 80% or higher	Measure 2: Three out of four students scored between 80 and 100% while one always scored below. This student did not invest enough into the lab report or understand the expectations	Measure 2: Implement a clear rubric for lab report assessment	
Ecology & Evolution: The dynamic interaction of living systems with each other and their environments	Measure 1: Students designed experiments testing plant heat resilience	Measure 1: 90% of students scoring 80% or higher	Measure 1: 100% of students achieved the goal	Measure 1: Students understood connections between membrane function and the plant's living environment	Measure 1: No action needed	
	Measure 2: Students designed	Measure 2: 90% of	Measure 2: 100% of students	Measure 2: Students understood how the	Measure 2: No action needed	

	experiments using PlantWave device	students scoring 80% or higher	achieved the goal	device detected voltage differences in the plant epidermis		
Ecology & Evolution: The transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.	Measure 1: Two essay questions on exam	Measure 1: 90% of students scoring 80% or higher	Measure 1: Students achieved the goal for one out of two questions	Measure 1: Despite this not having a 100% success rate, these were difficult questions where students had to think critically and apply what was learned in lecture	Measure 1: Provide students with more sample exam questions and time to discuss them	
	Measure 2: Discussion of lecture materials in class	Measure 2: 90% of students scoring 80% or higher	Measure 2: All students met the target	Measure 2: Student participation was thoughtful and engaging	Measure 2: Do more discussions because it led students to ask more questions which improved their learning	
The Process of Science: Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Two essay exam questions	Measure 1: 90% of students scoring 80% or higher	Measure 1: 100% of students achieved the goal	Measure 1: Students demonstrated mastery of the scientific process with application to plant physiology	Measure 1: No action needed	
	Measure 2: Weekly lab notebook entries	Measure 2: 90% of students scoring 80% or higher	Measure 2: All students met the target	Measure 2: Students excelled at designing lab experiments, summarizing, and interpreting data	Measure 2: No curricular or pedagogical changes needed at this time	
Quantitative Reasoning: Students will represent diverse experimental data sets graphically and apply statistical methods to them.	Measure 1: Lab notebook entries	Measure 1: 90% of students scoring 80% or higher	Measure 1: All students met the target	Measure 1: Students excelled at designing lab experiments, summarizing, and interpreting data	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: Graphing of data question with follow up written short-answer questions	Measure 2: 90% of students scoring 80% or higher	Measure 2: 75% of students scored 80% or higher	Measure 2: Three out of four students scored between 80 and 100% while one scored below. With such a small class, all students would need to score at least in the 80% range to achieve this goal	Measure 2: Get a larger class for a better assessment of learning	

Communication: Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences	Measure 1: Mini-presentations of results and conclusion of lab experiments	Measure 1: 90% of students scoring 80% or higher	Measure 1: All students met the target	Measure 1: Students excelled at presenting, evaluating, and discussing data from lab experiments	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: PowerPoint presentation of independent research topic	Measure 2: 90% of students scoring 80% or higher	Measure 2: All students met the target	Measure 2: Students excelled at researching and summarizing their findings in a special topic presentation	Measure 2: No curricular or pedagogical changes needed at this time	

General Note: This was a small class of four senior, high-achieving students with strong interests in plant physiology.

Course: **BTNY 3214, Soils** Semester taught: **Spring 2022** Sections included: **CRN 36036 n =10**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Ecology and Evolution. Students are able to describe and explain fundamental topics about the dynamic interaction of living systems with each other and their environments	Measure 1: An essay question on homework 1	Measure 1: 90% of students scored a 80% or higher on homework 1	Measure 1: 90% of students scored a 80% or higher on homework 1.	Measure 1: Students demonstrated an understanding of the dynamic interaction of living systems with each other and their environments.	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: A set of 4 multiple choice questions,2 drawing questions, 2 short answer, and 1 essay question on the midterm	Measure 2: 90% of students scored a 80% or on the midterm	Measure 2: 90% of students scored a 80% or higher on the midterm exam	Measure 2: Students demonstrated an understanding of the dynamic interaction of living systems with each other and their environments.	Measure 2: No curricular or pedagogical changes needed at this time	
	Measure 3: A set of 6 multiple choice questions on Final Exam	Measure 3: 90% of students scored a 80% or higher on 6 multiple choice questions on Final Exam	Measure 3: 80% of students scored a 80% or higher on the Final Exam questions	Measure 3: Threshold was not met. 80% of students were above a 80%. The overwhelming majority of students demonstrated an understanding of the dynamic interaction of living systems with each other and their environments.	Measure 3: No curricular or pedagogical changes needed at this time	
	Measure 4: A set of 3 short answer questions and one essay question on homework 5	Measure 1: 90% of students scored a 80% or higher on homework 5	Measure 1: 100% of students scored a 80% or higher on homework 5.	Measure 4: Students demonstrated an understanding of the dynamic interaction of living systems with each other and their environments.	Measure 4: No curricular or pedagogical changes needed at this time	
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: A final draft of a research paper that represents the culmination of course-based research	Measure 1: 90% of students scored a 80% or higher on final research paper	Measure 1: 67% of students scored a 80% or higher on annotated bibliography	Measure 1: Threshold was not met. It is unclear why, as students were provided feedback on their rough drafts of their research paper. Several students changed nothing and turned in the same paper with the same issues that were highlighted by me in the first draft. These students were also not engaged in the course-based research project.	Measure 1: Assign smaller assignments related to the CUR to help assess the process of science course objective.	

Report due 11/15/2023

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Quantitative Reasoning. Students will represent diverse experimental data sets graphically and apply statistical methods to them.	Measure 1: A set of 1 short answer question, and 5 calculation questions on Homework 3	Measure 1: 90% of students scored a 80% or higher on 1 short answer question, and 5calculation questions on Homework 3	Measure 1: 90% of students scored a 80% or higher on the homework assignment	Measure 1: Students demonstrated an understanding quantitative reasoning with respect to soil chemical data and math solutions to the problem.	Measure 1: No curricular or pedagogical changes needed at this time	There were non-quantitative questions on this assignment that brought some of the students above the threshold. Analyze the specific questions from independently from overall scores. Keep a record of student performance.
	Measure 2: A set of 2 multiple choice questions, 1 short answer, and 4 calculation questions on the final exam	Measure 2: 90% of students scored a 80% or higher on 2 multiple choice questions, 1 short answer, and 4 calculation questions on the final exam	Measure 2: 60% of students scored a 80% or higher on the Final Exam questions	Measure 2: In an exam setting students did not demonstrate an understanding quantitative reasoning with respect to soil chemical data and math solutions to the problem.	Measure 2: This is a high threshold that becomes particularly evident in small classrooms. It's especially noticeable in areas with quantitative reasoning. To reach this threshold in my class one student could be below an 80%	Measure 2: This is hard because I allow students to choose which questions per section they will answer on the exam (choose x number of x possible questions to answer). This makes it hard to choose a few to use as the record of performance.
	Measure 3: A final draft of a research paper	Measure 3: 90% of students scored a 80% or higher on final research paper	Measure 3: 90% of students scored a 80% or higher on annotated bibliography	Measure 3: Threshold was met.	Measure 3:	Continue to introduce students to diverse experimental data sets, how to represent them graphically, and how to apply statistical methods to them
Communication. Students will disseminate results of experiments in a variety of presentation formats to a wide variety of	Measure 1: Formal lab report: Soil Nutrients	Measure 1: 90% of students scored a 80% or higher on the lab report	Measure 1: Of the students that completed it 89% of students scored a 80% or higher on the lab report	Measure 1: This was the third formal lab write up in a series of five. Prior to this grade they were given an abundance of feedback. Those that incorporated feedback and put in the work made the 80% threshold. With a small number of students in a class 2 students procrastinating on a large	Measure 1: No curricular changes.	Measure 1: Flag students in starfish for lack of participation

