Weber State University
Biennial Report on Assessment of Student Learning

Cover Page

Department/Program:
Academic Year of Report: 2018/19 (covering Summer 2017 through Spring 2019)
Date Submitted: 18 December 2019
Report author: Sue Harley

Contact Information:
        Phone: x-7434
        Email: sharley@weber.edu

A. **Brief Introductory Statement:**
Please review the Introductory Statement and contact information for your department or academic program displayed on the assessment site:
http://www.weber.edu/portfolio/departments.html - if this information is current, please place an 'X' below. No further information is needed.

_X__ **Information is current; no changes required.**

B. Mission Statement
Please review the Mission Statement for your department or academic program displayed on the assessment site:
http://www.weber.edu/portfolio/departments.html - if the mission statement is current, please place an 'X' below.; If the information is not current, please provide an update:

___ **Information is current; no changes required.**

Update if not current:
The mission of the Botany Department at Weber State University is to provide students with the necessary knowledge and skills to pursue diverse educational and career goals. To this end, the Botany Department offers a diversity of high quality courses that provide classroom, laboratory, and field experience in the major subdisciplines of plant biology. Our botany graduates find employment as researchers in academic, industrial, or government labs; as field botanists for state and federal agencies, including state and national parks; and as employees of educational and environmental organizations. The undergraduate botany department at WSU is the only of its kind remaining in Utah and one of the few left in the U.S. As such, we aim to increase the visibility of botany as a vitally important discipline. Accordingly, the Department provides general education courses and support courses that enhance student appreciation for plants and their physically and functionally keystone place in the world.

C. Student Learning Outcomes
Please review the Student Learning Outcomes for your academic program displayed on the assessment site:
http://www.weber.edu/portfolio/departments.html. In particular, review in light of recent strategic reporting and indicate any needed updates. If the outcomes are current, mark below.

___ **Information is current; no changes required.**

Update if not current:

This is the last assessment that the Botany Department will be doing under the current Student Learning Outcomes and Curriculum Grid. Beginning with the 2020-2021 academic year, the Student Learning Outcomes and Curriculum Grid will be aligned with the American

Association for the Advancement of Science Call to Action for Vision and Change in Undergraduate Biology Education. The new learning outcomes are as follows:

GOAL 1: Breadth across three major subdisciplines of Botany:
A. Molecular, Cellular, and Developmental
1. The chemical and molecular machinations operating within all biological processes
2. The centrality of genetic systems' governance of life's actions from the cellular to the phyletic
 B. Anatomy, Physiology, and Organismal
The coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms
C. Ecology and Evolution
1. The dynamic interaction of living systems with each other and their environments
2. The transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.

GOAL 2: Core Competencies
A. The Process of Science: Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.
B. Quantitative Reasoning: Students will represent diverse experimental data sets graphically and apply statistical methods to them.
C. Communication: Students will disseminate results of experiments in a variety of presentation formats to a wide variety of audiences
D. Sustainability: Students will use their knowledge of biology to address environmental issues and solutions.

GOAL 3: Skills
A. Lab Skills
1. Basic Lab Techniques (For Example: pipetting, light microscopy, chromatography, aseptic technique, microbial culture and plating techniques, cell culture)
2. Molecular (For Example: DNA extractions, PCR, Gel electrophoresis)
3. Microscopy Techniques (For Example: Sectioning, Sample Infiltration and Embedding, Phase contrast, Confocal)
4. Safety (For Example: Chemical hygiene, Sharps, Waste management)
B. Field Skills
1. Navigation (For Example: GPS, Mapping, Remote Sensing, problem solving)
2. Plant Identification (For Example: Dichotomous keying, common Utah flora, curating specimen)
3. Plant Community Sampling (For example: plot selection and design, sampling strategies, vegetation sampling methods)
4. Safety (For example: minimizing risk from field hazards in remote areas such as weather, travel, wild animals, terrain)
C. Data Management Skills
1. Record Keeping (For example: lab notebook, field notebook)
2. Software Applications (For example: FLOUVIEW, ARCGIS, R, MATLAB, Spreadsheets, Databases, 4Peaks)

Report due 11/15/2019

D-1. **Curriculum**
"A collection of courses is not a program. A curriculum has coherence, depth, and synthesis."
(Linda Suskie; presentation at NWCCU Assessment Fellowship, June 19, 2019)

Please review the Curriculum Grid for your department or academic program displayed on the assessment site:
http://www.weber.edu/portfolio/departments.html.

Indicate in the curriculum grid where graduating student performance is assessed for each program outcome. In the 'additional information' section, please provide information about these assessments (e.g., portfolios, presentations, projects, etc.) This information will be summarized at the college and institutional level for inclusion in our NWCCU reporting on student achievement.

General Education Courses offered by the Botany Department

BTNY Life Science General Education Courses	Life Science General Education Learning Outcomes							
	1A	1B	1C	1D	2A	2B	2C	2D
BTNY 1203 LS (Plant Biology)	X	X	X	X	X	X	X	X
BTNY 1303 LS (Plants in Human Affairs)	X	X	X	X	X	X	X	X
BTNY 1403 LS (Environment Appreciation)	X	X	X	X	X	X	X	X
BTNY/MICR/ZOOL 1370 LS (Principles of Life Science)	X	X	X	X	X	X	X	X

1. Natural science learning outcomes:

A. 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.

B. Integration of science. All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.

C. 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.

D. Problem solving and data analysis. Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.

2. Life science learning outcomes:

A. Levels of organization. All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.

B. Metabolism and homeostasis. Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.

C. Genetics and evolution. Shared genetic processes and evolution by natural selection are universal features of all life.

D. Ecological interactions. All organisms, including humans, interact with their environment and other living organisms.

Discipline Courses offered by the Botany Department

Botany Courses: BTNY 2000 and higher	Botany Program Learning Outcomes																		
	Goal 1					Goal 2				Goal 3									
	A1	A2	B	C1	C2	A	B	C	D	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2
Core Courses Required																			
BTNY 2104 (Plant Form & Function)	1	1	1			1	1			1			1						1
BTNY 2114 (Evolutionary Survey of Plants)			1	1	2	1		1		1			1					1	
BTNY 2121 (Career Planning)						1		1											
BTNY 2600 (Laboratory Safety)		1	1										3				3		
BTNY 2750 (Topics in Science and Society)																			
BTNY 3624 (Taxonomy of Vascular Plants)				2	1			2	2	2				3	3	3	2	3	2
BTNY 4990 (Botany Capstone Seminar)	V	V	V	V	V	V	V	3	V										
Category A: Genetics, Cell, and Molecular																			
BTNY 3153 (Biology of the Plant Cell)	3	2				2													
BTNY 3303 (Plant Genetics)	2	3				2	2			3	2		2					3	2
BTNY/MICR 4252 (Cell Culture)	2		1			3	1			3			3					3	
Category B: Physiology and Organismal																			
BTNY 3105 (Anatomy of Vascular Plants)		1	3	2		2	2	2		3			2	1	1	1	1	2	2
BTNY 3204 (Plant Physiology)	1	1	3	2	1	3	2	1		3	2		3						2
BTNY 3504 (Mycology)			2	2	1	3	3	3	3	2	2		2					2	2
BTNY 3583 (Medicinal Plants)			2	2		3	2	1		3			3					3	

