Weber State University
Annual Assessment of Evidence of Learning

Cover Page

Department/Program: Botany
Academic Year of Report: 2016/17 (Summer 2016, Fall 2016, Spring 2017)
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Report due 11/15/2017

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. We will indicate "Last Reviewed: [current date]" on the page.

**__X_ Information is current; no changes required.**
**___ Information is not current; updates below.**

Update:

**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 it is current, please indicate as much; we will mark the web page as "Last Reviewed [current date]". No further information is needed.
If the information is not current, please provide an update:

**_X__ Information is current; no changes required.**
**___ Information is not current; updates below.**

Update:

**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** - if they are current, please indicate as much; we will mark the web page as "Last Reviewed [current date]". No further information is needed.
If they are not current, please provide an update:

**_X__ Information is current; no changes required.**
**___ Information is not current; updates below.**

D. **Curriculum**

Please review the Curriculum Grid for your department or academic program displayed on the assessment site: **http://www.weber.edu/portfolio/departments.html** - if it is current, please indicate as much; we will mark the web page as "Last Reviewed: [current data]". No further information is needed.
If the curriculum grid is not current, please provide an update:

**_X__ Information is current; no changes required.**
**___ Information is not current; updates below**

**E. Assessment Plan**

Please review the Assessment Plan for your department displayed on the assessment site: http://www.weber.edu/portfolio/departments.html - if the plan is current, please indicate as much; we will mark the web page as "Last Reviewed [current date]". No further information is needed.

The site should contain an up-to-date assessment plan with planning going out a *minimum of three years* beyond the current year. Please review the plan displayed for your department at the above site. The plan should 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.).

*Please be sure to include your planned assessment of any general education courses taught within your department.* This information will be used to update the General Education Improvement and Assessment Committee's planning documentation.

Assessment plan:

**General Education Life Science (LS) courses:**

The four Botany General Education courses are assessed using questions on exams that address either the Natural Science or 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 | Summer 2016 | Fall 2016 | Spring 2017 | Summer 2017 | Fall 2017 | Spring 2018 | Summer 2016 | Fall 2018 | Spring 2019 |
|---|---|---|---|---|---|---|---|---|---|
| **LIFE SCIENCES** | | | | | | | | | |
| BTNY 1203 | X | X | X | X | X | X | X | X | X |
| BTNY 1303 | | X | X | | | X | | X | X |
| BTNY 1370 | | | X | | | X | | | X |
| BTNY 1403 | | X | X | | X | X | | X | X |

**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:

| Course | 2016-2017 | 2017-2018 | 2018-2019 |
|---|---|---|---|
| BTNY 2104 | X | X | X |
| BTNY 2114 | X | X | X |
| BTNY 2303 | | X | X |
| BTNY 2413 | | X | |
| BTNY 3153 | | X | |
| BTNY 3204 | | X | |
| BTNY 3214 | X | | X |
| BTNY 3303 | X | | X |
| BTNY 3454 | X | | X |
| BTNY 3473 | X | | |
| BTNY 3504 | | X | |
| BTNY 3583 | X | | |
| BTNY 3624 | | X | |
| BTNY 3643 | X | | |
| BTNY 4980 | X | X | X |

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

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

There are a variety of ways in which departments can choose to show evidence of learning. This is one example. The critical pieces to include are 1) what learning outcome is being assessed, 2) what method of measurement was used, 3) what the threshold for 'acceptable performance' is for that measurement, 4) what the actual results of the assessment were, 5) how those findings are interpreted, and 6) what is the course of action to be taken based upon the interpretation.

**NOTE:** As indicated within the tables, some papers, etc. are graded on a Grade Point Scale rather than straight percentage out of 100%. The grading is as follows:

| Letter Grade | Grade Point | Percentage | Letter Grade | Grade Point | Percentage |
|---|---|---|---|---|---|
| A | 4.0 | 93–100% | C- | 1.7 | 70-72% |
| A- | 3.7 | 90–92% | D+ | 1.3 | 67-69% |
| B+ | 3.3 | 87–89% | D | 1.0 | 63-66% |
| B | 3.0 | 83-86% | D- | 0.7 | 60-62% |
| B- | 2.7 | 80-82% | E | 0.0 | 0-59% |
| C+ | 2.3 | 77-79% | | | |
| C | 2.0 | 73-76% | | | |

Assessment Threshold for Gen Ed LS courses is 80% or more of students scoring 70% or higher on the assessment indicated in the tables.
Assessment Threshold for 2000-level courses (core courses in the major) is 80% or more of students scoring 70% or higher on the assessment indicated in the tables.
Assessment Threshold for upper division courses is 90% or more of students scoring 80% or higher on the assessment indicated in the tables.
Note: Some course assessments were done before we received feedback on the thresholds used in the 2015-2016 report. Those assessments used different thresholds which are included with the respective assessment grids.

A. Evidence of Learning: Courses within the Major

Evidence of Learning Worksheet: **Courses within the Major**
Course:

**BTNY 2104 (Plant Form and Function) (Data based on 38 students in three sections [two in Fall 2016 and one in Spring 2017] who completed the class.) This is a Core lab course for Botany majors and minors. It is also used as an elective support course in Geosciences, Microbiology, and Zoology.**

| 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: 76.3% of students averaged 70% or higher on exams. | Measure 1: Most students successfully demonstrated knowledge and comprehension. | Measure 1: Add quizzes in Canvas and review exercised in class to prep students for exams. |
| Learning Outcome 2: Skills | Measure 1: Eleven lab exercises 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: 89.5% 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: Seven lab exercises requiring 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: 86.8% 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.

Additional narrative (optional – use as much space as needed):
The course was revised for 2016-17 to meet LS requirements. Because of the moratorium on new general education courses, the course does not yet have an LS designation.

**BTNY 2114 (Evolutionary Survey of Plants) (Data based on 28 students in two sections [Fall 2016 and Spring 2017]who completed the class.) This is a Core lab course for Botany majors and minors. It is also used as an elective support course in Geosciences, Microbiology, and Zoology.**

| **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: 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 80% or higher. | Measure 1: 61.3% of students averaged 80% or higher on exams. | Measure 1: Students did not successfully demonstrate knowledge and comprehension | Measure 1: More review for exams and practice exercises may improve performance |
| | Measure 2: Nine quizzes of a mixed format, including multiple choice, short answer, and essay questions. | Measure 2: Threshold for Evidence of Student Learning is 80% or more of the students achieving 80% or higher. | Measure 2: 75.5% of students averaged 80% or higher on quizzes. | Measure 2: Students did not successfully demonstrate knowledge and comprehension | Measure 2: Lab exercises will be added to better summarize material |
| Learning Outcome 2: Skills | Measure 1: Oral presentation on a topic or plant group studied in class. | Measure 1: Threshold for Evidence of Student Learning is 80% or more of the students achieving 80% or higher. | Measure 1: 96.3% of students averaged 80% or higher on their oral presentation. | Measure 1: Students successfully demonstrated development of laboratory and problem solving skills | Measure 1: No curricular or pedagogical changes needed at this time |