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
audiences				assignment can cause the threshold to not be made.		
	Measure 2: A final draft of a research paper	Measure 2: 90% of students scored a 80% or higher on final research paper	Measure 2: 90% of students scored a 80% or higher on final paper	Measure 2: Threshold was met. Students were provided feedback on their rough drafts of their research paper and peer-reviewed their assignments this year to help get 90% of students to an 80%.	Measure 2: Keep peer reviews, and in addition recommend the writing center for grammatical help.	Measure 2: It's clear to meet this threshold the paper needs to be broken into pieces. In previous semesters procrastination by students made it so that the threshold was not met.
Sustainability. Students will use their knowledge of biology to address environmental issues and solutions.	Measure 1: One essay questions on homework 1	Measure 1: 90% of students scored a 80% or higher on homework 1	Measure 1: 80% of students scored a 80% or higher on homework 1.	Measure 1. Students were able to use their knowledge of biology to address environmental issues and solutions. While I did not meet the threshold of 80% only two students achieved lower than an 80% on this essay.	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: A set of 4 short answer questions on Homework 5	Measure 2: 90% of students scored a 80% or higher on Homework 5	Measure 2: 100% of students scored a 80% or higher on the homework	Measure 2: Students were able to use their knowledge of biology to address environmental issues and solutions..	Measure 2: Reorganize exams so that questions are blocked by learning outcome and better record data on those specific questions	This is one of the final assignments and students were able to improve throughout the semester in demonstrating their knowledge
	Measure 3: A set of 5 short answer questions on homework 4	Measure 3: 90% of students scored a 80% or higher on homework 4	Measure 3: 90% of students scored a 80% or higher on homework 4.	Measure 3: Students were able to use their knowledge of biology to address environmental issues and solutions.	Measure 3: No curricular or pedagogical changes needed at this time	
	Measure 4: A set of 6 multiple choice questions, 3 short answer, and 4 True/False questions on Final Exam	Measure 4: 90% of students scored a 80% or higher on Final	Measure 4: 70% of students scored a 80% or higher on the final exam	Measure 4: Threshold was not met. Three students fell below the threshold. However, 90% of students were above a 70%, which is quite good.	Measure 4: No curricular or pedagogical changes needed at this time	
Laboratory Skills Students will	Measure 1: Formal Lab report on Soil Bulk Density	Measure 1: 90% of students scored a 80% or	Measure 1: 100% of students scored	Measure 1: Students demonstrated mastery of course appropriate laboratory skills	Measure 1: No curricular or pedagogical changes	

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
demonstrate mastery of course appropriate laboratory skills, such as basic lab skills, molecular techniques, microscopy, and safety.		higher on lab work	a 80% or higher on lab work		needed at this time	
	Measure 2: Formal Lab report on Soil N	Measure 2: 90% of students scored a 80% or higher on lab work	Measure 2: 88% of students scored a 80% or higher on lab work	Measure 2: Threshold was not met. Meeting this threshold in a small is very hard. Of the 8 students that completed the lab write-up, one student was below the threshold.	Measure 2: No curricular or pedagogical changes needed at this time	
	Measure 3: Formal Lab report on Soil Base Cation	Measure 3: 90% of students scored a 80% or higher on lab work	Measure 3: 100% of students scored a 80% or higher on lab work	Measure 3: Students demonstrated mastery of course appropriate laboratory skills	Measure 3: No curricular or pedagogical changes needed at this time	
Data Management Skills Students will demonstrate the ability to maintain accurate and complete records of their work in formats such as lab notebooks and the ability to use various software applications such as ARCGIS and spreadsheets.	Measure 1: Formal Lab report on Soil pH and Organic Matter	Measure 1: 90% of students scored a 80% or higher on lab work	Measure 1: 100% of students scored a 80% or higher on lab work	Measure 1: Students demonstrated mastery of course appropriate laboratory skills	Measure 1: No curricular or pedagogical changes needed at this time	
	Measure 2: Formal Lab report on Soil Water movement	Measure 2: 90% of students scored a 80% or higher on lab work	Measure 2: 100% of students scored a 80% or higher on lab work	Measure 2: Students demonstrated mastery of course appropriate laboratory skills	Measure 2: No curricular or pedagogical changes needed at this time	

*Direct and indirect: at least one measure per objective must be a direct measure.

General Note: This is a small class taken by geology, environmental science, botany, and zoology majors that requires chemistry as a prerequisite course. Soil sciences is a math and chemistry heavy course. When the course has 10-15 students it is quite challenging to get 90% of the students above an 80% threshold. Mathematically this threshold is problematic. It is asking for an average score of an 80 or above, but likely above because it would be problematic if all students were performing at exactly an 80%. So realistically this threshold is asking for an average score on a metric in the mid to high 80s. Currently, as I've assessed this the students as a whole are not meeting these thresholds in quantitative reasoning in exam settings where they used to. This may take some redesigning of the course to help students with the quantitative aspects of the course .

Course: BTNY3454 Plant Ecology Semester taught: Fall 2022 Sections included: CRN 20723 n = 19

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Anatomy, Physiology, & Organismal. Students are able to describe and explain fundamental topics about the coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms	Measure 1: exam 1 included short-answer questions about the organismal ecology of plants. Measure 2: A written homework assignment focused on plant evolution.	90% of the students achieving 80% or higher.	Measure 1: 84% of students met this objective Measure 2: 100% of students met this objective.	Students were successful in meeting this objective in homework but slightly below it on exams.	I intend to use more class time for interactively working through the readings so that they are better able to apply the specific situations from their readings to other examples.	Students have not been meeting content LOs as well as in past years. I intend to modify the curriculum to meet them where they are at.
Ecology and Evolution. Students are able to describe and explain fundamental topics about the transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.	Measure 1: A written homework assignment focused on plant evolution. Measure 2: exam 2 included short-answer questions about the ecology and evolution of plants. Measure 3: exam 3 included short-answer questions about the ecology and evolution of plants.	90% of the students achieving 80% or higher.	Measure 1: 100% of students met this objective. Measure 2: 68% of students met this objective. Measure 3: 74% of students met this objective.	Students were successful in meeting this objective in homework but below the objectives on exams.	I intend to use more class time for interactively working through the readings so that they are better able to apply the specific situations from their readings to other examples.	Students have not been meeting content LOs as well as in past years. I intend to modify the curriculum to meet them where they are at.