Botany Courses: BTNY 2000 and higher	Botany Program Learning Outcomes																	
	Goal 1					Goal 2				Goal 3								
	A1	A2	B	C1	C2	A	B	C	D	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2
Category C: Evolution, Ecology, and Environmental																		
BTNY 2413 (Natural Resource Management)				2		2	1	3	3					1	1	1			
BTNY 3214 (Soils)			3	1		2	2	1				2	1	1				2	2
BTNY 3454 (Plant Ecology)		1	2	3	2	3	3	3	3					2	3	3	3	3	2
BTNY 3473 (Plant Geography)			1	2	3	3	3	3	3					2	2	2		2	
BTNY 3643 (Intermountain Flora)																			
BTNY 4113 (Plant Evolution)																			
BTNY 4950 (Advanced Field Botany)			2	3		3	3	3	3					3	3	3	3	3	2
Other Botany Classes																		
BTNY 2203 (Home & Garden)																			
BTNY 2303 (Ethnobotany)																			
BTNY 2890 (Co-Op Work Experience)																			
BTNY 4750 (Topics in Botany)																			
BTNY 4800 (Individual Research)																			
BTNY 4830 (Readings in Botany)																			
BTNY 4840 (Thesis Readings)																			
BTNY 4850 (Thesis Research)																			
BTNY 4890 (Co-Op Work Experience)																			
BTNY 4920 (Short Courses, etc.)																			
BTNY 4970 (Botany Thesis)																			

1= introduced, 2 = emphasized, 3 = principle focus, V = variable.

GOAL 1: Breadth across three major subdisciplines of Botany:
A. Molecular, Cellular, and Developmental
1. The chemical and molecular machinations operating within all biological processes
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 B. Anatomy, Physiology, and Organismal
The coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms
C. Ecology and Evolution
1. The dynamic interaction of living systems with each other and their environments

Report due 11/15/2019

2. The transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life.

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D. Sustainability: Students will use their knowledge of biology to address environmental issues and solutions.

GOAL 3: Skills
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1. Basic Lab Techniques (For Example: pipetting, light microscopy, chromatography, aseptic technique, microbial culture and plating techniques, cell culture)
2. Molecular (For Example: DNA extractions, PCR, Gel electrophoresis)
3. Microscopy Techniques (For Example: Sectioning, Sample Infiltration and Embedding, Phase contrast, Confocal)
4. Safety (For Example: Chemical hygiene, Sharps, Waste management)
B. Field Skills
1. Navigation (For Example: GPS, Mapping, Remote Sensing, problem solving)
2. Plant Identification (For Example: Dichotomous keying, common Utah flora, curating specimen)
3. Plant Community Sampling (For example: plot selection and design, sampling strategies, vegetation sampling methods)
4. Safety (For example: minimizing risk from field hazards in remote areas such as weather, travel, wild animals, terrain)
C. Data Management Skills
1. Record Keeping (For example: lab notebook, field notebook)
2. Software Applications (For example: FLOUVIEW, ARCGIS, R, MATLAB, Spreadsheets, Databases, 4Peaks)

Additional Information (details about graduating student assessment):
Graduating students are assessed in BTNY 4990, Botany Capstone Seminar. They turn in their final ePortfolio (introduced in BTNY 2121-Career Planning for Botanists and featuring artifacts for evidence of content knowledge, skills, career planning, achievements, capstone experience, and self-assessment) and give a presentation on their capstone project (thesis research, independent research, internship-associated research, or library-based research) in which they demonstrated their familiarity with science as a way of knowing.

Report due 11/15/2019

D-2. High Impact Educational Experiences in the Curriculum

In response to the recent USHE requirement that all students have at least 1 HIEE in the first 30 credit hours and 1 HIEE in the major or minor we are asking programs to map HIEEs to curriculum using a traditional curriculum grid. This helps demonstrate how and where these goals are accomplished.

BTNY Courses	Department/Program use of High Impact Educational Experiences							
	HIEE 1	HIEE 2	HIEE 3	HIEE 4	HIEE 5	HIEE 6	HIEE 7	HIEE 8
LS1203 (Plant Biology)			X			X		
LS1303 (Plants in Human Affairs)		X						
LS1403 (Environment Appreciation)			X		X	X		
2104 (Plant Form & Function)			X			X		
2114 (Evolutionary Survey of Plants)			X			X		X
2121 (Career Planning)						X		X
2203 (Home & Garden)					X	X		
2303 (Ethnobotany)			X		X	X		
2413 (Natural Resource Management)			X		X	X		X
2600 (Lab Safety)			X					
2750 (Topics in Science and Society)	varies with course topic and instructor							
3105 (Anatomy of Vascular Plants)			X		X	X	X	
3153 (Biology of the Plant Cell)			X					X
3204 (Plant Physiology)			X			X	X	
3214 (Soils)			X		X	X	X	
3303 (Plant Genetics)			X			X		
3454 (Plant Ecology)			X		X	X	X	
3473 (Plant Geography)								
3504 (Mycology)			X		X	X	X	
3583 (Medicinal Plants)			X		X	X	X	
3624 (Taxonomy of Vascular Plants)			X		X	X		
3643 (Intermountain Flora)								
4750 (Topics in Botany)	varies with course topic and instructor							

Report due 11/15/2019

BTNY Courses	Department/Program use of High Impact Educational Experiences							
	HIEE 1	HIEE 2	HIEE 3	HIEE 4	HIEE 5	HIEE 6	HIEE 7	HIEE 8
4800 (Individual Research)	X						X	X
4830 (Readings in Botany)								
4840 (Thesis Readings)								
4850 (Thesis Research)	X						X	X
4890 (Co-Op Work Experience)				X				X
4950 (Advanced Field Botany)		X	X		X	X	X	X
4970 (Botany Thesis)	X						X	X
4990 (Botany Capstone Seminar)	X							

HIEEs:
1. capstone courses or experiences
2. community-engaged learning
3. evidence-based teaching practices
4. internships, project-based learning
5. project-based learning
6. team-based learning
7. undergraduate research
8. pre-professional/career development experiences.

Additional information (HIEE planning, assessment, or other information):
BTNY 3473 and BTNY 3643 are not marked for HIEEs pending the hire of a new plant taxonomist.

E. Assessment Plan
Please update the Assessment Plan for your department displayed on the assessment site: http://www.weber.edu/portfolio/departments.html. Keep in mind that reporting will be done biennially instead of annually; that should be reflected in your assessment plan. Please ensure that Gen Ed courses are assessed/reported at least twice during a standard program review cycle.