**Course: BTNY 3214 Soils Root (N= 16) This course is required in the Track B Botany major and is an elective for Track A, Track C, the Botany minor, and some majors in Geosciences.**

| 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 take-home quizzes with questions that integrated multiple topics | Measure 1: 70% of students with a score of 70% or greater | Measure 1: 100% of the students had average quiz scores over 70% | Measure 1: Students successfully demonstrated knowledge and comprehension | No curricular or pedagogical changes needed at this time |
| Learning Outcome 2: Skills | Measure 1: Mystery soil presentations | Measure 1: 70% of students with a score of 70% or greater | Measure 1: 100% of the students had mystery soils scores of over 70% | Measure 1: Students successfully demonstrated skills | No curricular or pedagogical changes needed at this time |
| | Measure 2: Individual projects | Measure 2: 70% of students with a score of 70% or greater | Measure 2: 94% of students had project of over 70% | Measure 2: Students successfully demonstrated skills | |
| Learning Outcome 3: Affective Domain | Measure 1: 7 take-home quizzes with questions that integrated multiple topics. Questions about conservation ethics were not evaluated separately | Measure 1: 70% of students with a score of 70% or greater | Measure 1: 100% of the students had average quiz scores over 70% | Measure 1: Students successfully demonstrated development the affective domain | No curricular or pedagogical changes needed at this time |

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

Additional narrative (optional – use as much space as needed):
Lab skills for cookbook labs were also evaluated as pass/fail for each of 8 labs. The skills acquired were more formally assessed in their application for the 2 main projects of the semester, the mystery soil, and independent projects.
Conservation and sustainability questions, as well as questions about case studies and some of the trickier lab applications were common on the exams. Because the exams were take-home, they were integrative essay-style exams.

Course: **BTNY 3303, Plant Genetics (n = 10) This course is required in the Track A and Track C Botany major and is an elective for Track B. the Botany minor, some majors in Microbiology, and the Biochemistry major in Chemistry.**

| Course [BTNY 3303] | | 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 exams, all composed of problems and essay questions | Measure 1: 90% of students with a score of 80% or greater | Measure 1: 90% of the students had an overall exam score of 80% or greater | Measure 1: Students successfully demonstrated knowledge and comprehension | No curricular or pedagogical changes needed at this time |
| | Measure 2: nine homework problem quizzes | Measure 2: 90% of students with a score of 80% or greater | Measure 2: 100% of the students had an overall quiz score of 80% or greater | Measure 2: Students successfully demonstrated knowledge and comprehension | |
| Learning Outcome 2: Skills | Measure 1: six laboratory exercises in which students learned and applied a variety of techniques (electrophoresis, PCR, etc.) and skills (pipetting, safety, data analysis, etc.) | Measure 1: 90% of students with a score of 80% or greater | Measure 1: 100% of the students had an overall quiz score of 80% or greater | Measure 1: Students successfully demonstrated skills | No curricular or pedagogical changes needed at this time |
| | Measure 2: nine homework problem quizzes | Measure 2: 90% of students with a score of 80% or greater | Measure 2: 100% of the students had an overall quiz score of 80% or greater | Measure 2: Students successfully demonstrated knowledge and comprehension | |
| Learning Outcome 3: Affective Domain | Did not measure in this class. | | | | |

*Direct and indirect: at least one measure per objective must be a direct measure.
Additional narrative (optional – use as much space as needed):

**Course: BTNY 3454 Plant Ecology. Root (N= 10) This course is required in the Track B and Track C Botany major and is an elective for Track A and the Botany minor, and some majors in Microbiology.**

| 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: 7 take-home quizzes with questions that integrated multiple topics | Measure 1: 70% of students with a score of 70% or greater | Measure 1: 100% of the students had average quiz scores over 70% | Measure 1: Students successfully demonstrated knowledge and comprehension | No curricular or pedagogical changes needed at this time |
| Learning Outcome 2: Skills | Measure 1: 3 class field projects at Snow Basin, Antelope Island, and foothills written reports | Measure 1: 70% of students with a score of 70% or greater | Measure 1: 90% of the students had average scores for these labs of over 70% | Measure 1: Students successfully demonstrated skills | No curricular or pedagogical changes needed at this time |
| | Measure 2: Field notebooks | Measure 2: 70% of students with a score of 70% or greater | Measure 2: 90% of students had scores of over 70% for keeping field notebooks | Measure 2: Students successfully demonstrated skills | |
| | Measure 3: Greenhouse lab written reports | Measure 3: 70% of students with a score of 70% or greater | Measure 3: 100% of the students had scores over 70% on the greenhouse lab project | Measure 3: Students successfully demonstrated skills | |
| | Measure 4: Independent project written and oral reports | Measure 4: 70% of students with a score of 70% or greater | 100% of the students had scores over 70% on their independent projects | Measure 4: Students successfully demonstrated skills | |
| Learning Outcome 3: Affective Domain | Measure 1: 7 take-home quizzes with questions that integrated multiple topics. Questions about conservation ethics were not evaluated separately | Measure 1: 70% of students with a score of 70% or greater | Measure 1: 100% of the students had average quiz scores over 70% | Measure 1: Students successfully demonstrated development the affective domain | No curricular or pedagogical changes needed at this time |

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

Additional narrative (optional – use as much space as needed):
Students were very successful in this class at learning the material, analysis, problem-solving, skills.

Evidence of Learning Worksheet: **Courses within the Major**
**Course: Botany 3473 Plant Geography N=11 This course is an elective for all Botany major tracks and the Botany minor.**

| | | | | | |
|---|---|---|---|---|---|
| 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: Two exams, all composed of problems and essay questions. | Measure 1: 90% of students with a score of 80% or greater. | Measure 1: 90% of the students had an overall exam score of 80% or greater. | Measure 1: Students successfully demonstrated knowledge and comprehension. | Measure 1: No curricular or pedagogical changes needed at this time. |
| Learning Outcome 2: Skills | Measure 1: Preparation and presentation of a power point presentation | Measure 1: 90% of students with a score of 80% or greater. | Measure 1: 100% of the students had an overall quiz score of 80% or greater. | Measure 1: Students successfully demonstrated skills. | Measure 1: No curricular or pedagogical changes needed at this time. |
| Learning Outcome 3: Affective Domain | Measure 1: Did not measure in this class | Measure 1: | Measure 1: | Measure 1: | Measure 1: |

Evidence of Learning Worksheet: **Courses within the Major**

Evidence of Learning Worksheet: **Courses within the Major**
**Course: 3583 Herbal Medicines, N= 8. This course is required in the Track A Botany major and is an elective for Track B. Track C, the Botany minor, and the Biochemistry major in Chemistry.**

| 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 & comprehension | Measure 1: three lab experiments and reports | Measure 1: Evidence of Student Learning is 70% out | Measure 1: Average grade of the 6 participating | Measure 1: students demonstrated | Measure 1: No measures needed |

| 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 |
| | | of 100% | students (75% of class): 74% | knowledge and comprehension | |
| | Measure 2:<br>three exams | Measure 2:<br>Evidence of Student Learning is 70% out of 100% | Measure 2:<br>in class exams had low success rates with on average 25% of students achieving 70% or more. Students were allowed to retake midterm exams at home with the average of both attempts at each midterm counted as final grade. This raised the percentage of studens achieving >70% to 37.5% with 75% of students receiving >70% in the at-home exams | Measure 2:<br>student struggled to demonstrate knowledge and comprehension | Measure 2:<br>Hold review session before exams to remind students of what is going to be asked in exams. |
| Learning Outcome 2: Skills | Measure 1:<br>Reading and summarizing papers from the primary literature | Measure 1:<br>indirectly and through measure 2 | Measure 1:<br>in class discussions showed intermediate understanding of data presented in primary literature papers with lots of variation between students<br>in student presentations again is showed that not everyone | Measure 1:<br>about two thirds of student successfully demonstrated skills, one third of students struggled | Measure 1:<br>Define journals from which papers for presentations need to come so that there is no doubt about primary literature. |

| 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 |
| | | | understands what primary literature is or how to interpret its findings | | |
| | Measure 2:<br>Preparing and presenting two talks on chosen topics | Measure 2:<br>Evidence of Student Learning is 70% out of 100% | Measure 2:<br>Average grade was 85% | Measure 2:<br>students successfully demonstrated skills | Measure 2:<br>No action necessary |