The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Students completed a first group research project and developed individual written reports. Measure 2: Students completed a second group research project and developed written reports.	90% of the students achieving 80% or higher.	Measure 1: 64% of students met this objective. Measure 2: 100% of students met this objective.	Method 1: This assessment is a scaffolding exercise to support the more intensive individual projects. Method 2: Students met this learning outcome by the end of the semester.	Giving the students two research projects allowed them to improve their skills such that they were meeting LOs by the end of the semester.	Students are better at meeting this outcome than they did in past years.
Quantitative Reasoning. Students will represent diverse experimental data sets graphically and apply statistical methods to them.	Measure 1: Students analyzed data for group research projects.	90% of the students achieving 80% or higher.	Measure 1: 100% of students who submitted results prior to the full report met objectives. 4 students did not submit preliminary results. Two of these met this objective in the final report stage.	Method 1: Students met this LO well.	No pedagogical changes needed.	This is consistent with past years' performance.
Communication. Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences	Measure 1: Students communicated the results of research projects on a poster. Measure 2: Students communicated the results of research projects as written reports.	90% of the students achieving 80% or higher.	Measure 1: 100% of students met this objective. Measure 2: 90% of students met this objective.	Students met this LO well.	No pedagogical changes.	Students improved in meeting this LO compared with past years.
Sustainability. Students will use their knowledge of biology to address environmental issues and solutions.	Measure 1: Students had a written homework assignment addressing this topic.	90% of the students achieving 80% or higher.	100% of students met this objective.	Students met this LO well.	No pedagogical changes needed.	This is consistent with past years' performance.
Field Skills. Students will demonstrate an ability to use field skills such as navigation, plant	One 6-week research project required plant identification and	90% of the students achieving	64% of students met this objective.	This LO was assessed as part of the associated research project and, as described above, it was	The next time I teach this course, I will incorporate a quiz specifically	In past years, I assessed field skills directly, which was a better approach.

identification, plant measurement, and safety.	methods of field measurements.	80% or higher.		their first attempt at writing up a full research paper. To directly assess their field skills, I need to separate them from the analysis and writing components of the project.	targeting the field methods.	
Data Management Skills. Students will demonstrate the ability to keep accurate records of their work and/or analyze their data using spreadsheets and statistical software.	Measure 1: Students will maintain a field notebook with their observations, which was assessed throughout the semester.	90% of the students achieving 80% or higher.	Measure 1: 90% of students met this objective. .	Students met this LO well.	No pedagogical changes needed.	This is consistent with past years' performance.

*Direct and indirect: at least one measure per objective must be a direct measure.

Additional narrative (optional – use as much space as needed): Students overall are doing well in competency and skills development. However, their performance on content-based outcomes (organismal, evolutionary, and ecological) has declined. In previous years, I have assigned readings with associated homework with the assumption that students will arrive in class with a foundational understanding of the material that could be built on in class. My sense is that while this assumption worked well in past years, the students are less prepared to read scientific literature. In fall 2023, I've observed this same pattern. Partway through the semester, I developed a very different approach to readings, taking the time in class to walk students through methods and results using case study style active learning. I've used these more active pedagogies in lower division classes, but they've been less necessary in upper division classes. However, I think adopting a more active pedagogical approach will keep students engaged and help them meet content LOs in future years.

Course: **BTNY 3473, Plant Geography** Semester taught: **Fall 2022** Sections included: **1**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Cellular, Developmental, Genetics, & Molecular. Students are able to describe and explain fundamental topics about the chemical and molecular machinations operating within all biological processes.	Measure 1: Discussion during oral final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Anatomy, Physiology, & Organismal. Students are able to describe and explain fundamental topics about the coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms	Measure 1: Final paper	Measure 1: 70% of students will score 80% or better on the paper	Measure 1: 80% of students scored 80% or better on the paper	Measure 1: Students understand this concept in a satisfactory manner		
Ecology and Evolution. Students are able to describe and explain fundamental topics about the dynamic interaction of living systems with each other and their environments	Measure 1: Discussion during oral final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Ecology and Evolution. Students are able to describe and explain fundamental topics about the transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.	Measure 1: Discussion during oral final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		

Report due 11/15/2023

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Class activity on transects	Measure 1: 70% of students will score 80% or better on the activity	Measure 1: 100% of students scored 80% or better on the activity	Measure 1: Students understand this concept in a satisfactory manner		
Quantitative Reasoning. Students will represent diverse experimental data sets graphically and apply statistical methods to them.	Measure 1: Class activity on transects	Measure 1: 70% of students will score 80% or better on the activity	Measure 1: 100% of students scored 80% or better on the activity	Measure 1: Students understand this concept in a satisfactory manner		
Communication. Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences	Measure 1: Class activity on floristic connections	Measure 1: 70% of students will score 80% or better on the activity	Measure 1: 100% of students scored 80% or better on the activity	Measure 1: Students understand this concept in a satisfactory manner		
Sustainability. Students will use their knowledge of biology to address environmental issues and solutions.	Measure 1: Discussion during oral final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Field Skills Navigation	Measure 1: Class activity on transects	Measure 1: 70% of students will score 80% or better on the activity	Measure 1: 100% of students scored 80% or better on the activity	Measure 1: Students understand this concept in a satisfactory manner		

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Field Skills Plant community sampling	Measure 1: Class activity on floristic connections	Measure 1: 70% of students will score 80% or better on the activity	Measure 1: 100% of students scored 80% or better on the activity	Measure 1: Students understand this concept in a satisfactory manner		

*Direct and indirect: at least one measure per objective must be a direct measure.

Additional narrative (optional – use as much space as needed):
Plant Geography (BTNY 3473) had only five students enrolled during the Fall 2022 semester. Because of this, we had more in-class discussions than I would have if the class were larger. We also did not have many assignments that were submitted, but rather we had engaged class participation and discussion on various activities focused on better understanding plant geography. In the future, I will have the student submit their work so that there are artifacts for direct assessment.

Course: **BTNY 3624, Plant Taxonomy** Semester taught: **Fall 2022** Sections included: **1**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Cellular, Developmental, Genetics, & Molecular. Students are able to describe and explain fundamental topics about the centrality of genetic systems' governance of life's actions from the cellular to the phyletic.	Measure 1: Question on final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 85% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Ecology and Evolution. Students are able to describe and explain fundamental topics about the dynamic interaction of living systems with each other and their environments	Measure 1: Question on final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 79% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Ecology and Evolution. Students are able to describe and explain fundamental topics about the transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.	Measure 1: Question on final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 71% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Question on final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 80% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Field Skills Plant identification	Measure 1: Final lab practical	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 10% of students scored 80% or better on exam	Measure 1: Continue to work with the students on approaches to plant identification throughout the lab, including providing assignments, such as the creation of a		

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
				dichotomous key, for challenging plant groups so students understand various approaches to vascular plant family identification. It should be noted that the majority of students scored 60% or better on the exam.		

*Direct and indirect: at least one measure per objective must be a direct measure.