A complete plan will include a list of courses from which data will be gathered and the schedule, as well as an overview of the assessment strategy the department is using (for example, portfolios, or a combination of Chi assessment data and student survey information, or industry certification exams, etc.), and plans for continuous improvement.

Assessment plan:

General Education Life Science (LS) courses:
The four Botany General Education courses are assessed using questions on exams that address the Natural Science and Life Science Gen Ed Learning Outcomes. This is done using Chi-Tester grading of individual questions within a category. Additional assessment is done through quizzes; student writing, including essay questions and written assignments; case studies; and other assignments that assess one or more Learning Outcomes.

General Education LS Assessment Schedule:

Area and Course	Fall 2018	Spring 2019	Fall 2019	Spring 2020	Fall 2020	Spring 2021
LIFE SCIENCES						
BTNY 1203		X		X		X
BTNY 1303		X		X		X
BTNY 1403		X		X		X
BTNY/MICR/ZOOL 1370						X

Report due 11/15/2019

Courses within the major:

Courses within the major are evaluated in a number ways. Most courses use exams and quizzes for at least part of the assessment of content knowledge. Other assessments include lab reports, projects (individual or group), term papers, case studies, and class presentations.

Courses within the Major Assessment Schedule:

At a minimum, the following courses will be evaluated within the next three years:

BTNY Course	2018-2019	2019-2020	2020-2021
2104 (Plant Form & Function)	X	X	X
2114 (Evolutionary Survey of Plants)	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)	X		X
2750 (Topics in Science and Society)		X	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	
3454 (Plant Ecology)	X		X
3473 (Plant Geography)			X
3504 (Mycology)	X		X
3583 (Medicinal Plants)	X		X
3624 (Taxonomy of Vascular Plants)		X	
3643 (Intermountain Flora)		X	
4750 (Topics in Botany)	when taught		
4950 (Advanced Field Botany)	X		X
4990 (Botany Capstone Seminar)		X	

a. Assessment of Thesis, Coop Work Experience, etc. will be done as students complete those courses.

Report due 11/15/2019

F. Report of assessment results for the most previous academic year:

A. 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 Botany majors and support courses for College of Science majors
Upper Division Botany courses: 90% of students achieve at least 80%
  These courses serve Botany majors and minors, but some also attract other College of Science majors

BTNY 2104-Plant Form and Function. Data based on 33 students in two sections (Fall 2017 and Spring 2018) who completed the class. This is a Core lab course for Botany majors and minors.

BTNY 2104, Plant Form and Function		Evidence of Learning: Courses within the Major			
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: Four exams, including a cumulative final. The exams are a mixed format of multiple choice, short answer, essay, and lab practical	Measure 1: Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.	Measure 1: 67.7% of students averaged 70% or higher on exams.	Measure 1: Most students successfully demonstrated knowledge and comprehension at level of 70% or higher.	Measure 1: Added quizzes in Canvas and review exercises in class to prep students for exams. Adding stop and summarize breaks to lectures.
Learning Outcome 2: Skills	Measure 1: Seventeen labs and assignments with minimal data analysis	Measure 1: Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.	Measure 1: 96.8% of students averaged 70% or higher on lab exercises.	Measure 1: Students successfully demonstrated development of laboratory and problem solving skills	Measure 1: No curricular or pedagogical changes needed at this time
	Measure 2: Thirteen labs and assignments that require data analysis with statistics &/or	Measure 2 Threshold for Evidence of Student Learning is 80% or more of the students	Measure 2: 84.8% of students averaged 70% or higher on lab exercises.	Measure 2: Students successfully demonstrated development of	Measure 2: No curricular or pedagogical changes needed at this time

BTNY 2104, Plant Form and Function	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	graphing done in Excel or equivalent	achieving 70% or higher.		problem solving and computer skills	

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

Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.

BTNY 2104-Plant Form and Function. Data based on 28 students in two sections (Fall 2018 and Spring 2019) who completed the class. This is a Core lab course for Botany majors and minors.

BTNY 2104, Plant Form and Function	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: Four exams, including a cumulative final. The exams are a mixed format of multiple choice, short answer, essay, and lab practical	Measure 1: Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.	Measure 1: 85% of students averaged 70% or higher on exams.	Measure 1: Students successfully demonstrated knowledge and comprehension at level of 70% or higher.	Measure 1: No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: Seventeen labs and assignments with minimal data analysis	Measure 1: Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.	Measure 1: 89% of students averaged 70% or higher on lab exercises.	Measure 1: Students successfully demonstrated development of laboratory and problem solving skills.	Measure 1: No curricular or pedagogical changes needed at this time
	Measure 2: Thirteen labs and assignments that require data analysis with statistics &/or graphing done in Excel or equivalent	Measure 2 Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.	Measure 2: 79% of students averaged 70% or higher on lab exercises.	Measure 2: Students successfully demonstrated development of problem solving and computer 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.

Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.

Report due 11/15/2019

Course: BTNY 2114 Evolutionary Survey of Plants Fall 2017 & Spring 2018 (N= 16)

Course [BTNY 2114]	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: 8 quizzes with questions that integrated multiple topics	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 85% of the students had average quiz scores over 70%	Measure 1: Students meet the threshold	No curricular or pedagogical changes needed at this time
	Measure 2: 5 Exams	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 95% of the students had average quiz scores over 70%	Measure 1: Students meet the threshold	No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: Lab Notebook (new assignment Spring 2018 class)	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 78% of the students had an average score of over 80%	Measure 1: Students successfully demonstrated skills and were very close to the threshold.	No curricular or pedagogical changes needed at this time See note below
Learning Outcome 3: Affective Domain	Measure 1: Oral Presentation	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 95% of students had project of over 70%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time

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

Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.

Learning Outcome 2: One or two students did not do the assignment and receive a score of zero; this brought the averages down.

Course: BTNY 2114 Evolutionary Survey of Plants Fall 2018 & Spring 2019 (N= 28). This is a Core lab course for Botany majors and minors.

Course [BTNY 2114]	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: 8 quizzes with questions that integrated multiple topics	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 93% of the students had average quiz scores over 70%	Measure 1: Students meet the threshold	No curricular or pedagogical changes needed at this time
	Measure 2: 5 Exams	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 93% of the students had average quiz scores over 70%	Measure 1: Students meet the threshold	No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: Lab Notebook	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 100% of the students had an average score of over 70%	Measure 1: Students successfully demonstrated skills and were very close to the threshold.	No curricular or pedagogical changes needed at this time See note below
Learning Outcome 3: Affective Domain	Measure 1: Oral Presentation	Measure 1: 80% of students with a score of 70% or greater	Measure 1: 96% of students had project of over 70%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time

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

Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.

Report due 11/15/2019

BTNY 2121 (Career Planning for Botanists) (Data based on 21 students in two sections [Fall 2017 and Spring 2018] who completed the class.) This is a Core lab course for Botany majors and minors.