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

Additional narrative (optional – use as much space as needed):
Exam success was very low even though all questions aimed at materials that came straight from the slides of which the students had hand-outs. While I asked very little transfer-knowledge, maybe the phrasing of questions was confusing or ambiguous. After the first exams, I therefore asked students to help me understand their confusions about the exam questions- yet in that period, no serious confusions were uncovered. It therefore remains a bit mysterious why students were having such a hard time- except maybe that there was a lot of material. I think review periods could help, as well as some practice exams and quizzes to put students on the right track. For the final, students were allowed a 3x5 flash card but that did relatively little to help them succeed. The final was hard, though, so I need to work on that.

Evidence of Learning Worksheet: **Courses within the Major**
**Course: Botany 3643 Intermountain Flora N=7. This course is an elective for all Botany major tracks and the Botany minor.**

| | | | | | |
|---|---|---|---|---|---|
| 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:<br>Knowledge and comprehension | Measure 1:<br>Fourteen plant I.D. exams, including a cumulative final. | Measure 1:<br>Threshold for Evidence of Student Learning is 80% or more of the students achieving 70% or higher | Measure 1:<br>71.4 students averaged 70% or higher on exams. | Measure 1:<br>Most students successfully demonstrated knowledge and comprehension. | Measure 1:<br>No curricular or pedagogical changes needed at this time. |

b. Evidence of Learning: High Impact Practices (HIPs)

List the activities you have within your academic program that you consider to be high impact. For key elements of high impact practices, see: Key Elements of High-Impact Practices.

Botany Thesis (BTNY 4850 + BTNY 4840 + BTNY 4970)
One student. "Lichen biomonitoring in Ogden, UT." The student did field collections and laboratory analyses, wrote a thesis, and gave a seminar presentation on the project. The student also completed a self-assessment of the experience for Portfolio (BTNY 4980).

Independent Research and Directed Readings (BTNY 4800 + BTNY 4830)
One student. "Kin *Taraxacum officinale* trait responses to AMF species richness gradients" The student did three semesters of directed readings, one summer of greenhouse research, and one summer of lab research on arbuscular mycorrhizal fungi. The work was funded through the WSU Office of Undergraduate Research. The student gave two seminar presentations on the work, one as a senior seminar (BTNY 4990) and the other a report on the reserach findings at the annual WSU Undergraduate Symposium in March 2017. The student also completed a self-assessment of the experience for Portfolio (BTNY 4980). The student received a Young Botanist Award from the Botanical Society of America for the project. It was one of 17 awards given to undergraduates in 2017.

Study Abroad.
One student. "Reforestation in Costa Rica." The student spent a summer semester in Costa Rica with the Round River Conservation Project. The student applied for and received the annual Hulet Scholarship to partially fund the trip. The student did field work in rain forest restoration in conjunction with native peoples. Upon returning to Ogden, the student completed directed readings (BTNY 4830) on the science and policy decisions associated with tropical reforestation and gave two seminar presentations, one a report on the study abroad experience and the other (BTNY 4990) a report on the readings. The student also completed a self-assessment of the experience for Portfolio (BTNY 4980). The student received a Young Botanist Award from the Botanical Society of America for the project. It was one of 17 awards given to undergraduates in 2017.

BTNY 4890, Co-Op Work Experience
Four students completed co-op work experiences. All reported satisfaction with being able to apply what they had learned in courses to their work experiences. Their supervisors indicated that both students did excellent work while enrolled in BTNY 4890. Students who participate in 4890 must turn in a statement of goals at the beginning or the semester and a self-assessment of how well they achieved those goals at the end of the semester. Supervisors turn in a standard evaluation form at the end of the semester.
The specific experiences were:
Utah Division of Wildlife Resources. The student had experience applying GIS technologies in a vegetation rehabilitation project. The team the student was with won an award from the state for their work.

Local nursery. The nursery specializes in tropical plants. Working there made the student familiar with the flora of Costa Rica prior to a Study Abroad experience (see above).
Utah Natural Heritage Project. The student applied the skills learned in plant taxonomy, plant geography, and field botany to survey and prepare reports on endemic, rare, and endangered plants.
U. S. Forest Service. The student applied the skills learned in plant taxonomy, plant ecology, and field botany to survey vegetation in the Upper Columbia River Basin.

**BTNY 4990 Botany Senior Seminar, 2016-27 (N=5)**

| Course [Subject/Number] | | Evidence of Learning: High Impact Service Learning | | |
|---|---|---|---|---|
| Measurable Learning Outcome | Method of Measurement* | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
| Learning Outcome 1: gain the knowledge and skills required to research and present a seminar project | Measure 1: Evaluation based on grade in class which includes evaluation of the written outline, abstract, annotated bibliography, and oral presentation of seminar | Measure 1: Four students received an A and the fourth a B+ in the course. | Measure 1: The students learned research skills & gained in writing and oral presentation skills | No curricular or pedagogical changes needed at this time |

Additional narrative (optional – use as much space as needed):
Seminar titles were:
Photosynthesis: The Key to Life in the Universe
Exotic Plant Colonization in the Upper Columbia River Basin
Kin *Taraxacum officinale* trait responses to AMF species richness gradients
Reforestation in Costa Rica
Phytoremediation: Exploring the Diversity of Leaf Surface Bacteria who Contribute to the Remediation of Air Pollutants

