

Academic Assessment Report
BEST PRACTICES IN STUDENT LEARNING OUTCOMES
(B.S. DEGREE/ ENVIRONMENTAL, SOIL, AND WATER SCIENCE)
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Contact

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CSES Mission

The mission of the Department of Crop, Soil, and Environmental Sciences is to provide superior education programs at the undergraduate and graduate levels, conduct innovative research and extension programs in the crop, soil, and environmental sciences and provide superior service for citizens of Arkansas and the nation.

Program Goals

(Program goals are broad general statements of what the program intends to accomplish and describes what a student will be able to do after completing the program. The program goals are linked to the mission of the university and college.)

1. Graduates have the discipline-specific knowledge in soil, water, and environmental sciences required to perform successfully in private, government, or academic entry-level positions.
2. Graduates are able to critically analyze, synthesize, and evaluate new information to make informed decisions.
3. Graduates have the ability to solve complex, multidisciplinary problems.
4. Graduates are able to prepare and synthesize information to effectively communicate, both orally and in writing.

Student Learning Outcomes

(Student Learning Outcomes are defined in terms of the knowledge, skills, and abilities that students will know and be able to do as a result of completing a program. These student learning outcomes are directly linked to the accomplishment of the program goals.)

1. Students will demonstrate the discipline specific knowledge required to function as environmental, soil, and/or water science professionals.
2. Students will demonstrate the ability to critically evaluate situations or scenarios to arrive at well thought out and supported decisions and outcomes.
3. Students will demonstrate the ability to work through and solve complex, multidisciplinary problems.
4. Communication skills
 - a. Students will demonstrate the skills required to effectively communicate technical/scientific information in oral platforms.
 - b. Students will demonstrate the ability to integrate, organize, and effectively present written reports of technical/scientific information.

Assessment Measure for Outcome 1

- Achievement is measured using **pre- and post-assessments**.
- This is a **direct** measure of student learning.
- Pre- and post-assessments of 20 test questions from the ESWS faculty represent essential discipline specific knowledge and skills of students completing an environmental, soil, and water science degree.
- The initial assessment was generated by ESWS faculty during the spring 2016. Following performance and feedback from students in 2016, the pre/post-test was reviewed and three questions were revised while two were deleted and replaced with new questions during 2017. Although content overlaps, questions could roughly be divided into 5 water, 7 environmental, and 8 soil science based questions. Questions were conceptual in nature or calculation based. If the calculation based questions are separated and considered a separate category, the tests consists of 4 water, 7 environmental, and 4 soil science based and 5 calculation based questions.
- Target populations are at least half of the incoming fall freshmen and half of the spring graduating ESWS class.
- Scores are calculated for each assessment with the range, average, and median calculated for the pre- and post-assessments to calculate the change in scores from pre- to post-assessment.

Acceptable and Ideal Targets (not required for indirect measures)

- The use of pre- and post-assessments is still a relatively new initiative for CSES; therefore, we are unsure of how “incoming” students in particular will perform on the pre-assessment.
- Acceptable: We are initially targeting a 50% increase in the mean and/or median test scores between the two populations (incoming and graduating students).
- Ideal: We are initially targeting an 80% increase in the mean and/or median test scores between the two populations (incoming and graduating students).

Key Personnel (who is responsible for the assessment of this measure)

- ENSC 1001L Environmental Science Laboratory (FA, SP) or CSES 1203 (FA, SP), required courses for all ESWS students, are the target courses for the pre-test.
- ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population, are the target courses for the post-test.

Summary of Findings

- The pre- and post-assessments were not administered during 2018-2019.
- Seven senior ESWS students prepared for and completed the national General Environmental Science certification examination in March 2019 and five out of seven received passing scores indicating that they demonstrated baseline fundamental proficiency in environmental science knowledge. The exam categorizes knowledge in five sections: 1) Basic Sciences, 2) Math and Statistics, 3) Monitoring (Air and Water), 4) Waste Management, Treatment, and Disposal, and 5) Environmental Science, Management, and Policy.

Recommendations

- The pre/post-assessment needs to be administered to students each year. The assessment is an evolving assessment; continual data collection will help refine the assessment to provide the most useful data for program assessment purposes. Questions span from straight knowledge

based questions that required only memorized information to answer correctly to comprehension, application, and analysis questions. Faculty should continue to review the questions on the ESWS pre/post-assessment to determine if the questions address the most important concepts and technical skills in ESWS.