Course BTNY 2121 Fall 2017 & Spring 2018		Evidence of Learning: Courses within the Major			
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: **Knowledge and Comprehension** Understanding of how plants are similar to other organisms, how plants are unique, and the products humans get from plants (= first draft for their final student portfolio)	Measure 1: A preliminary essay on how plants are similar to other organisms, how plants are unique, and the products humans get from plants (= first draft for their final student portfolio)	Measure 1: 80% of students will score at least 70% on the assignment	Measure 1: The threshold was met (Fall 2017: 90.9% of students achieved at least 70%) **NOTE:** This course was changed and this assignment was not required in Spring 2018)	Measure 1: Students did effectively demonstrate a basic knowledge of plants' similarity and differences as compared with other organisms, as well as the products that humans obtain from plants.	Measure 1: No curricular or pedagogical changes needed at this time
Learning Outcome 2: **Skills** Measure 1: written communication, information-seeking & critical thinking	Measure 1: An outline of a talk to the general public entitled, *Science as a Way of Knowing* (includes scientific method, specific examples from Botany and explanations of how science is used to shape public policy)	Measure 1: 80% of students will score at least 70% on the assignment	Measure 1: The threshold was met (89.5% of students achieved at least 80%) (Fall 2017: 88.9% & Spring 2018: 90%)	Measure 1: Students did effectively communicate in a written outline an understanding of how science is conducted and its relevance to public policy decisions.	Measure 1: No curricular or pedagogical changes needed at this time

Report due 11/15/2019

Course BTNY 2121 Fall 2017 & Spring 2018		Evidence of Learning: Courses within the Major			
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 2: **Skills** Measure 2: oral communication & information-seeking skills	Measure 2: Oral presentation on a graduate/professional program of the student's choice	Measure 2: 80% of students will score at least 70% on the assignment	Measure 2: The threshold was met (100% of students achieved at least 80% in both semesters)	Measure 2: Students effectively presented information about a graduate/professional program to fellow classmates through an oral presentation	Measure 2: No curricular or pedagogical changes needed at this time
Learning Outcome 2: **Skills** Measure 3: self-assessment skills	Measure 3: Written self-assessment of strengths, weaknesses, plans for self-improvement, career interests, short- and long-term goals	Measure 3: 80% of students will score at least 70% on the assignment	Measure 3: The threshold was met (100% of students achieved at least 80% in both semesters)	Measure 3: Students effectively demonstrated an ability to critically assess themselves	Measure 3: No curricular or pedagogical changes needed at this time
Learning Outcome 2: **Skills** Measure 4: written communication skills	Measure 4: Written resumé	Measure 4: 80% of students will score at least 70% on the assignment	Measure 4: The threshold was met (100% of students achieved at least 80% in both semesters)	Measure 4: Students effectively demonstrated an ability to write a resumé	Measure 4: No curricular or pedagogical changes needed at this time

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

Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher.

Report due 11/15/2019

Course: BTNY 2121 Career Planning. Data based on 23 students in two sections (Fall 2018 and Spring 2019) who completed the class. This is a required course for Botany majors.

Course [BTNY 2121]	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: science as a way of knowing draft outline	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 95.6% of the students had scores over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: resume, skills list, cover letter	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students average scores of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
Learning Outcome 3: Affective Domain	Measure 1: journals	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students average scores of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time

Additional narrative:

Students who complete assignments are meeting outcomes in this course. The greatest challenges with this course are missing assignments and/or low attendance.

BTNY 2600 (Laboratory Safety) (Data based on 37 students in two sections [Fall 2017 and Spring 2018] who completed the class.)
         This is a Core course for Botany majors and minors.

Course BTNY 2600 Fall 2017 & Spring 2018		Evidence of Learning: Courses within the Major			
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 2: Skills Measure 1: written communication, information-seeking & critical thinking	Measure 1: Written assignment in which students must find and interpret Safety Data Sheets (SDS) for 17 chemicals to determine how each must be properly stored and explain safety measures and precautions required in labs for chemical storage and personal safety.	Measure 1: 80% of students will score at least 70% on the assignment	Measure 1: The threshold was not met (66.4% of students achieved at least 70%) (Fall 2017: 63.6% & Spring 2018: 69.2%)	Measure 1: Students did not effectively interpret Safety Data Sheets to determine how each must be properly stored and explain safety measures and precautions required in labs for chemical storage and personal safety .	Measure 1: Additional information on SDS and chemical storage is required. This class changed from a face-to-face format to a mostly on-line fornmat, with a few face-to-face meetings. This has proved challenging for this homework assignment.
Learning Outcome 2: Skills Measure 2: : written communication, information-seeking & critical thinking	Measure 2: Written assignment identifying the five major risks each student will encounter in their career of choice and explaining how to minimize each risk.	Measure 2: 80% of students will score at least 70% on the assignment	Measure 2: The threshold was met (100% of students achieved at least 70% in both semesters)	Measure 2: Students effectively identified the five major risks they will encounter in their career of choice and an explained how to minimize each risk.	Measure 2: No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills Measure 3: ability to conduct a basic lab audit using a checklist	Measure 3: Hands-on, in-class exercise in which each student uses a checklist provided to conduct a safety audit of a College of Science classroom lab	Measure 3: 80% of students will score at least 70% on the assignment	Measure 3: The threshold was met (100% of students achieved at least 70% in both semesters)	Measure 3: Students effectively demonstrated an ability to conduct a basic lab audit using a checklist	Measure 3: No curricular or pedagogical changes needed at this time

Report due 11/15/2019

Course BTNY 2600 Fall 2017 & Spring 2018		Evidence of Learning: Courses within the Major			
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 2: Skills Measure 4: ability to use a fire extinguisher properly to put out a fire	Measure 4: Hands-on, in-class exercise in which each student practices how to use a hand-held fire extinguisher to put out a fire	Measure 4: 80% of students will score at least 70% on the assignment	Measure 4: The threshold was met (100% of students achieved at least 70% in both semesters)	Measure 4: Students effectively demonstrated an ability use a fire extinguisher properly to put out a fire	Measure 4: No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills Measure 5: understanding topics including chemical safety, basic toxicology and risk assessment, biological hazards, fire safety, proper use of lab equipment, waste disposal, radiation and laser safety, safe and ethical treatment of research animals, overall lab safety, and field safety	Measure 5: Multiple choice, matching and essay questions on two closed-book exams	Measure 5: 80% of students will score at least 70% on the exams	Measure 5: The threshold was met (96% of students achieved at least 70% on the exams) (Fall 2017: 92% & Spring 2018: 100%)	Measure 5: Students successfully demonstrated an understanding of the lab and field safety topics covered	Measure 5: No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills Measure 6: understanding topics including chemical safety, basic toxicology and risk assessment, biological hazards, fire safety, proper use of lab equipment, waste disposal, radiation and laser safety, safe and ethical treatment of research animals, overall lab safety, and field safety	Measure 6: Multiple choice, matching and essay questions on 10 open-book quizzes	Measure 6: 80% of students will score at least 70% on the quizzes	Measure 6: The threshold was met (90% of students achieved at least 70% on the quizzes) (Fall 2017: 80% & Spring 2018: 100%)	Measure 6: Students successfully demonstrated an understanding of the lab and field safety topics covered	Measure 6: No curricular or pedagogical changes needed at this time