**Course: 4980 Portfolio, N= 5 for 2016-17. Course required for all Botany majors.**

| Course [Portfolio BTNY4980] | | 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 & comprehension | Measure 1: Final Botany Knowledge and comprehension essay | Measure 1: Evidence of Student Learning is 90% of students scoring 2.7 (80%) or higher on a Four Point Grade Scale. | Measure 1: Mean score: 3.0 | Measure 1: students successfully demonstrated knowledge and comprehension | Measure 1 & 2: No curricular or pedagogical changes needed at the time |
| | Measure 2: Science as a Process Folder | Measure 2: Evidence of Student Learning is 90% of students scoring 2.7 (80%) or higher on a Four Point Grade Scale. | Measure 2: Mean score: 3.4 | Measure 2: students successfully demonstrated knowledge and comprehension | |
| Learning Outcome 2: Skills | Measure 1: Skills Folder | Measure 1: Evidence of Student Learning is 90% of students scoring 2.7 (80%) or higher on a Four Point Grade Scale. | Measure 1: Mean score: 3.8 | Measure 1: students successfully demonstrated skills | Measure 1: No curricular or pedagogical changes needed at the time |
| | Measure 2: Capstone Folder | Measure 2: Evidence of Student Learning is 90% of students scoring 2.7 (80%) or higher on a Four Point Grade Scale. | Measure 2: Mean score: 3.6 | Measure 2: students successfully demonstrated skills | Measure 2: No curricular or pedagogical changes needed at the time |
| Learning Outcome 3: Affective domain | Measure 1: Affective Domain Folder | Measure 1: Evidence of Student Learning is 90% of students scoring 2.7 (80%) or higher on a Four Point Grade Scale. | Measure 1: Mean score: 3.6 | Measure 1: students successfully demonstrated skills in the affective domain | Measure 1 & 2: No curricular or pedagogical changes needed at the time |
| | Measure 2: | Measure 2: | Measure 2: | Measure 2: | |

| Course [Portfolio BTNY4980] | 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 |
| | Creativity Folder | Evidence of Student Learning is 90% of students scoring 2.7 (80%) or higher on a Four Point Grade Scale. | Mean score: 4.0 | students successfully demonstrated skills in the affective domain | |

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

Additional narrative (optional – use as much space as needed):
Five students completed the class with a mean score (4 pt scale equivalent to GPA) of 3.4.

c. Evidence of Learning: General Education Courses
(Area-specific EOL grids can be found at http://weber.edu/oie/Complete_Rubrics.html; they can replace this page.)

**BOTANY LS 1203 (Plant Biology), combined Summer 2016 (n=30) and Fall 2016 (n=39), online**

| Evidence of Learning: General Education Area LS | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>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 NS1:<br>Nature of Science | Measure 1:<br>5 multiple choice exam questions<br><br>Measure 2:<br>quiz scores for 3 modules that include this learning outcome (open book/note; up to 3 attempts allowed) | Measure 1<br>80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes | Measure 1:<br>78.2% of students met the 70% threshold for these questions; average score was 74.3%<br><br>Measure 2:<br>96.7% of students scored above 70% , with an average score of 96.5% | Measure 1:<br>Students are close to the threshold for demonstrating an understanding of the nature of science.<br><br>Measure 2: Students successfully demonstrated an understanding of the nature of science. | Measure 1:<br>See note at the end of this table.<br><br>Measure 2: No curricular or pedagogical changes needed at this time. |
| Learning Outcome NS2: | Measure 1: | Measure 1 | Measure 1: | Measure 1: | Measure 1: |

| Evidence of Learning: General Education Area LS | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>Students will… | Method of Measurement | Threshold for Evidence of Student Learning | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
| Integration of Science | 5 multiple choice exam questions<br><br>Measure 2:<br>quiz scores for 5 modules that include this learning outcome (open book/note; up to 3 attempts allowed) | 80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes | 76.8% of students met the 70% threshold for these questions; average score was 79.0%<br><br>Measure 2:<br>90.0% of students scored above 70% , with an average score of 92.6% | Students are close to the threshold for demonstrating an understanding of the integration of science.<br><br>Measure 2:<br>Students successfully demonstrated an understanding of the integration of science. | See note at the end of this table.<br><br>Measure 2: No curricular or pedagogical changes needed at this time. |
| Learning Outcome NS3:<br>Science and Society | Measure 1:<br>5 multiple choice exam questions<br><br>Measure 2:<br>quiz scores for 5 modules that include this learning outcome (open book/note; up to 3 attempts allowed) | Measure 1<br>80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes | Measure 1:<br>91.3% of students met the 70% threshold for these questions; average score was 96.1%<br><br>Measure 2:<br>96.1% of students scored above 70% , with an average score of 92.7% | Measure 1:<br>Students successfully demonstrated an understanding science and society.<br><br>Measure 2:<br>Students successfully demonstrated an understanding science and society. | Measure 1:<br>No curricular or pedagogical changes needed at this time.<br><br>Measure 2: No curricular or pedagogical changes needed at this time. |
| Learning Outcome NS4:<br>Problem Solving and Data Analysis | Measure 1:<br>5 multiple choice exam questions.<br><br>Measure 2:<br>quiz scores for 5 modules that include this learning outcome (open book/note; up to 3 attempts allowed)<br><br>Measure 3:<br>8 problem solving quizzes in Canvas (open | Measure 1<br>80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes<br><br>Measure 3:<br>80% of students score 70% or higher on the quizzes | Measure 1:<br>76.8% of students met the 70% threshold for these questions; average score was 73.6%<br><br>Measure 2:<br>96.1% of students scored above 70% , with an average score of 90.0%<br><br>Measure 3: | Measure 1:<br>Students are close to the threshold for demonstrating an understanding of problem solving and data analysis.<br><br>Measure 2:<br>Students successfully demonstrated an understanding of problem solving and data analysis.<br><br>Measure 3: | Measure 1:<br>See note at the end of this table.<br><br>Measure 2: No curricular or pedagogical changes needed at this time.<br><br>Measure 3: No curricular or pedagogical changes needed at this time. |

| Evidence of Learning: General Education Area LS | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>Students will… | Method of Measurement | Threshold for Evidence of Student Learning | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
| | book/note; only 1 attempt allowed) | | 82.3% of students scored above 70% , with an average score of 85.4% | Students successfully demonstrated an understanding of problem solving and data analysis. | |
| Learning Outcome LS1: Levels of Organization | Measure 1:<br>9 multiple choice exam questions.<br><br>Measure 2:<br>quiz scores for 15 modules that include this learning outcome (open book/note; up to 3 attempts allowed) | Measure 1<br>80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes | Measure 1:<br>76.7% of students met the 70% threshold for these questions; average score was 79.2%<br><br>Measure 2:<br>88.6% of students scored above 70% , with an average score of 89.0% | Measure 1:<br>Students are close to the threshold for demonstrating an understanding of levels of organization.<br><br>Measure 2:<br>Students successfully demonstrated an understanding of levels of organization. | Measure 1:<br>Measure 1:<br>See note at the end of this table.<br><br>Measure 2:<br>No curricular or pedagogical changes needed at this time. |
| Learning Outcome LS2: Metabolism and Homeostasis | Measure 1:<br>9 multiple choice exam questions.<br><br>Measure 2:<br>quiz scores for 7 modules that include this learning outcome (open book/note; up to 3 attempts allowed) | Measure 1<br>80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes | Measure 1:<br>75.7% of students met the 70% threshold for these questions; average score was 76.6%<br><br>Measure 2:<br>88.4% of students scored above 70% , with an average score of 93.0% | Measure 1:<br>Students are close to the threshold for demonstrating an understanding of metabolism and homeostasis.<br><br>Measure 2:<br>Students successfully demonstrated an understanding of metabolism and homeostasis. | Measure 1:<br>See note at the end of this table.<br><br>Measure 2:<br>No curricular or pedagogical changes needed at this time. |
| Learning Outcome LS3: Genetics and Evolution | Measure 1:<br>18 multiple choice exam questions.<br><br>Measure 2:<br>quiz scores for 8 modules that include this learning outcome (open | Measure 1<br>80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes | Measure 1:<br>68.1% of students met the 70% threshold for these questions; average score was 80.2%<br><br>Measure 2: | Measure 1:<br>While the class on average is scoring above 70%, some students need additional or different resources or assessments in order to demonstrate an understanding of genetics and evolution. | Measure 1:<br>See note at the end of this table.<br><br>Measure 2:<br>No curricular or pedagogical changes needed at this time. |