Course: **BTNY 3810, Utah Flora** Semester taught: **Spring 2023** Sections included: **1**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Ecology and Evolution. Students are able to describe and explain fundamental topics about the dynamic interaction of living systems with each other and their environments	Measure 1: Final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Ecology and Evolution. Students are able to describe and explain fundamental topics about the transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.	Measure 1: Final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		
Field Skills Plant identification	Measure 1: Final exam	Measure 1: 70% of students will score 80% or better on the question	Measure 1: 100% of students scored 80% or better on the question	Measure 1: Students understand this concept in a satisfactory manner		

*Direct and indirect: at least one measure per objective must be a direct measure.

Additional narrative (optional – use as much space as needed):
The class involved learning to work with dichotomous keys to identify vascular plants from Utah. The final exam, which was returned to students, had the students work collectively, mimicking being part of a field crew, to identify a dozen pressed specimens.

Report due 11/15/2023

Course: **BTNY 4810, Utah Flora** Semester taught: **Summer 2023** Sections included: **1**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Ecology and Evolution. Students are able to describe and explain fundamental topics about the dynamic interaction of living systems with each other and their environments	Measure 1: Field discussion	Measure 1: 70% of students will score 80% or better this concept	Measure 1: 100% of students scored 80% or better on this concept	Measure 1: Students understand this concept in a satisfactory manner		
Ecology and Evolution. Students are able to describe and explain fundamental topics about the transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.	Measure 1: Field discussion	Measure 1: 70% of students will score 80% or better this concept	Measure 1: 100% of students scored 80% or better on this concept	Measure 1: Students understand this concept in a satisfactory manner		
The Process of Science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Measure 1: Plant collection	Measure 1: 70% of students will score 80% or better on plant identification	Measure 1: 100% of students scored 80% or better on plant identification	Measure 1: Students understand this concept in a satisfactory manner		
Field Skills Plant identification	Measure 1: Plant collection	Measure 1: 70% of students will score 80% or better on plant identification	Measure 1: 100% of students scored 80% or better on plant identification	Measure 1: Students understand this concept in a satisfactory manner		
Field Skills Safety	Measure 1: Field	Measure 1: 70% of	Measure 1: 100% of students scored	Measure 1: Students understand this concept in a		

Report due 11/15/2023

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
	discussion	students will score 80% or better this concept	80% or better on this concept	satisfactory manner		
Field Skills Record keeping	Measure 1: Plant collection	Measure 1: 70% of students will score 80% or better on plant identification	Measure 1: 100% of students scored 80% or better on plant identification	Measure 1: Students understand this concept in a satisfactory manner		

*Direct and indirect: at least one measure per objective must be a direct measure.

Additional narrative (optional – use as much space as needed):
The class involved working with plant identification of the Utah flora, in various ecosystems throughout Weber and Davis Counties. Throughout the class, students kept notes of the plants were examined and kept a field notebook for their own plant collections, which were submitted at the end of the semester and involved collecting and then using dichotomous keys to identify plants from the Utah flora.

Course: BTNY 4990 (Botany Capstone Seminar) Semester taught: Fall 2022 Section: 20727 N=2

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	"Closing the Loop"
Seminar: Communication (Core Skills) Students will demonstrate mastery of presenting a seminar based on a scientific article or a research project that they have conducted.	Measure 1: Final seminar presentation	90% of students will score 80% or above	Measure 1: 100% of students scored 80% or better	Measure 1: Students successfully demonstrated an ability to present a formal seminar	This is based on 2 students. Rather than course based assessment this course should be assessed on objective based and all students graduating in an academic year should be compiled together.	all students graduating in an academic year should be compiled together

*Direct and indirect: at least one measure per objective must be a direct measure.

This course is currently run every semester to accommodate students graduating in spring and fall. However, it is a strain on departmental resources to run it this frequently with 2 students enrolled. It has run the past three semesters with 2 students enrolled and accounts for 2 credit hours of faculty time. There is no meaningful course based assessment that can be done with an n=2, statistically speaking. For example you cannot calculate a mean and standard deviation. Everyone in the course needs to be at the threshold when so few are enrolled. Furthermore, different faculty teach it from semester to semester based on who has the space in their schedule, making it hard to compile assessment across the sections. We are going to change the course offering in the coming academic year to run once a year, and to utilize an e-portfolio that is started in BTNY 2121 Career Planning. This would increase the enrollment in any one section and make it more uniform to allow for a more thorough and meaningful assessment of student learning objectives.

Evidence of Learning: General Education Courses

Botany LS 1203 (Plant Biology), Combined 2 online sections; fall 2022 & spring 2023 (N=108)

Evidence of Learning: General Education Area [fill in]					
Measurable Learning Outcome Students will…	Method of Measurement	Target Performance	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: NS1: Nature of Science	7 multiple choice questions spread across 2 exams	65% or higher on multiple choice exam questions	83% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of the nature of science.	General observations: Since moving the exams to online to be taken from any computer (during the pandemic) overall scores have improved. This is not consistent to what is observed in student achievements overall. Are they cheating? I plan to rework question banks.
Learning Outcome 2: NS2: Integration of Science	5 multiple choice questions spread across 2	65% or higher on multiple choice exam questions	91% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of the integration of science.	
Learning Outcome 3: NS3: Science and Society	7 multiple choice questions on spread across 2 exams	65% or higher on multiple choice exam questions	92% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of science and society.	
Learning Outcome 4: NS4: Problem Solving and Data Analysis	6 multiple choice spread across 2 exams	65% or higher on multiple choice exam questions	78% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of problem solving and data analysis	
Learning Outcome 5: NS5: Levels of Organization	12 multiple choice questions on exam 1	65% or higher on multiple choice exam questions	92% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of the levels of organization.	
Learning Outcome 6: NS6: Metabolism and Homeostasis	7 multiple choice questions on exam 2	65% or higher on multiple choice exam questions	79% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of metabolism and homeostasis.	
Learning Outcome 7: NS7: Genetics and Evolution	11 multiple choice questions on exam 3	65% or higher on multiple choice exam questions	93% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of genetics and evolution.	This is an odd result, usually students struggle with this topic. However, the questions about genetics that involve the use of math are accounted for in the

Evidence of Learning: General Education Area [fill in]					
Measurable Learning Outcome Students will…	Method of Measurement	Target Performance	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
					NS4 category.
Learning Outcome 8: NS8: Ecological Interactions	5 multiple choice questions spread across 3 exams	65% or higher on multiple choice exam questions	78% of students met the 65% threshold for these questions	Students successfully demonstrated an understanding of ecological interactions.	