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

Report due 11/15/2019

Course: BTNY 3105 Anatomy Fall 2018 (N= 5)   This course is required in the Track A, Option 1 Botany major and is an elective for Tracks A2, B, and C and the Botany minor. (Spring 2018)

Course [BTNY 3105]	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: 5 quizzes with questions that integrated multiple topics	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 80% of the students had average quiz scores over 80%	Measure 1: Students did not meet the threshold	There were only 5 students in the course. So one student averaging below an average of an 80% means only 80% are at 80%.
	Measure 2: 2 Exams with questions that integrated multiple topics	Measure 2: 90% of students with a score of 80% or greater	Measure 2: 80% of students had average score of over 80%	Measure 2: Students did not meet the threshold	There were only 5 students in the course. So one student averaging below an average of an 80% means only 80% are at 80%.
Learning Outcome 2: Skills	Measure 1: Lab assignments	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students had an average score of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
	Measure 2: Manuscript Writing	Measure 2: 90% of students with a score of 80% or greater	Measure 2: 100% of students had project of over 80%	Measure 2: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
	Measure 3: Oral Presentation in form of a seminar to the department	Measure 3: 90% of students with a score of 80% or greater	Measure 3: 100% of students had project of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time

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

Upper Division Threshold for Evidence of Student Learning is 90% or more of the students achieving 80% or higher

Additional narrative:

Learning Outcome 1: Students did not meet the threshold on their quizzes or exams. One student out of five was below the threshold. When class sizes are this small a 90% threshold actually mean that a 100% of my students need to be at 80%, this is a not realistic objective in my opinion. The way to get 100% of students at an 80% is to reduce the rigor of the class, which I won't do.

Report due 11/15/2019

BTNY 3153, Biology of the Plant Cell (n = 5) This course is required in the Track A, Option 2 Botany major and is an elective for Tracks A1, B, and C and the Botany minor. (Spring 2018)

Course [BTNY 3153]	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: three essay exams	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 80% of the students had an average score of 80% or greater on exams	Measure 1: Most students successfully demonstrated knowledge and comprehension	Add stop and summarize breaks to lectures. Provide additional homework assignments with practice exam questions.
Learning Outcome 2: Skills	Measure 1: three essays on cell vs organismal theory, model organisms, and plant movements at the cellular level. Skills: critical thinking, information seeking, written communication

Measure 2: Oral report on a specific plant cell. Skills: critical thinking, information seeking, oral communication | Measure 1: 90% of students with a score of 80% or greater

Measure 2: 90% of students with a score of 80% or greater | Measure 1: 60% of the students had an average essay score of 80% or greater

Measure 2: 100% of the students had an average essay score of 80% or greater | Measure 1: Most students successfully demonstrated skills at a level of 80% or higher. All averaged 70% or higher on their essays.

Measure 2: All students successfully demonstrated skills at a level of 80% or higher. | Add in class practice on reading the scientific literature and searching for articles. |

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

Report due 11/15/2019

Course: BTNY 3214 Soils Spring 2019 (N= 10).   This course is required in the Track B Botany major and is an elective for Tracks A and C and the Botany minor.

Course [BTNY 3214]	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: 5 homework assignments with questions that integrated multiple topics	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students had average quiz scores over 80%	Measure 1: Students meet the threshold	No curricular or pedagogical changes needed at this time
	Measure 2: 2 Exams with questions that integrated multiple topics	Measure 2: 90% of students with a score of 80% or greater	Measure 2: 91% of students had average score of over 80%	Measure 2: Students meet the threshold. Only one student was below.	No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: Lab assignments	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students had an average score of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
	Measure 2: Independent Projects	Measure 2: 90% of students with a score of 80% or greater	Measure 2: 91% of students had project of over 80%	Measure 2: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
	Measure 3: Oral Presentation	Measure 3: 90% of students with a score of 80% or greater	Measure 3: 100% of students had project of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time

Report due 11/15/2019

BTNY 3454 Plant Ecology (n = 20) This course is required in the Track B and the Track C Botany major and is an elective for Track A and the Botany minor. (Fall 2018)

Course [BTNY 3454]		Evidence of Learning: Courses within the Major			
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: 6 quizzes	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 85% of the students had average quiz scores over 80%	Measure 1: Three students failed to meet the benchmark. All of these were due to missing quizzes.	No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: 4 projects with lab reports	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 90% of the students had lab report scores of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
	Measure 2: Field notebooks	Measure 2: 90% of students with a score of 80% or greater	Measure 2: 90% of students had field notebook of over 80%	Measure 2: Students successfully demonstrated skills	
Learning Outcome 3: Affective Domain	Measure 1: not assessed				

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

Report due 11/15/2019

Course: BTNY 3504 Mycology Fall 2017 (N= 16)

Course [BTNY 3504]	Evidence of Learning: Courses within the Major				
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: 12 quizzes with questions that integrated multiple topics	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 93.8% of the students had average quiz scores over 80%	Measure 1: Students meet the threshold	No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: Lab assignments	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 93.8% of the students had an average score of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
	Measure 2: Individual projects	Measure 2: 90% of students with a score of 80% or greater	Measure 2: 75% of students had project of over 80%	Measure 2: In independent projects, students struggled more with the results and discussion section	Independent projects did not meet the threshold, see notes below
	Measure 3: Oral Presentation	Measure 3: 90% of students with a score of 80% or greater	Measure 3: 100% of students had project of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
Learning Outcome 3: Affective Domain	Measure 1: Reading Assignments and Discussions	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 87.5% of the students had average reading and discussion score over 80%	Measure 1: Students were very close to the threshold.	No curricular or pedagogical changes needed at this time, See note below

*Direct and indirect: at least one measure per objective must be a direct measure.
Upper Division Threshold for Evidence of Student Learning is 90% or more of the students achieving 80% or higher

Additional narrative:

Learning Outcome 2: Students did not meet the threshold on their independent project. Each portion of the project write up was completed and graded in a step wise manner to make the project manageable. On the introduction section, as well as the materials and methods section, 93.8% of the students meet the threshold; the portion that brought the overall score down was the results and discussion. The students had the skills to execute the project, but struggle presenting results and interpreting their findings correctly. Part is the students failing to incorporate feedback from peer reviews and myself. In the future I will stress further the importance of edits post peer review to strength this section.

Learning Outcome 3: With a class of only 16 students to reach 90% of students scoring 80% and above 15 out of 16 must meet the threshold. There were multiple reading and discussion days so if students miss class they receive a score of zero; this brought the averages down with only 3 students missing one day each.