| Evidence of Learning: General Education Area LS | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>Students will… | Method of Measurement | Threshold for Evidence of Student Learning | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
| | book/note; up to 3 attempts allowed) | | 91.2% of students scored above 70% , with an average score of 90.0% | Measure 2:<br>Students successfully demonstrated an understanding of genetics and evolution. | |
| Learning Outcome LS4:<br>Ecological Interactions | Measure 1:<br>15 multiple choice exam questions.<br><br>Measure 2:<br>quiz scores for 12 modules that include this learning outcome (open book/note; up to 3 attempts allowed) | Measure 1<br>80% of students score 70% or higher on multiple choice exam questions<br><br>Measure 2:<br>80% of students score 70% or higher on the quizzes | Measure 1:<br>81.1% of students met the 70% threshold for these questions; average score was 83.3%<br><br>Measure 2:<br>93.8% of students scored above 70% , with an average score of 91.2% | Measure 1:<br>Students successfully demonstrated an understanding of ecological interactions.<br><br>Measure 2:<br>Students successfully demonstrated an understanding of ecological interactions. | Measure 1:<br>No curricular or pedagogical changes needed at this time.<br><br>Measure 2:<br>No curricular or pedagogical changes needed at this time. |

Exams are in ChiTester. Quizzes are in Canvas. Data from exams and quizzes are in Excel files.

This assessment reports the first two offerings of a revised version of the online BTNY 1203 that had exercises and quizzes that specifically focused on data analysis and problem solving. There were a total of eight problem solving quizzes, each tied to a relevant module topic. In Spring 2017, the textbook for the class was changed from *Introductory Plant Biology* (McGraw-Hill) to *Botany for Dummies*. While the traditional textbook has better artwork, the text of the Dummies book is more readable. The thinking is that a more straightforward text might help in getting concepts across in an online class. *Botany for Dummies* is also being used in face-to-face sections as of Fall 207.

**Botany LS 1203 (Plant Biology), Fall 2016 Section 23923**

| Evidence of Learning: General Education Area [LS] | | | | | |
|---|---|---|---|---|---|
| **Measurable Learning Outcome**<br><br>**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:<br><br>S1:<br>Nature of Science | a) 4 multiple choice questions on 1 exam | a) 65% or higher on multiple choice exam questions | a) 85.83% average on questions | Students successfully demonstrated an understanding of the nature of science. | None |
| Learning Outcome 2:<br><br>S2:<br>Integration of Science | | a) 65% or higher on multiple choice quiz questions | | | Need to add assessment to Chi tester exams or keep photocopies of all quizzes |
| Learning Outcome 3:<br><br>S3:<br>Science and Society | a) 1 short answer questions on exam 1<br><br>b) 9 Final exam questions | a) 65% or higher on exam questions<br><br>b) 65% or higher on exam questions | a) 99.44% average on question<br><br>b) 94.23% average on final exam questions | Students successfully demonstrated an understanding of science and society. | None |
| Learning Outcome 4:<br><br>S4:<br>Problem Solving and Data Analysis | 4 multiple choice questions on 1 exam | a) 65% or higher on multiple choice exam questions | | Students successfully demonstrated an understanding of problem solving and data analysis | Incorporate more problem solving and data analysis that is not genetics problems |
| Learning Outcome 5:<br><br>LS1:<br>Levels of Organization | a) 14 multiple choice questions on exam 1<br><br>b) 3 multiple choice questions on exam 2 | a) 65% or higher on multiple choice exam questions<br><br>b) 65% or higher on multiple choice exam questions | a) 69.88% average on Exam 1 questions<br>b) 82.74% average on Exam 2 questions | Students successfully demonstrated an understanding of the levels of organization. | None |
| Learning Outcome 6:<br><br>LS2:<br>Metabolism and Homeostasis | a) 1 multiple choice question on exam 1 | a) 65% or higher on multiple choice exam questions<br><br>b) 65% or higher on multiple | a) 83.33% average on the question<br><br>b) 59.08% average on the questions | Students successfully demonstrated an understanding of metabolism and homeostasis. | Spend more time on Photosynthesis and Respiration. Include more active learning techniques and assessments of |

| Evidence of Learning: General Education Area [LS] | | | | | |
|---|---|---|---|---|---|
| **Measurable Learning Outcome**<br><br>**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) 12 multiple choice questions on exam 2 | choice exam questions | | | understanding before exams |
| Learning Outcome 7:<br><br>LS3:<br>Genetics and Evolution | a) 12 multiple choice questions on exam 1<br><br>b) 10 multiple choice questions and 1 short answer on exam 2<br><br>c) 1 short answer question on Final Exam | a) 65% or higher on multiple choice exam questions<br><br>b) 65% or higher on multiple choice exam questions<br><br>c) 65% or higher on exam questions | a) 54.44% average on the questions<br><br>b) 73.54% average on questions<br><br>c) 95.19% average on the final exam question | Students successfully demonstrated an understanding of genetics and evolution. | |
| Learning Outcome 8:<br><br>LS4:<br>Ecological Interactions | a) 2 short answer questions on Exam 2<br><br>b) 2 short answer questions on Final Exam | a) 65% or higher on exam questions<br><br>b) 65% or higher on exam questions | a) 76.15% average on exam 2 questions<br><br>b) 95.58% average on Final exam questions | Students successfully demonstrated an understanding of ecological interactions | Incorporate more multiple choice assessment questions |

**Botany LS 1203 (Plant Biology), Fall 2016 Section 23930**

| Evidence of Learning: General Education Area [LS] | | | | | |
|---|---|---|---|---|---|
| **Measurable Learning Outcome**<br><br>**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:<br><br>S1:<br>Nature of Science | a) 4 multiple choice questions on 1 exam | a) 65% or higher on multiple choice exam questions | a) 89.41% average on questions | Students successfully demonstrated an understanding of the nature of science. | None |
| Learning Outcome 2:<br><br>S2:<br>Integration of Science | | | | | Need to add assessment to Chi tester exams or keep photocopies of all quizzes |
| Learning Outcome 3:<br><br>S3:<br>Science and Society | a) 1 short answer question on exam 1<br><br>b) 9 Final exam questions | a) 65% or higher on exam questions<br><br>b) 65% or higher on exam questions | a) 99.44% average on question<br><br>b) 94.23% average on final exam questions | Students successfully demonstrated an understanding of science and society. | None |
| Learning Outcome 4:<br><br>S4:<br>Problem Solving and Data Analysis | a) 3 multiple choice questions on 1 exam | a) 65% or higher on multiple choice exam questions | a) 74.01% average on exam questions | Students successfully demonstrated an understanding of problem solving and data analysis | Incorporate more problem solving and data analysis that is not genetics problems |
| Learning Outcome 5:<br><br>LS1:<br>Levels of Organization | a) 8 multiple choice questions on exam 1<br><br>c) 1 multiple choice question on exam 2 | a) 65% or higher on multiple choice exam questions<br><br>c) 65% or higher on multiple choice exam questions | a) 80.93% average on Exam 1 questions<br><br>c) 84.62% average on Exam 2 question | Students successfully demonstrated an understanding of the levels of organization. | None |
| Learning Outcome 6:<br><br>LS2:<br>Metabolism and Homeostasis | a) 8 multiple choice questions on exam 2 | a) 65% or higher on multiple choice exam questions | a) 76.2% average on the questions | Students successfully demonstrated an understanding of metabolism and homeostasis. | Spend more time on Photosynthesis and Respiration. Include more active learning techniques and assessments of |