Course: Botany LS 1203 (Plant Biology) **Semester Taught:** Combined 2 **online** sections 1 each for Summer 2021, Fall 2021, Spring 2022 (N=147)

Evidence of Learning: General Education Area						
Measurable Learning Outcome Students will…	Method of Measurement	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	Closing the Loop
Learning Outcome 1: LS1: Levels of Organization	20 questions from *Levels of Organization I* quiz 20 questions from L*evels of Organization II* quiz A selection of 10 questions from a pool of 15 on Exam 1	80% of students will score 70% or better 80% of students will score 70% or better 80% of students will score 70% or better	82% of students met the 70% threshold for these questions 86% of students met the 70% threshold for these questions 78% of students met the 70% threshold for these questions	Students successfully demonstrated an understanding of the levels of organization. However, they are allowed to take the quizzes multiple times to help solidify the materials The exams were unfortunately more bimodal in distribution than the quizzes in BTNY LS 1403. The exams were open until the last day of the course. Despite many emails encouraging participation at certain points in the semester, several put off the exams until the end. This did not serve them well.	This is a topic that largely students excel at. Set a deadline for exams after the completion of the modules to prevent procrastination	
Learning Outcome 2: LS2: Metabolism and Homeostasis	20 questions from *Metabolism* quiz 20 questions from *Photosynthesis* quiz	80% of students will score 70% or better 80% of students will score 70% or better	90% of students met the 70% threshold for these questions 85% of students met the 70% threshold for these questions	Students successfully demonstrated an understanding of metabolism and homeostasis.	No curricular or pedagogical changes needed at this time	

Learning Outcome 3: LS3: Genetics and Evolution	A set of 10 questions from Exam 2 20 questions from *Evolution and Adaptation* quiz	80% of students will score 70% or better 80% of students will score 70% or better	81% of students met the 70% threshold for these questions 100% of students met the 70% threshold for these questions	Students successfully demonstrated an understanding of genetics and evolution.	No curricular or pedagogical changes needed at this time	
Learning Outcome 4: LS4: Ecological Interactions	A set of 3 questions from Exam 3 20 questions from *Plant Kingdom* quiz	80% of students will score 70% or better 80% of students will score 70% or better	93% of students met the 70% threshold for these questions 100% of students will score 70% or better	Students successfully demonstrated an understanding of ecological interactions	No curricular or pedagogical changes needed at this time	
Learning Outcome 5: S1: Nature of Science	A set of 5 questions from 1 exam 20 questions from *Introduction to Science* quiz	80% of students will score 70% or better 80% of students will score 70% or better	100% of students met the 70% threshold for these questions 100% of students met the 70% threshold for these questions	Students successfully demonstrated an understanding of the nature of science.	No curricular or pedagogical changes needed at this time	
Learning Outcome 6: S2: Integration of Science	5 questions from *Exam 3*	80% of students will score 70% or better	94% of students met the 70% threshold for these questions	Students successfully demonstrated an understanding of the integration of science.	No curricular or pedagogical changes needed at this time	
Learning Outcome 7: S3: Science and Society	20 questions from *Plants and People* quiz Signature Assignment:	80% of students will score 70% or better 80% of students will score 70% or better	100% of students met the 70% threshold for these questions 72% of students met the 70%	Students successfully demonstrated an understanding of science and society. While students didn't make this threshold, it does include those that elected not to do the assignment. If I only include those that did the	No curricular or pedagogical changes needed at this time	

	Curing Plant Blindness		threshold for these questions	assignment then 86% were above a 70% on the assignment.		
Learning Outcome 8: S4: Problem Solving and Data Analysis	A set of 8 questions found in Exam 1 and Exam 2	80% of students will score 70% or better	82% of students met the 70% threshold for these questions	Students successfully demonstrated an understanding of problem solving and data analysis.	No curricular or pedagogical changes needed at this time	

Summary of Artifact Collection Procedure

Artifact	When/How Collected?	Where Stored?
Quizzes are found in canvas courses. They are old canvas quizzes that do not have the linked learning outcome per question. Now that there is the new quiz tool, I will link all questions if/when I teach this course again. The exams were in ChiTester and the data was pulled at the time of assessment. The raw scores are found in Canvas.	Downloaded from Canvas and ChiTester (2022?) to complete this report.	Canvas.

Course___BTNY 1403 (3 CH) __CRN 37858__ SPRING 2022_____

Gen Ed Learning Goal Students will demonstrate understanding of:	**Measurable Learning Outcome** Students will demonstrate their understanding by:	**Method of Measurement** Direct and Indirect Measures*	**Threshold**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Learning Outcome 1. Students will demonstrate understanding of what is and what is not considered science.	Measure 1: An in-class activity with students working in groups to identify examples of scientific explanations versus examples of non-scientific explanations. Examples come from scientific history.	All student groups will be able to successfully explain why each of the examples are considered scientific explanations versus nonscientific explanations.	Measure 1: All 5 student groups were able to successfully explain the difference between scientific and nonscientific explanations	Measure 1: All groups were successful, but not all students participated equally in this assignment.	Measure 1: Rather than use historical examples, find current headlines/articles that could demonstrate this.
		Measure 2: Students will take an individual Canvas-based quiz covering what is science and what does not count as science.	80% of students will receive a score of 80% or higher on quiz	Measure 2: 13/13 students received >80% on quiz	Measure 2: The quiz provided additional practice of this topic and was successfully completed	Measure 2: Again, it would be beneficial to include more current headlines/articles to use as part of the quiz rather than just historical examples.

GE Learning Goal	**Measurable Learning Outcome**	**Method of Measure.**	**Threshold**	**Findings**	**Interpretation**	**Action Plan**
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate an understanding that Environmental Science has major contributions from many disciplines ranging from the life	Measure 1: In a small group setting, have the students explore the many different scientific disciplines involved in transitioning from fossil fuels to sustainable energy sources. Groups	Student groups will describe at least 5 different disciplines involved in transitioning to sustainable energy. Disciplines that could be mentioned include: biology, sociology, engineering,	All groups were able to come up with at least 5 different disciplines involved in transitioning to sustainable energy. However, why each of these disciplines were involved, was not clear to all students.	Although they could come up with a list of different disciplines involved, many students understand how each discipline would contribute to this transition in energy use.	Give a similar example of the contributions of many disciplines to provide context for the students.

Report due 11/15/2023

	sciences to politics.	record as many disciplines as possible with explanation of why these fields of study might be important.	chemistry, psychology, politics.			
		Measure 2:				

*At least one measure per objective must be a direct measure.

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Science and Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will understand the changing nature of human population growth and how it is related to improvements in sanitation, health care, technology, and food production.	Measure 1: Canvas quiz covering the demographic transition from a pre-modern society with high birth rates and high death rates to a stable mature society with low birth rates and low death rates.	80% of students will achieve 70% or higher on quiz covering this material	100% of students were able to achieve threshold.	Students were able to grasp this material	Link the demographic transition to events in US history. This might provide a better link to the material presented.