Course: BTNY 4950 Advanced Field Botany (N= 8) This course is required in the Track B Botany major and is an elective for Tracks A and C and the Botany minor. Spring 2019

Course [BTNY 4950]		Evidence of Learning: Courses within the Major			
Measurable Learning Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: Knowledge and comprehension	Measure 1: 2 Quizzes	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students had average lab report scores over 80%	Measure 1: Students successfully demonstrated knowledge and comprehension	No curricular or pedagogical changes needed at this time
Learning Outcome 2: Skills	Measure 1: Field notebook entries 1-4	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students had lab report scores of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time
Learning Outcome 3: Affective Domain	Measure 1: Field notebook entry 5	Measure 1: 90% of students with a score of 80% or greater	Measure 1: 100% of the students had lab report scores of over 80%	Measure 1: Students successfully demonstrated skills	No curricular or pedagogical changes needed at this time

Report due 11/15/2019

B. Evidence of Learning: General Education Courses

Course: BOTANY LS 1303 (Plants in Human Affairs), Fall 2018 and Spring 2019 (N=105 in two sections). Online class.

Evidence of Learning: Life Science					
Measurable Learning Outcome Students will...	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
NS1: Nature of Science	Measure 1: 4 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 68% of the students correctly answered 70% or higher	Measure 1: Students struggled here, yet they were not far from an average performance of 70%.	Measure 1: Re-evaluate exam question concentrations. Also review item analysis to replace/reword any heavily missed question.
	Measure 2: Project 2 Topic discussions	Measure 2: 80% of the students correctly answered 70% or higher	Measure 2: 98% of students correctly answered 70% or higher	Measure 2: Students were very successful for this learning outcome.	Measure 2: No curricular or pedagogical changes needed at this time.
NS2: Integration of Science	Measure 2: 5 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 76% of the students correctly answered 70% or higher	Measure 1: Students performed at an above average level here, but did not achieve the 80% tolerance threshold.	Measure 1: Re-evaluate exam question concentrations. Also review item analysis to replace/reword any heavily missed question.
	Measure 2: Project 2 Topic discussions	Measure 2: 80% of the students correctly answered 70% or higher	Measure 2: 98% of students correctly answered 70% or higher	Measure 1: Students were very successful for this learning outcome	Measure 2: No curricular or pedagogical changes needed at this time.
NS3: Science and Society	Measure 1: 5 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 71% of the students correctly answered 70% or higher	Measure 1: Students performed at an above average level here, but did not achieve the 80% tolerance threshold.	Measure 1: Re-evaluate exam question concentrations. Also review item analysis to replace/reword any heavily missed question.
	Measure 2: Project 1 & 2, Book review and Topic discussions	Measure 2: 80% of the students correctly answered 70% or higher	Measure 2: 87% of the students correctly answered 70% or higher	Measure 2: Students were successful for this learning outcome	Measure 2: No curricular or pedagogical changes needed at this time.

Report due 11/15/2019

Evidence of Learning: Life Science					
Measurable Learning Outcome Students will...	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
NS4: Problem Solving and Data Analysis	Measure 1: 5 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 56% of the students correctly answered 70% or higher	Measure 1: Students were not successful for this learning outcome.	Measure 1: Question concentrations were too low. Add additional general concept questions.
	Measure 2: Project 1 & 2 Book review and Topic discussions	Measure 2: Project 1 & 2 Book review and Topic discussions	Measure 2: 87% of the students correctly answered 70% or higher	Measure 2: Students were very successful for this learning outcome	Measure 2: No curricular or pedagogical changes needed at this time
LS1: Levels of Organization	Measure 1: 5 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 67% of the students correctly answered 70% or higher	Measure 1: Students struggled here, yet they were not far from an average performance 0f 70%.	Measure 1: Re-evaluate exam question concentrations. Also review item analysis to replace/reword any heavily missed question.
LS2: Metabolism and Homeostasis	Measure 1: 5 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 52% of the students correctly answered 70% or higher	Measure 1: Students were not successful for this learning outcome. This was the most difficult for them	Measure 1: Question concentrations were too low. Add additional general concept questions and revise any question that is too course specific.
LS3: Genetics and Evolution	Measure 1: 7 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 64% of the students correctly answered 70% or higher	Measure 1: Students were not successful for this learning outcome	Measure 1: Re-evaluate exam question concentrations. Also review item analysis to replace/reword any heavily missed question.
LS4: Ecological Interactions	Measure 1: 4 Multiple Choice Questions	Measure 1: 80% of the students correctly answered 70% or higher	Measure 1: 60% of the students correctly answered 70% or higher	Measure 1: Students were not successful for this learning outcome	Measure 1: Question concentrations were too low. Add additional general concept questions.

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

Additional narrative (optional – use as much space as needed):

Report due 11/15/2019

This is an online course. It is quite difficult for students to master the concepts of science in an online environment. Online often leads to low exam scores. To compensate for this, students watch short video presentation, read papers and articles, and write discussion posts. They also do a Signature Assignment that requires them to integrate and solidify course concepts. This offsets the deficit in exam score and gives a much more realistic picture of their learning.

The tolerance threshold of 80% is quite high. Overall, students were moderately successful at meeting most of the learning outcomes at near or above 70%. They struggled most with metabolism and homeostasis and also struggled with genetics and evolution and ecological interactions. This is not uncommon in a GenEd course were many of not most of the students are not science majors.

In speaking with students they suggest that other GenEd courses require far less study than does this one. The students were, therefore, less prepared for the exams than they should have been. But, exam 1 was the lowest scored exam overall and exam scores improved once students realized that additional study would be required.

I plan to do a very thorough re-assessment of the exams as they seem to be the most problematic on the whole. I will be revising to achieve three things; 1) a better distribution of questions across all learning outcomes, and 2) revision of any question missed by more than 60% of the students, 3) revision of any question that is too course specific and not general enough to meet the learning outcomes.

Botany LS 1403 (Environment Appreciation), Spring 2018 (86 students)

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will…	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: S1: Nature of Science	a) 4 multiple choice questions on 1 exam b) 1 multiple choice questions on final exam	a) 80% of students achieving 70 % or higher on multiple choice exam questions b) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 85% of students achieved 70% or higher on questions b) 96% of students achieved 70% or higher on questions	Students successfully demonstrated an understanding of the nature of science.	None

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will…	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 2: S2: Integration of Science	a) 2 multiple choice questions on 1 exam	a) 80% of students achieving 70 % or higher on multiple choice exam questions	b) 92% of students achieved 70% or higher on questions	Students successfully demonstrated an understanding of the nature of science.	None
Learning Outcome 3: S3: Science and Society	a) 2 multiple choice questions on exam 1 b) 6 multiple choice questions on exam 2 c) 3 multiple choice questions on the final exam	a) 80% of students achieving 70 % or higher on multiple choice exam questions b) 80% of students achieving 70 % or higher on multiple choice exam questions c) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 92% of students achieved 70% or higher on questions b) 74% of students achieved 70% or higher on questions c) 64% of students achieved 70% or higher on questions	Students successfully demonstrated an understanding of science and society.	None Collectively, across the three exams students met the threshold