| Evidence of Learning: General Education Area [LS] | | | | | |
|---|---|---|---|---|---|
| **Measurable Learning Outcome**<br><br>**Students will…** | **Method of Measurement** | **Threshold for Evidence of Student Learning** | **Findings Linked to Learning Outcomes** | **Interpretation of Findings** | **Action Plan/Use of Results** |
| | | | | | understanding before exams |
| Learning Outcome 7:<br><br>LS3:<br>Genetics and Evolution | a) 8 multiple choice questions on exam 1<br><br>b) 7 multiple choice questions on exam 2<br><br>c) 1 short answer question on Final Exam | a) 65% or higher on multiple choice exam questions<br><br>b) 65% or higher on multiple choice exam questions<br><br>c) 65% or higher on exam questions | a) 72.46% average on the questions<br><br>b) 75.55% average on questions<br><br>c) 95.19% average on the final exam question | Students successfully demonstrated an understanding of genetics and evolution. | |
| Learning Outcome 8:<br><br>LS4:<br>Ecological Interactions | a) 2 short answer questions on Final Exam | a) 65% or higher on exam questions | a) 95.58% average on Final exam questions | Students successfully demonstrated an understanding of ecological interactions | Incorporate more multiple choice assessment questions |

## Botany 1303 Plants in Human Affairs Spring 2017 (N=17)

| Evidence of Learning: General Education Area NS/LS | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>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:<br>NS1- Nature of Science | Measure 1<br>15 multiple choice questions spread across 2 exams | Measure 1<br>65% or higher on exam questions | Measure 1:<br>95% of students met the 65% threshold | Measure 1:<br>students understand the Nature of Science | Measure 1:<br>No curricular or pedagogical changes needed at the time |

| Evidence of Learning: General Education Area NS/LS | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>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:<br>NS2 - Integration of Science | Measure 1:<br>4 multiple choice questions spread across 1 exam | Measure 1:<br>65% or higher on exam questions | Measure 1:<br>41% of students met the 65% threshold | Measure 1:<br>students struggle with understanding of the integration of Science | Measure 1:<br>Incorporate more practice and more examples into curriculum |
| Learning Outcome 3:<br>NS3 - Science and Society | Measure 1:<br>36 questions (multiple choice, essay, matching etc) spread across 4 exams<br><br>Measure 2:<br>Essay assignment where students interview a person working with plants and summarize what they have learned in terms of how plants affect people and society | Measure 1:<br>65% or higher on exam questions<br><br>Measure 2:<br>65% or higher for written assignment | Measure 1:<br>47% of students met the 65% threshold<br><br>Measure 2:<br>The average score for this assignment was 74%. 6 % of students did not finish the assignment, even though it counts for 10% of the final grade | Measure 1:<br>students struggle with understanding of Science & Society<br><br>Measure 2:<br>students successfully demonstrated an understanding and appreciation of Science & Society | Measure 1:<br>Emphasize connection of Science and Society more<br><br>Measure 2:<br>No curricular or pedagogical changes needed at the time |
| Learning outcome 4:<br>NS4 – Problem Solving & Data Analysis | Measure 1:<br>32 multiple choice questions across 4 exams | Measure 1:<br>65% or higher on exam questions | Measure 1:<br>26.4% of students met the 65% threshold | Measure 1:<br>Students struggled with Data Analysis | Measure 1:<br>Incorporate more practice and more examples into curriculum and expose students to wider variety of data analysis problems and questions |
| Learning outcome 1:<br>LS1 – Levels of organization | Measure 1:<br>51 multiple choice questions across 4 exams | Measure 1:<br>65% or higher on exam questions | Measure 1:<br>51% of students met the 65% threshold | Measure 1:<br>Students struggle with understanding the levels of organization in Botany | Measure 1:<br>Incorporate more examples outside the book to emphasize and diversify |

| Evidence of Learning: General Education Area NS/LS | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>Students will… | Method of Measurement | Threshold for Evidence of Student Learning | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
| | | | | | exposure to these principles |
| Learning outcome 2:<br>LS2 – Metabolism & Homeostasis | Measure 1:<br>22 multiple choice questions across 3 exams | Measure 1:<br>65% or higher on exam questions | Measure 1:<br>44% of students met the 65% threshold | Measure 1:<br>students struggle with understanding metabolism & homeostasis | Measure 1:<br>Reduce level of detail and spend more time on what is being discussed for deeper understanding |
| Learning outcome 3:<br>LS3 – Genetics & Evolution | Measure 1:<br>31 multiple choice questions across 4 exams | Measure 1:<br>65% or higher on exam questions | Measure 1:<br>63% of students met the 65% threshold | Measure 1:<br>students struggle with understanding genetics & evolution | Measure 1:<br>Incorporate more examples into curriculum, reduce level of detail, take more time |
| Learning outcome 4:<br>LS4 – Ecological Interactions | Measure 1:<br>25 multiple choice, matching questions across 3 exams | Measure 1:<br>65% or higher on exam questions | Measure 1:<br>69% of students met the 65% threshold | Measure 1:<br>students successfully demonstrated an understanding of ecological interactions | Measure 1:<br>No curricular or pedagogical changes needed at the time |

*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):
Students complained about too many details. Will reduce level of detail and number of different topics presented in class in favour of deeper discussion of each presented topic.

**BOTANY LS 1403 (Environment Appreciation), Fall 2016 (N=79)**

| Evidence of Learning: General Education Area [fill in] | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>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: 8 Multiple Choice Questions spread across 3-7 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 94% of the students correctly answer 65% or higher | Measure 1: Students were very successful for this learning outcome | Measure 1: No curricular or pedagogical changes needed at this time |
| NS2: Integration of Science | Measure 2: 4 Multiple Choice Questions spread across 2 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 82% of the students correctly answer 65% or higher | Measure 1: Students were very successful for this learning outcome | Measure 1: Maintain records of student answers in Chi-Tester where they can be summarized in the same way as the threshold |
| NS3: Science and Society | Measure 1: 4 Multiple Choice Questions spread across 3-7 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 92% of the students correctly answer 65% or higher | Measure 1: Students were very successful for this learning outcome | Measure 1: Maintain records of student answers in Chi-Tester where they can be summarized in the same way as the threshold |
| NS4: Problem Solving and Data Analysis | Measure 1: 4 Multiple Choice Questions spread across 3-7 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 92% of the students correctly answer 65% or higher | Measure 1: Students were very successful for this learning outcome | Measure 1: Maintain records of student answers in Chi-Tester where they can be summarized in the same way as the threshold |
| LS1: Levels of Organization | Measure 1: 5 Multiple Choice Questions spread across 3-7 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 63% of the students correctly answer 65% or higher | Measure 1: Students were successful for this learning outcome, but it was one of the more difficult for them | Measure 1: Maintain records of student answers in Chi-Tester where they can be summarized in the same way as the threshold |
| LS2: Metabolism and Homeostasis | Measure 1: 5 Multiple Choice Questions spread across 3-7 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 63% of the students correctly answer 65% or higher | Measure 1: Students were successful for this learning outcome, but it was one of the more difficult for them | Measure 1: Maintain records of student answers in Chi-Tester where they can be summarized in the |