		Measure 2: Students will read Garret Hardin's "Tragedy of the Commons" and complete a Canvas based assignment quizzing their understanding of the article.	80% of students will achieve 70% or higher on assignment covering this material	100% of students were able to meet threshold.	Despite the difficulty of the article, all students were able to learn from this article.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate how to interpret and produce graphs related to various topics throughout the course. This includes, but is not limited to: air quality measurements, human population pyramids, and human population growth curves.	Measure 1: Questions on Exam 1 covering analysis of graphs. Specifically, graphs of human population pyramids. These questions require students to interpret several different population pyramids with regards to projected growth.	80% of students will achieve 70% or higher on Exam 1	92% of students, (12/13) met threshold	Students were able to analyze graphs of human population pyramids.	
		Measure 2: Canvas based quiz asking students to analyze air quality data over time and interpret how the change in air quality were connected to specific measures taken by governments to improve air quality.	80% of students will achieve 80% or higher on this quiz.	100% of students (13/13) met this threshold.	Students were able to analyze data and interpret how governmental intervention was connected to these air quality changes.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate an understanding of atoms, molecules, macromolecules, cells, and organisms within ecosystems	Measure 1: Canvas quiz covering organization of living organisms.	80% of students will achieve 80% or higher on this quiz.	100% of students (13/13) were above threshold.	Students were able to understand and answer questions on this topic.	
		Measure 2: Students will read an article about secondary succession entitled "Hundreds of Reindeer died by Lightning". Students will then answer essay questions demonstrating understanding of the change in ecosystems through time based on availability of resources and energy in an environment.	80% of students will achieve 80% or higher on this assignment.	84% of students (11/13) were above threshold.	Students were able to demonstrate understanding of the change in ecosystems through time based on availability of resources and energy in an environment.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate a basic understanding of photosynthesis and cellular respiration.	Measure 1: Canvas Quiz covering photosynthesis and respiration	80% of students will achieve 80% or higher on this quiz.	100% of students (13/13) were above threshold.	Students were able to understand this material and answer basic questions about this.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate a basic understanding of Mendelian Genetics, the genetic basis of natural selection, and recognize evolutionarily advantageous traits in different types of organisms	Measure 1: Canvas Quiz covering photosynthesis and respiration	80% of students will achieve 80% or higher on this quiz.	92% (12/13) students were able to achieve threshold.	Students were able to understand this material and answer basic questions about this.	
		Measure 2: Students will read an article about evolutionary pressures faced by organisms experiencing deforestation. "Fractured Forests Are Endangering wildlife". Students will then answer essay questions demonstrating understanding of this topic.	80% of students will achieve 80% or higher on this assignment.	100% (13/13) students were able to achieve threshold.	Students were able to demonstrate understanding evolutionary pressure faced by organisms experiencing deforestation.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate an understanding of the change in atmospheric CO2 concentrations over time and apply this to climate change, biodiversity loss, and habitat loss. Students will also demonstrate an understanding of the complexities of water use along the Colorado River	Measure 1: Canvas Quiz covering CO2 changes over time.	80% of students will achieve 80% or higher on this quiz.	92% (12/13) students were able to achieve threshold.	Students were able to understand and answer basic questions covering this material.	
		Measure 2: Students will read an article about human caused changes of the Colorado River. “40 Million People Rely on the Colorado River. It’s drying up fast”. Students will then answer essay questions demonstrating understanding of this topic.	80% of students will achieve 80% or higher on this assignment.	100% (13/13) students were able to achieve threshold.	Students were able to demonstrate an understanding of the complexities of water use along the Colorado River.	Students really loved the direct connection between our region and use of water from the Colorado River. This topic could be expanded.

Course___BTNY 1403 (3 CH) __CRN 31113__ SPRING 2023_____

Gen Ed Learning Goal Students will demonstrate understanding of:	**Measurable Learning Outcome** Students will demonstrate their understanding by:	**Method of Measurement** Direct and Indirect Measures*	**Threshold**	**Findings Linked to Learning Outcomes**	**Interpretation of Findings**	**Action Plan/Use of Results**
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Learning Outcome 1. Students will demonstrate understanding of what is and what is not considered science.	Measure 1: An in-class activity with students working in groups to identify examples of scientific explanations versus examples of non-scientific explanations. Examples come from scientific history.	All student groups will be able to successfully explain why each of the examples are considered scientific explanations versus nonscientific explanations.	Measure 1: All 5 student groups were able to successfully explain the difference between scientific and nonscientific explanations	Measure 1: All groups were successful, but not all students participated equally in this assignment.	Measure 1: Rather than use historical examples, find current headlines/articles that could demonstrate this.
		Measure 2: Students will take an individual Canvas-based quiz covering what is science and what does not count as science.	80% of students will receive a score of 80% or higher on quiz	Measure 2: 92% (11/12) students received >80% on quiz	Measure 2: The quiz provided additional practice of this topic and was successfully completed	Measure 2: Again, it would be beneficial to include more current headlines/articles to use as part of the quiz rather than just historical examples.

GE Learning Goal	**Measurable Learning Outcome**	**Method of Measure.**	**Threshold**	**Findings**	**Interpretation**	**Action Plan**
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate an understanding that Environmental Science has major contributions from many disciplines ranging from the life sciences to politics.	Measure 1: In a small group setting, have the students explore the many different scientific disciplines involved in transitioning from fossil fuels to sustainable energy	Student groups will describe at least 5 different disciplines involved in transitioning to sustainable energy. Disciplines that could be mentioned include: biology, sociology,	All groups were able to come up with at least 5 different disciplines involved in transitioning to sustainable energy. However, why each of these disciplines were involved, was not clear	Although they could come up with a list of different disciplines involved, many students understand how each discipline would contribute to this transition in energy use.	Give a similar example of the contributions of many disciplines to provide context for the students.

Report due 11/15/2023

		sources. Groups record as many disciplines as possible with explanation of why these fields of study might be important.	engineering, chemistry, psychology, politics.	to all students.		

*At least one measure per objective must be a direct measure.