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will…	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 4: S4: Problem Solving and Data Analysis	a) 4 multiple choice questions on 1 exam b) 2 multiple choice questions on Final Exam	a) 80% of students achieving 70 % or higher on multiple choice exam questions b) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 83% of students achieved 70% or higher on questions c) 80% of students achieved 70 % or higher on multiple choice exam questions	Students successfully demonstrated an understanding of problem solving and data analysis	None
Learning Outcome 5: LS1: Levels of Organization	a) 3 multiple choice questions on exam 1	a) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 24% of students achieved 70% or higher on questions	Students did not successfully demonstrated an understanding of the levels of organization.	Ask more questions in this category on Exam 1. Many got 2/3 questions correct (>80%) but that puts them at a 67%.
Learning Outcome 6: LS2: Metabolism and Homeostasis	a) 3 multiple choice questions on exam 2 b) 1 multiple choice questions on Final Exam	a) 80% of students achieving 70 % or higher on multiple choice exam questions b) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 45% of students achieved 70% or higher on questions b) 90% of students achieved 70% or higher on questions	Students successfully demonstrated an understanding of metabolism and homeostasis.	Ask more questions in this category on Exam 2. Many got 2/3 questions correct (~92%) but that puts them at a 67%. If you combine the questions from Exam 1 and 2 then you get over 80% (87%) at 75%
Learning Outcome 7: LS3: Genetics and Evolution	a) 13 multiple choice questions on exam 1	a) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 82% of students achieved 70% or higher on questions	Students successfully demonstrated an understanding of genetics and evolution.	None

Report due 11/15/2019

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will…	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	b) 6 multiple choice questions on final exam	b) 80% of students achieving 70 % or higher on multiple choice exam questions	b) 73% of students achieved 70% or higher on questions		
Learning Outcome 8: LS4: Ecological Interactions	a) 1 multiple choice question and 1 essay question on Exam 1 b) 9 multiple choice questions on the final exam	a) 80% of students achieving 70 % or higher on multiple choice exam questions b) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 49% of students achieved 70% or higher on questions b) 65% of students achieved 70% or higher on questions	Students did not successfully demonstrated an understanding of ecological interactions	Ask more questions on exams in this category and send more time on the biodiversity and ecological services assignments and lectures.

Botany LS 1403 (Environment Appreciation), Fall 2018 and Spring 2019 (n = 109 in two sections)

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will…	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1: S1: Nature of Science	c) 4 multiple choice questions on 1 exam d) 2 multiple choice questions on final exam	c) 80% of students achieving 70 % or higher on multiple choice exam questions d) 80% of students achieving 70 % or higher on multiple choice exam questions	c) 94% of students achieved 75% or higher on questions d) 88% of students achieved 70% or higher on questions	Students successfully demonstrated an understanding of the nature of science.	None
Learning Outcome 2: S2: Integration of Science	b) 2 multiple choice questions on 1 exam c) 1 multiple choice question on final exam	c) 80% of students achieving 70 % or higher on multiple choice exam questions d) 80% of students achieving 70 % or higher on multiple choice exam questions	a) 89% of students achieved 70% or higher on questions b) 94% of the students achieved 70% or higher on questions	Students successfully demonstrated an understanding of the nature of science.	None
Learning Outcome 3: S3: Science and Society	d) 2 multiple choice questions on exam 1 e) 2 multiple choice questions on exam 2	d) 80% of students achieving 70 % or higher on multiple choice exam questions e) 80% of students achieving 70 % or higher on multiple choice exam questions	d) 92% of students achieved 70% or higher on questions e) 92% of students achieved 70% or higher on questions	Students successfully demonstrated an understanding of science and society.	None

Report due 11/15/2019

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will…	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	f) 6 multiple choice questions on the final exam	f) 80% of students achieving 70 % or higher on multiple choice exam questions	f) 75% of students achieved 70% or higher on questions		
Learning Outcome 4: S4: Problem Solving and Data Analysis	a) 3 multiple choice questions on 1 exam b) 3 multiple choice questions on Final Exam	d) 80% of students achieving 70 % or higher on multiple choice exam questions e) 80% of students achieving 70 % or higher on multiple choice exam questions	b) 72% of students achieved 70% or higher on questions f) 59% of students achieved 70 % or higher on multiple choice exam questions	Students did not successfully demonstrate an understanding of problem solving and data analysis	Ask more questions on this category on the exam 1 [Many got 3/3 or 2/3 (66.7%) questions correct (94%)], and the final [Percentage of students that got 3/3 or 2/3 (66.7%) questions correct was 88%]
Learning Outcome 5: LS1: Levels of Organization	b) 3 multiple choice questions on exam 1	b) 80% of students achieving 70 % or higher on multiple choice exam questions	b) 58% of students achieved 70% or higher on questions	Students did not successfully demonstrate an understanding of the levels of organization.	Ask more questions in this category on Exam 1. Eliminate the very challenge question that only 33% of students got correct.
Learning Outcome 6: LS2: Metabolism and Homeostasis	c) 3 multiple choice questions on exam 2 d) 3 multiple choice questions on exam	c) 80% of students achieving 70 % or higher on multiple choice exam questions d) 80% of students achieving 70 % or higher on multiple choice exam questions e) 80% of students achieving 70 % or	c) 45% of students achieved 70% or higher on questions d) 57% of students achieved 70% or higher on questions	Students improved in their understanding of metabolism and homeostasis as the semester progressed.	Ask more questions in this category on all exams.

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will…	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	e) 1 multiple choice question on the Final Exam	higher on multiple choice exam questions	e) 86% of students achieved 70% or higher on questions		
Learning Outcome 7: LS3: Genetics and Evolution	c) 12 multiple choice questions on exam 1 d) 1 multiple choice question on Exam 2 e) 8 multiple choice questions on final exam	c) 80% of students achieving 70 % or higher on multiple choice exam questions d) 80% of students achieving 70 % or higher on multiple choice exam questions e) 80% of students achieving 70 % or higher on multiple choice exam questions	c) 66% of students achieved 70% or higher on questions d) 86 % of students achieved 70% or higher on questions e) 76 % of students achieved 70% or higher on questions	Students did not successfully demonstrate an understanding of genetics and evolution.	This is an area of the life sciences that even majors struggle with. With limited time to cover all LS objectives, spending more time on this is not possible. I could try implementing more assignments.
Learning Outcome 8: LS4: Ecological Interactions	c) 3 multiple choice question and 1 essay question on Exam 1 d) 2 multiple choice question on Exam 2	c) 80% of students achieving 70 % or higher on multiple choice exam questions d) 80% of students achieving 70 % or higher on multiple choice exam questions	c) 56% of students achieved 70% or higher on questions d) 37% of students achieved 70% or higher on questions	Students did not successfully demonstrate an understanding of ecological interactions	Ask more questions on exams 1 and 2 in this category. By the final exam there are large gains in understanding, especially if I drop the questions from analyses that were meant to separate out A students from B students.