| Evidence of Learning: General Education Area [fill in] | | | | | |
|---|---|---|---|---|---|
| Measurable Learning Outcome<br><br>Students will… | Method of Measurement | Threshold for Evidence of Student Learning | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
| | | | | | same way as the threshold |
| LS3: Genetics and Evolution | Measure 1: 8 Multiple Choice Questions spread across 3-7 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 87% of the students correctly answer 65% or higher | Measure 1: Students were very successful for this learning outcome | Measure 1: Maintain records of student answers in Chi-Tester where they can be summarized in the same way as the threshold |
| LS4: Ecological Interactions | Measure 1: 8 Multiple Choice Questions spread across 3-7 exams | Measure 1: 60% of the students correctly answer 65% or higher | Measure 1: 93% of the students correctly answer 65% or higher | Measure 1: Students were very successful for this learning outcome | Measure 1: Maintain records of student answers in Chi-Tester where they can be summarized in the same way as the threshold |

*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):
Students were successful at meeting outcomes.

Evidence of Learning Worksheet: **General Education Area LS**
**Course: Botany 1403 Environment Appreciation Spring 2015 N=94**

| | | | | | |
|---|---|---|---|---|---|
| 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 NS1: Nature of Science | Measure 1:<br>Seven Multiple Choice questions on exams 1, 2 and 4. | Measure 1:<br>70% or higher on multiple choice exam questions. | Measure 1:<br>87% of students met the 70% threshold for these questions. | Measure 1:<br>Students successfully demonstrated an | Measure 1:<br>No curricular or pedagogical changes needed at this time. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | understanding of the nature of science. | |
| Learning Outcome NS2: Integration of Science | Measure 1: 5 multiple choice questions on exams 2 and 4. | Measure 1: 70% or higher on multiple choice exam questions. | Measure 1: 81% of students met the 70% threshold for these questions. | Measure 1: Students successfully demonstrated an understanding of the integration of science. | Measure 1: No curricular or pedagogical changes needed at this time. |
| Learning Outcome NS3: Science and Society | Measure 1: Five Multiple choice questions on exams 1, 2, 3 and 4. | Measure 1: 70% or higher on multiple choice exam questions. | Measure 1: 91% of students met the 70% threshold for these questions. | Measure 1: Students successfully demonstrated an understanding of science and society. | Measure 1: No curricular or pedagogical changes needed at this time. |
| Learning Outcome NS4: Problem Solving and Data Analysis | Measure 1: 6 multiple choice questions requiring calculations or graph interpretation on exams 1 and 4. | Measure 1: 70% or higher on multiple choice exam questions. | Measure 1: 79% of students met the 70% threshold for these questions. | Measure 1: Students successfully demonstrated an understanding of problem solving and data analysis. | Measure 1: No curricular or pedagogical changes needed at this time. |
| Learning Outcome LS1: Levels of Organization | Measure 1: Five multiple choice questions on exam 2. | Measure 1: 70% or higher on multiple choice exam questions. | Measure 1: 83% of students met the 70% threshold for these questions. . | Measure 1: Students successfully demonstrated an understanding of levels of organization. | Measure 1: No curricular or pedagogical changes needed at this time. |
| Learning Outcome LS2: Metabolism and Homeostasis | Measure 1: Four multiple choice questions on exam 2 | Measure 1: 70% or higher on multiple choice exam questions. | Measure 1: 74% of students met the 70% threshold for these questions. | Measure 1: Students successfully demonstrated an understanding of metabolism and homeostasis. | Measure 1: No curricular or pedagogical changes needed at this time. |
| Learning Outcome LS3: Genetics and Evolution | Measure 1: Eight multiple choice questions on exam 2 which included interpretations of a cladogram. | Measure 1: 70% or higher on multiple choice exam questions. | Measure 1: 76% of students met the 70% threshold for these questions. | Measure 1: Students successfully demonstrated an understanding of genetics and evolution, however improvement will be sought. | Measure 1: More practice is called for in this area. A class exercise will be added. |
| Learning Outcome LS4: Ecological Interactions | Measure 1: Six multiple choice questions on exams 2 and 4. | Measure 1: 70% or higher on multiple choice exam questions. | Measure 1: 88% of students met the 70% threshold for these questions. | Measure 1: Students successfully demonstrated an understanding of ecological interactions. | Measure 1: No curricular or pedagogical changes needed at this time. |

Evidence of Learning: **General Education, Life Science Courses**
Course: BTNY/MICR/ZOOL 1370
Term: Spring 2017
Sections: One section taught in Spring Semester 2017 (*n* = 17 students)

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Nature of Science**.<br>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. | Students will demonstrate their understanding by performance answering exam questions focused on the nature of science. | A set of 7 multiple choice & matching questions | Combined student performance of 65% or higher | Combined student performance was 67% | Students understand the nature of science | No changes needed |

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Integration of Science**<br>All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated. | Students will demonstrate their understanding by performance answering exam questions focused on the integration of science. | A set of 4 multiple choice & matching questions | Combined student performance of 65% or higher | Combined student performance was 54% | Students understand the integration of science | Questions will be increased & improved |



Report due 11/15/2017

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Science & Society**<br>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 demonstrate their understanding by performance answering exam questions focused on science and society. | A set of 20 multiple choice & matching questions | Combined student performance of 65% or higher | Combined student performance was 57% | Students understand the role of science in society | Questions will be increased & improved |

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Problem Solving & Data Analysis**<br>Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner. | Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis. | A set of 34 multiple choice & matching questions | Combined student performance of 65% or higher | Combined student performance was 58% | Students understand problem solving and data analysis | Questions will be improved |

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Levels of Organization** All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems. | Students will demonstrate their understanding by performance answering exam questions focused on levels of organization. | A set of 39 multiple & matching choice questions | Combined student performance of 65% or higher | Combined student performance was 64% | Students understand levels of organization | Questions will be improved |

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Metabolism and homeostasis:** Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism. | Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis. | A set of 45 multiple choice 7 matching questions | Combined student performance of 65% or higher | Combined student performance was 61% | Students understand metabolism and homeostasis | Questions will be improved |

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Genetics and evolution:** Shared genetic processes and evolution by natural selection are universal features of all life | Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution. | A set of 63 multiple choice & matching questions | Combined student performance of 65% or higher | Combined student performance was 62% | Students understand genetics and evolution | Questions will be improved |

| Gen Ed Learning Goal | Measurable Learning Outcome | Measure | Threshold | Findings Linked to Learning Outcomes | Interpretation of Findings | Action Plan/Use of Results |
|---|---|---|---|---|---|---|
| **Ecological interactions:** All organisms, including humans, interact with their environment and other living organisms. | Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions. | A set of 38 multiple choice & matching questions | Combined student performance of 65% or higher | Combined student performance was 57% | Students understand ecological interactions | Questions will be improved |