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Science and Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will understand the changing nature of human population growth and how it is related to improvements in sanitation, health care, technology, and food production.	Measure 1: Canvas quiz covering the demographic transition from a pre-modern society with high birth rates and high death rates to a stable mature society with low birth rates and low death rates.	80% of students will achieve 70% or higher on quiz covering this material	75% (9/12) of students were able to achieve threshold.	Data was skewed as only 9 students took quiz. Remaining students achieved threshold.	Link the demographic transition to events in US history. This might provide a better link to the material presented.
		Measure 2: Students will read Garret Hardin's "Tragedy of the Commons" and complete a Canvas based assignment quizzing their understanding of the article.	80% of students will achieve 70% or higher on assignment covering this material	100% of students were able to meet threshold.	Despite the difficulty of the article, all students were able to learn from this article.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate how to interpret and produce graphs related to various topics throughout the course. This includes, but is not limited to: air quality measurements, human population pyramids, and human population growth curves.	Measure 1: Questions on Exam 1 covering analysis of graphs. Specifically, graphs of human population pyramids. These questions require students to interpret several different population pyramids with regards to projected growth.	80% of students will achieve 70% or higher on Exam 1	100% of students were able to meet threshold.	Students were able to analyze graphs of human population pyramids.	
		Measure 2: Canvas based quiz asking students to analyze air quality data over time and interpret how the change in air quality were connected to specific measures taken by governments to improve air quality.	80% of students will achieve 80% or higher on this quiz.	Only 58% (7/12) met threshold	4/12 students neglected to take the quiz. Of the students who completed quiz 7/8 met threshold.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate an understanding of atoms, molecules, macromolecules, cells, and organisms within ecosystems	Measure 1: Canvas quiz covering organization of living organisms.	80% of students will achieve 80% or higher on this quiz.	75% of students met threshold (9/12)	11/12 students took quiz, but 2/12 did not meet threshold.	Encourage students to complete quizzes to help them study.
		Measure 2: Students will read an article about secondary succession entitled "Hundreds of Reindeer died by Lightning". Students will then answer essay questions demonstrating understanding of the change in ecosystems through time based on availability of resources and energy in an environment.	80% of students will achieve 80% or higher on this assignment.	92% of students (11/12) were above threshold.	Students were able to demonstrate understanding of the change in ecosystems through time based on availability of resources and energy in an environment.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate a basic understanding of photosynthesis and cellular respiration.	Measure 1: Canvas Quiz covering photosynthesis and respiration	80% of students will achieve 80% or higher on this quiz.	75% of students met threshold (9/12)	11/12 students took quiz, but 2/12 did not meet threshold.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate a basic understanding of Mendelian Genetics, the genetic basis of natural selection, and recognize evolutionarily advantageous traits in different types of organisms	Measure 1: Canvas Quiz covering photosynthesis and respiration	80% of students will achieve 80% or higher on this quiz.	92% (11/12) students were able to achieve threshold.	Students were able to understand this material and answer basic questions about this.	
		Measure 2: Students will read an article about evolutionary pressures faced by organisms experiencing deforestation. "Fractured Forests Are Endangering wildlife". Students will then answer essay questions demonstrating understanding of this topic.	80% of students will achieve 80% or higher on this assignment.	92% (11/12) students were able to achieve threshold.	Students were able to demonstrate understanding evolutionary pressure faced by organisms experiencing deforestation.	

GE Learning Goal	Measurable Learning Outcome	Method of Measure	Threshold	Findings	Interpretation	Action Plan
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate an understanding of the change in atmospheric CO2 concentrations over time and apply this to climate change, biodiversity loss, and habitat loss. Students will also demonstrate an	Measure 1: Canvas Quiz covering CO2 changes over time.	80% of students will achieve 80% or higher on this quiz.	58% (7/12) students were able to achieve threshold. 2 students failed to take quiz. 3 waited until last hour before quiz closed	3/12 students failed to meet threshold.	Encourage students to study and take quizzes early.

	understanding of the complexities of water use along the Colorado River	Measure 2: Students will read an article about human caused changes of the Colorado River. “40 Million People Rely on the Colorado River. It’s drying up fast”. Students will then answer essay questions demonstrating understanding of this topic.	80% of students will achieve 80% or higher on this assignment.	75% (9/12) students were able to achieve threshold. 3/12 students failed to complete assignment.	Students who completed assignment were able to demonstrate an understanding of the complexities of water use along the Colorado River.	Students really loved the direct connection between our region and use of water from the Colorado River. This topic could be expanded.

Summary of Artifact Collection Procedure

Artifact	When/How Collected?	Where Stored?
Canvas Exam Analysis Reports and Excel worksheet created from outcome report	Downloaded from Canvas recently to complete this report.	Canvas.

G.

Appendix A

Most departments or programs receive a number of recommendations from their Five/Seven-Year Program Review processes. This page provides a means of updating progress towards the recommendations the department/program is enacting.

The Botany Department did not get a list of recommendations from our last program review. Instead, weaknesses were identified which we are in the process of addressing. Here we report on progress since the 2019-2021 biennial report on assessment of student learning.

Date of Program Review: 2018-19	Weakness	Progress Description since Spring 2021
Weakness 1	Herbarium: The herbarium, however, has not been databased and, because of this, it does not form part of regional or international consortia.	At the time of the program review the previous taxonomist had retired from WSU. Since then we have hired Dr. James Cohen to teach in the field and serve as the director of the Mary Carver Hall Herbarium. He started in Fall 2020. To date, 10,069 vascular plant specimens have been made available online through the Intermountain Region Herbarium Network, with almost 3000 of them georeferenced.
		The herbarium has added lichen specimen since Dr. Cohen started. They have added 498 specimen to the database so far. Additionally, they have added around 2000 specimens to the collection through exchange and gifts and collecting in the area (and beyond)
		The herbarium is now participating in the macroalgae and bryophyte portals and has emeritus faculty member Dr. Bozniak's algal specimen to contribute.
		The herbarium is part of a large grant submitted to National Science Foundation to digitize woody plant specimens of the Americas, and that grant is pending presently
Weakness 2	In terms of evaluation of teaching performance, the evaluation of success in teaching is largely based in the quantification of acquired skills; i.e., the grades and exam results, as is well explained in the Department's Self-Study. There are no set systems to gather student's	From the last biennial report: *There is a system for student evaluation of teaching. These evaluations are not asked for in the program self-study but are used in the annual review of faculty, rank and tenure reviews, and post-tenure reviews. Students also provide*

	own feedback on the courses, the curricula, or the perceived quality of the teaching process.	*feedback about the curriculum when they graduate. We switched from a face-to-face exit interview to an online one four years ago, and then tacked the online department exist survey to the university's two years ago. Our response rate plummeted when our survey was with the university's. In Fall 2019, we separated the department exit survey and had a 90% response rate.*
Weakness 3	The Department of Botany at WSU is strongly bimodal in its age-class distribution. Three of the faculty members (Harley, Clark, and Wachocki) are senior professors, all of them approaching the age of retirement. The other three faculty members (Hilbig, Root, and Schramm) are Assistant Professors, not yet tenured. Steve Clark is retiring in June this year, and both Sue Harley and Barb Wachocki will retire in four years' time. This will generate, in a very short time, a transfer of responsibilities between the two cohorts requiring the advancement to tenure of the younger researchers, plus the need to hire replacements for those that are retiring.	2021-2022 Three faculty were tenured. One of the three junior faculty who met with program review team (Hilbig) has achieved tenure and promotion to associate professor. One of the junior faculty (Schramm) resigned winter of 2021.
		A new Plant Physiologist was hired and began Fall 2022.
		One of the senior faculty (Wachocki) retired in spring 2022, a search for her replacement is underway.
		A transfer of responsibilities between the two cohorts has been underway for years, but this fall 2023 one of the tenured associate professors stepped into the role of chair.
		We have continued to be flexible in our curriculum to promote student success and timely graduation in this time of flux. We recognize that during this time some courses might not be offered for several years, new courses will be developed, and some existing courses will be

		deleted. However, we have worked hard to offer upper division course across the sub-disciplines in Botany in every academic year. The revised major that went into effect in 2020-2021 is adaptable in nature and we continue to make minor tweaks for student and faculty success. For instance we will be reducing the number of times we offer low enrollment courses to free faculty to offer more electives across the subdisciplines.
Weakness 4	The greenhouse needs attention. The glass panes are thermally inefficient and demand a lot of energy to keep cool in summer and warm in winter	While none of us disagree with the assessment made by our program review, this is out of our control to address. Two glass panes broke in 2021 and were replace with glass, setting the stage for it to remain glass. The greenhouse then froze in 2022 which resulted in the loss of thousands of dollars of specimen. These included specimen older than all of us, which are impossible to replace.