Evidence of Learning: General Education Area [LS]					
Measurable Learning Outcome Students will...	Method of Measurement	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	e) 11 multiple choice questions on the final exam	e) 80% of students achieving 70 % or higher on multiple choice exam questions	e) 82% of students achieved 70% or higher on questions		

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 acting upon.

The Botany Department did not get a list of recommendations for our last program review. Instead, weaknesses were identified which we are in the process of addressing.

Date of Program Review: 2018-19	Weakness Identified	Progress Description
Weakness 1	Herbarium: The herbarium, however, has not been databased and, because of this, it does not form part of regional or international consortia.	In Fall 2018, Dr. Harley began mentoring a student doing a pilot project to digitize a 1950s collection of Utah mosses made in conjunction with the writing of Utah moss flora. At this point, WSU has 326 moss records databased on the Consortium of North American Bryophyte Herbaria. Twenty-eight of the specimens have been georeferenced. In Fall 2019, a different student took responsibility of the mosses.
		In Summer 2019, the department hired an adjunct instructor for Plant Taxonomy. He incorporated the use of the various herbarium portals into the

		class. This gave us a nucleus of trained students to draw from when we hired student employees for the herbarium in Fall 2019.
		In Fall 2019, the department hired an herbarium manager who has worked at USU and is well versed in the full digitization workflow. He has made a great start on digitizing the flowering plants, aided by four students who are learning valuable skills in curation, plant taxonomy, and digitization. As of today, 2,608 specimens (of approximately 28,000 vascular plant specimens) have been posted to the Intermountain Regional Herbarium Network, with 22% of the specimens georeferenced.
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 own feedback on the courses, the curricula, or the perceived quality of the teaching process.	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 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 greenhouse needs attention. The glass panes are thermally inefficient and	An energy audit of the Tracy Hall Science Center was conducted between

	demand a lot of energy to keep cool in summer and warm in winter.	the time we completed our self-study and the review team site visit. The audit revealed that the greenhouse accounted for approximately 15% of the energy used by the building. Several fixes were identified at that time, and the department supports incorporating them into the greenhouse facility. However, implementation of the fixes requires financial support from the university. Improving the energy efficiency of the greenhouse would be compatible with the university's goal to be carbon neutral by 2050.
Weakness 4	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.	The goals of the current curriculum revision now working its way through the university's curriculum approval process are diverse and take the faculty turnover into account: • bring the curriculum into alignment with the AAAS Vision and Change document which would give us a national standard for assessment of learning • streamline the major for students and bring it in line with the requirements in Microbiology which requires 12 fewer credit hours • provide flexibility in course requirements so that students can complete degrees in a timely manner as several of our courses, including currently required courses, are offered alternate years

		• provide flexibility in course requirements to make it easier to balance teaching loads among the faculty • keep students on time to graduate by providing flexibility to meet course requirements during the faculty turnover period when some courses might not be offered for several years, new courses will be developed, and some existing courses will be deleted • have the new curriculum in place for 2020-2021 so that it is in place for three years while Drs. Harley and Wachocki are still around to assist with debugging any issues that arise

Additional narrative:

Several aspects of this year's assessment report include information about the curriculum revision mentioned in response to Weakness 4. The most obvious is the change to the Student Learning Outcomes. The new assessment grid will be used for course assessments in the major beginning in Fall 2019.

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	2017-18	2018-19
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)		
Full-time Tenured	3	3
Full-time Non-Tenured (includes tenure-track)	3	3
Part-time and adjunct	2	1
With Master's Degrees		
Full-time Tenured		
Full-time Non-Tenured		
Part-time and adjunct	3	4
With Bachelor's Degrees		
Full-time Tenured		
Full-time Non-tenured		
Part-time and adjunct		1
Other		
Full-time Tenured		
Full-time Non-tenured		
Part-time		
Total Headcount Faculty		
Full-time Tenured	3	3
Full-time Non-tenured	3	3
Part-time	5	6

Report due 11/15/2019

Please respond to the following questions.

1) First year student success is critical to WSU's retention and graduation efforts. We are interested in finding out how departments support their first-year students. Do you have mechanisms and processes in place to identify, meet with, and support first-year students? Please provide a brief narrative focusing on your program's support of new students:

   a. Any first-year students taking courses in your program(s).
   Syllabi for all courses, including general education courses and other lower division courses, include the following statement:
   > Brian Pilcher, learning strategist in the College of Science, can help you with learning skills such as time management, study methods, test taking, and test anxiety. He is located in TY 201D, but appointments are the surest way to see him. Make an appointment at https://brianpilcher.youcanbook.me. Other ways to contact him are 626-6110 and BrianPilcher@weber.edu. He will also offer learning skills workshops. You can find the current workshop schedule at https://bit.ly/2KW30wb.

   The staff from the College of Science advising office visit introductory classes (BTNY 2104, BTNY 2114, and BTNY 2121) during the second and third week of classes to introduce themselves to the students and provide contact information.

   b. Students declared in your program(s), whether or not they are taking courses in your program(s)
   We encourage students who are declared in the program to participate in Botany Club. At the time students declare their major, we ask if they want to be on the Botany Club mailing list (no one has yet to say "no"). We explain that we work with the club president to use this mailing list to send out information about internships, graduate programs, important department events, etc.
   BTNY 2121, Career Planning for Botanists, is specifically designed to provide advising about academics and information about student support services, especially Career Services, to students.
   The person who has the most contact with students outside of instructional time is our lab manager. Her office is in the midst of the classrooms and labs while the faculty offices are on a different floor and tucked away in an office suite. She lends a sympathetic ear and is very knowledgeable about the variety of student support services on campus, having used several of them herself as a non-traditional student here. She'll send students to the appropriate support office or faculty member as needed.

2) A key component of sound assessment practice is the process of 'closing the loop' – that is, following up on changes implemented as a response to your assessment findings, to determine the impact of those changes/innovations. It is also an aspect of assessment on which we need to improve, as suggested in our NWCCU mid-cycle report. Please describe the processes your program has in place to 'close the loop'.

   There isn't a specific departmental process regarding the assessment findings. What generally happens is that an instructor identifies a problem area during a course's assessment and then tinkers with that area the next time they teach the class. If the situation seems

41

to improve the next time the class is taught, the "tinker" becomes an ongoing part of the class. If the situation is not better, or even worse, the change is dropped and something else might or might not be tried, depending on the results of the next assessment. The move to a two-year assessment cycle should be useful in encouraging longer trial periods for changes to show an effect in medium to large classes that are taught in multiple sections every semester and therefore present a large sample size of students. Unfortunately, our upper division content classes, on top of presenting a small sample size, are taught once a year or once every two years, making it difficult to assess the effectiveness of changes quantitatively and even qualitatively, given the variation in the backgrounds and preparedness of the students each time the course is taught. With all that in mind, the most useful place to check the impact of changes in the major is probably from compiling several years of exit interviews with graduates where we get holistic, rather than course by course, feedback on the curriculum. We have found this information helpful in guiding the recent changes that we have made to the Botany capstone.

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.