G. **Summary of Artifact Collection Procedure**

| Artifact | When/How Collected? | Where Stored? |
|---|---|---|
| **BTNY LS1203 online**<br>4 exams and 23 quizzes | Throughout the semester | Exams are in ChiTester. Quizzes are in Canvas. Data from exams and quizzes are in Canvas and in Excel files. |

| | | |
|---|---|---|
| **BTNY LS1203**<br>Scores for exams | Exams are given 3-4 times per semester | Exams and results are in ChiTester |
| Written assignments and scoring rubric | Three assignments per semester | Student papers and results are in Canvas |
| **BTNY LS1303**<br>Scores for exams | Exams are every given 3-4 times per semester | Exams and results are in ChiTester |
| **BTNY LS1403**<br>Scores for exams | Three exams throughout the semester | Excel file, Word File, and ChiTester |
| Group papers | Throughout the semester | Excel file & hard copies in file cabinet |
| | | |
| **BTNY LS1403 Fall 2016 Root**: Canvas exam results | 7 times per semester | Chi Tester |
| BTNY 3454 Plant Ecology Spring 2016 Root: exam scans | 3 times per semester for quizzes, once per semester for project results | Pdf scans of quizzes, project reports, and Powerpoint slides from student project presentations |
| **BTNY 2104**<br>Scores for 4 exams, 18 lab exercises, 6 quizzes | Throughout the semester | Canvas<br>Excel file |
| **BTNY 2114**<br>Scores for quizzes, exams, and lab reports | Throughout the semester | Canvas<br>Excel file |
| **BTNY 3214**<br>Scores for exams and student activities | Throughout the semester | Canvas |
| **BTNY 3303**<br>Scores for 3 exams, 6 lab reports, and 9 quizzes | Throughout the semester | Canvas<br>Excel file |
| **BTNY 3454**<br>Scores for exams and student activities | Throughout the semester | Canvas |

| | | |
|---|---|---|
| **BTNY 3473**<br>Scores for 2 exams | mid- semester and end of semester | hard copies |
| **BTNY 3583**<br>Scores for 3 exams, 3 lab reports, and 2 oral presentations | Throughout the semester | Canvas |
| **BTNY 3643**<br>Scores for 14 exams | Throughout the semester | hard copies |
| **BTNY 4890**<br>Co-op work experience proposals, supervisor assessments, and student self-assessments | End of the semester | Electronic and hard copies |
| **BTNY 4980**<br>Essay rubric | End of the semester | Electronic copies of completed rubrics |
| Portfolio rubric | End of the semester | Electronic copies of completed rubrics |
| **BTNY 4990**<br>Slides, outlines and abstracts from senior seminar presentations | End of the semester | Electronic copies |

Summary Information (as needed)

**Appendix A**

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

| Date of Program Review: 1 April 2013 | Recommendation | Progress Description |
|---|---|---|
| Standard B, Curriculum. | The Department should carefully reassess the curriculum in terms of serving both botany majors and general education. | BTNY 2104 has been revised to meet LS requirements. We are waiting for the lifting of the moratorium on new general education classes. The requirements for the minor and BIS are being changed to decrease lower division requirements and provide more opportunities for taking upper |

| | | |
|---|---|---|
| | | division courses. Active learning strategies are being used more in general education classes. The learning goals for the curriculum are being reviewed and revised in light of "Vision and Change." This is estimated to be a two year process. |
| Standard B, Curriculum. | The Department should pursue additional interdepartmental cooperation in an introductory biology course, or sequence, as recommended in "Vision and Change" and including cell/molecular biology, genetics, evolution, and ecology | The three life science department chairs meet every two weeks to report on research on other institutions, discuss course content and how to work the laboratory portion of the class, and talk about common goals in implementation of Vision and Change. We are submitting curriculum proposals to cross-list selected upper division courses across the departments. rporate Vision and Change goals into curricula. |
| Standard D, Academic Advising. | We recommend that student advising be distributed among the faculty. | This began in Fall 2017. |
| Standard E Faculty. | New faculty hires should complement the current strengths of the Department and add to the Department's teaching and research capacity. | New faculty now constitute 50% of the Botany faculty. Two complement our existing strength in preparing students for employment with BLM, Forest Service, USGS, and similar federal and state agencies. The third strengthens training of students for work in the natural products industry, pharmaceuticals, and chemical ecology. Due to their efforts, five classes now have substantially enhanced laboratory or filed experiences. Two of the new faculty have external grants and have hired students as research assistants. |

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 2016-17 | |
|---|---|
| Headcount | 10 |
| With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution) | 7 |
| Full-time Tenured | 3 |
| Full-time Non-Tenured (includes tenure-track) | 3 |
| Part-time and adjunct | 1 |
| | |
| With Master's Degrees | 3 |
| Full-time Tenured | 0 |
| Full-time Non-Tenured | 0 |
| Part-time and adjunct | 3 |
| | |
| With Bachelor's Degrees | 0 |
| Full-time Tenured | 0 |
| Full-time Non-tenured | 0 |
| Part-time and adjunct | 0 |
| | |
| Other | 0 |
| Full-time Tenured | 0 |
| Full-time Non-tenured | 0 |
| Part-time | 0 |
| Total Headcount Faculty | 10 |
| Full-time Tenured | 3 |
| Full-time Non-tenured | 3 |
| Part-time | 4 |

**Please respond to the following questions.**

1) Based on your program's assessment findings, what subsequent action will your program take?

We are reviewing course learning objectives across the curriculum in light of the AAAS Vision and Change document. With this, we will update the curriculum grid. This will give us learning objectives for majors courses that align better with those for LS and what incoming students are starting to encounter in K-12 due to NGSS (Next Generation Science Standards).

We want to better coordinate assessment questions for general education learning outcomes across all Botany general education offerings. We have started to diversify assessment measures in order to get a fuller indication of student success in general education classes beyond multiple choice exams.

Several faculty are involved with pilot projects on incorporating a Big Question and GELOs into their general education classes as part of the university general education revitalization.

We are switching to low cost textbooks (such as the Dummies series) or free online textbooks (Open Stax) in relevant general education classes in hopes that students who try to succeed in a class without buying a standard textbook will use these resources. We are also starting to post department–generated 5-8 minute video lectures for our lower division classes to cover gaps in the content available in the Bozeman Science videos we have been using.

With this report, we are using higher standards for student achievement for some of the classes. All classes will use these standards in next year's report. Instructors have already taken note of areas of concern (see Additional Narrative with some course assessments).

2) We are interested in better understanding how departments/programs assess their graduating seniors. Please provide a short narrative describing the practices/curriculum in place for your department/program. Please include both direct and indirect measures employed.

The most distinctive assessment strategy for the Botany Program is the Botany Student Portfolio. The Portfolio consists of a substantial essay, worth 30% of the portfolio grade. The essay is a culmination of the knowledge that the student gained throughout their studies at WSU. Additional evidence of skills development, self-assessment skills, career preparation, as well as creativity, ethics, and an appreciation for diversity is also required. In addition, all students must have a capstone experience (thesis or directed research, paid or volunteer Botany work experience, or a library research project) that they present orally. The portfolio requires a written statement as to how the capstone experience impacted them (see Artifacts Collection in G). http://www.weber.edu/botany/Student_Portfolio.html