Additional narrative:

Appendix B

Please provide the following information about the full-time *and adjunct faculty* contracted by your department during the last academic year (summer through spring). Gathering this information each year will help with the headcount reporting that must be done for the final Five-Year Program Review document that is shared with the State Board of Regents.

Faculty Headcount	2019-20	2020-21	2021-22	2022-23
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)				
Full-time Tenured	2	3	3	4
Full-time Non-Tenured (includes tenure-track)	3	3	2	2
Part-time and adjunct	1	1	1	2
With Master's Degrees				
Full-time Tenured	0	0	0	0
Full-time Non-Tenured	0	0	0	0
Part-time and adjunct	3	3	3	3
With Bachelor's Degrees				
Full-time Tenured	0	0	0	0
Full-time Non-tenured	0	0	0	0
Part-time and adjunct	1	0	1	1
Other				
Full-time Tenured	0	0	0	0
Full-time Non-tenured	0	0	0	0
Part-time	0	0	0	0
Total Headcount Faculty				
Full-time Tenured	2	3	3	4
Full-time Non-tenured	3	3	2	2
Part-time	5	4	5	6

Appendix C

Please respond to the following questions.

1) Looking back at your previous biennial report where you identified strategies for improvement, what progress has been made in implementing improvements?

We are constantly working to ensure student success. While the last years were harder with faculty numbers down, the remaining faculty have worked collectively to engage students in HIEEs. We have many courses designated as such (CRE, SUS) and others that are inherently HIEE (e.g. lab courses). We have shifted to offer our first botany elective entirely online (Ethnobotany). Despite our low faculty numbers, we strive to teach diverse offerings. To this end we have upper division courses across the sub-disciplines every academic year, we teach night courses and courses at the Davis campus including our intro botany course for majors.(2104). We have now implemented the botany major that was overhauled in 2020 for several years and identified areas for further improvement. We have prioritize hiring faculty replacements that strengthen the department across the sub-disciplines of Botany to keep us in line with AAAS's Vision and Change. We have engaged in many outreach events including 2 Botany open houses that introduce the faculty and staff and the major, minor, and field certificate and started a botany peer mentoring program. Those open houses and the peer mentoring program are funded by a National Science Foundation grant for broadening participation and increase persistence in Botany.

2) Please take a few minutes to review the new DFWI dashboard in the Report Gallery. This dashboard allows you to see the percentage of students in each course who earn a D+, D, D-, E, W, UW, or NC grade. The data can be filtered by several parameters. Reflect on the DFWI rates overall and of your underserved minority students versus your Caucasian students:

   a. What are you seeing?
   Every course is below 20% with the exception of BTNY 1303, which is at 37%. This is a general education course only taught online, a format that is notorious for students being disengaged. Additionally, this course suffers from this common misconception that botany is horticulture or gardening and has a majority of freshman students. The percent of DFI's drop as students are progressing through our program.

   b. What concerns you?
   At this time we are not concerned by these numbers because they just a percent of Ds, Es, W, and UWs. While some seem like they may be high, a percentage can be very misleading. The graph of the COS looks like we have a lot of students failing in BTNY 1303 in comparison to MATH 990, but in reality they have over 5.5 times the DFWs when you look at the raw number of students enrolled in those courses. As a small department we have small course sizes that could have a large percent of DFWs when even one person stops showing up because it is what is in their best interest to take a break

c. What additional data could be beneficial?
As a new chair looking at the reports I need more introduction in how these numbers can be informative. Without any kind of statistical analyses the numbers alone are not particularly useful in identifying if and what underlying issues exist. There are a lot of descriptive data presented, which is great, but it would be informational to have statistical analyses that tell you if the DFWs are significant and if there are variables that significantly contribute to the number of DFWs. For example using a PCA to identify which of the variables (found in different tables as you click) account for the majority of the variation in DFWs across the COS and then across Botany would be really helpful in creating a plan to better meet students where they are.

3) We have invited you to re-think your program assessment. What strategies are you considering? What support or help would you like?

We would love help from WSU's Office of Institutional Effectiveness to transition to outcome-based assessment. We feel that the course-based assessment, while advantageous in its ease, is less effective at capturing the students building of skills and knowledge and long term retention of the botany learning objectives . Therefore, the current course-based approach is limited in its ability to truly assess the complexity of a metric like career readiness. We are moving to an e-portfolio. All students that began in 2022 should have created their e-portfolio in career planning. Career planning is listed as a pre-req to many upper division, thus forcing students to begin the e-portfolio early and to continue to build it until their senior capstone course. This will aid the collection of artifacts for outcome-based assessment, but we need help from the Office of Institutional Effectiveness on best strategies for this transition.

Glossary

Student Learning Outcomes/Measurable Learning Outcomes

The terms 'learning outcome', 'learning objective', 'learning competency', and 'learning goal' are often used interchangeably. Broadly, these terms reference what we want students to be able to do AFTER they pass a course or graduate from a program. For this document, we will use the word 'outcomes'. Good learning outcomes are specific (but not too specific), are observable, and are clear. Good learning outcomes focus on skills: knowledge and understanding; transferrable skills; habits of mind; career skills; attitudes and values.

- Should be developed using action words (if you can see it, you can assess it).
- Use compound statements judiciously.
- Use complex statements judiciously.

Curriculum Grid

A chart identifying the key learning outcomes addressed in each of the curriculum's key elements or learning experiences (Suskie, 2019). A good curriculum:

- Gives students ample, diverse opportunities to achieve core learning outcomes.
- Has appropriate, progressive rigor.
- Concludes with an integrative, synthesizing capstone experience.
- Is focused and simple.
- Uses research-informed strategies to help students learn and succeed.
- Is consistent across venues and modalities.
- Is greater than the sum of its parts.

Target Performance (previously referred to as 'Threshold')

The level of performance at which students are doing well enough to succeed in later studies (e.g., next course in sequence or next level of course) or career.

Actual Performance

How students performed on the specific assessment. An average score is less meaningful than a distribution of scores (for example, 72% of students met or exceeded the target performance, 5% of students failed the assessment).

Closing the Loop

The process of following up on changes made to curriculum, pedagogy, materials, etc., to determine if the changes had the desired impact.

Continuous Improvement
An idea with roots in manufacturing, that promotes the ongoing effort to improve. Continuous improvement uses data and evidence to improve student learning and drive student success.

Direct evidence
Evidence based upon actual student work; performance on a test, a presentation, or a research paper, for example. Direct evidence is tangible, visible, and measurable.

Indirect evidence
Evidence that serves as a proxy for student learning. May include student opinion/perception of learning, course grades, measures of satisfaction, participation. Works well as a complement to direct evidence.

HIEE – High Impact Educational Experiences
Promote student learning through curricular and co-curricular activities that are intentionally designed to foster active and integrative student engagement by utilizing multiple impact strategies. Please see https://weber.edu/weberthrives/HIEE.html