- A challenge in the ESWS degree plan is that students have flexibility in course choice, so not all graduates complete the same courses. The ESWS faculty need to continually review and articulate expectations of ESWS related knowledge within the knowledge dimension (factual, conceptual, procedural, and metacognitive). Faculty also need to review essential knowledge in ESWS for the target cognitive (remembering, understanding, applying, analyzing, evaluating, and creating) and affective levels (receiving, responding, valuing, organizing, and internalizing/characterizing).

Assessment Measure for Outcome 2

- Achievement will be measured using a critical thinking scenario and rated using a **critical thinking rubric**.
- This is a **direct** measure of student learning.
- Assessment scenarios will be generated to cover application of critical thinking in environmental, soil, water, or ecological contexts.

Acceptable and Ideal Targets (not required for indirect measures)

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

Key Personnel (who is responsible for the assessment of this measure)

- ENSC 3933 Environmental Ethics (SP), ENSC 4023 Water Quality (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population, are the target courses for the critical thinking assessment.

Summary of Findings

- The term paper for 22 students in ENSC 3933 was scored critical thinking skills. Explanation of issues ranged from basic to proficient, with median performance between basic and proficient level (2.5). Evidence, influence of context and assumptions, generation the student's position (perspective, thesis/hypothesis), and conclusions and related outcomes were rated a median basic level score of 2.0 and ranged from beginning to proficient with conclusions ranging from basic to proficient. Both the mean and median were below proficient for all criteria evaluating critical thinking.
- Half of the students demonstrated proficiency explaining issues; 2) 41% demonstrated proficiency supplying and synthesizing evidence and generating their position (perspective, thesis/hypothesis), while only 27% demonstrated proficiency identifying influence of context and assumptions, and 36% demonstrated proficiency drawing conclusions and relating outcomes.

Recommendations

- Critical thinking requires analysis, synthesis, and evaluation, i.e. learning at high cognitive levels. Faculty need to consider and articulate where and when students have opportunities to develop (learn and repeatedly practice) those cognitive skills within the curriculum. If assessment

continues to show students achieving at lower than proficient level, learning opportunities within the curriculum should be enhanced.

Assessment Measure for Outcome 3

- Achievement will be measured using a problem based scenario and scored using a **problem solving rubric**.
- This is a **direct** measure of student learning.
- Assessment scenarios will be generated to cover application of problem solving in environmental, soil, water, or ecological contexts.

Acceptable and Ideal Targets (not required for indirect measures)

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

Key Personnel (who is responsible for the assessment of this measure)

- ENSC 4023 Water Quality (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population, are the target courses.

Summary of Findings

- Problem solving ability was not assessed during 2018-2019.

Recommendations

- Problem solving ability should be assessed during 2019-2020. Assessment should highlight areas where students are achieving at lower than proficient level.
- Problem solving does require comprehension, application, analysis, synthesis, and evaluation, i.e. learning at high cognitive levels; therefore, in general, faculty should continue to consider and articulate where and when students have opportunities to develop (learn and repeatedly practice) those cognitive skills within the curriculum.

Assessment Measure for Outcome 4a

- Achievement will be assessed using an **oral communication rubric** during oral presentations where the student has compiled and evaluated the scientific literature as part of a class project and/or completed an independent research project as part of a special problems, research project or internship class.
- This is a **direct** measure of student learning.

Acceptable and Ideal Targets (not required for indirect measures).

- Acceptable: 70% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

Key Personnel (who is responsible for the assessment of this measure).

- CSES 3023 CSES Colloquium (FA), an upper division, professional development, communication-intensive course that should capture at least half of the senior population, is the target course for the assessment.

- CSES 462V Internship, Special Problems, and Honors thesis defenses provide other opportunities where students present and the oral communication rubric can be used to evaluate communication skills.

Summary of Findings

- Seventeen ESWS students' oral communication skills were evaluated based on a 10-12 minute presentation of literature research of a topic chosen by teams of students. Each student had an objective within one team thesis that they had to collect, analyze, and scientific data to present to their peers. Each student had to contribute to presentation development, slide generation, oral delivery, and composition of an executive summary. Scores were assessed for organization, language, delivery, supporting material, and central message. The breakdown is as follows:
 Organization and Central Message: basic to mastery with an average between basic and proficient and median of proficient achievement; 63% of students performed at the proficient level;
 Language: basic to mastery with an average of 2.6 and median of 2.5 in between basic and proficient level; 47% of students performed at the proficient level;
 Delivery and Supporting Material: beginning/developing to mastery with averages of 2.4 and 2.1 and medians of 2.5 and 2.0 for delivery and supporting material, respectively, which fall in between basic and proficient or at the basic level (e.g. 2.0). Only 37 and 21 % of students performed at the proficient level for delivery and supporting material, respectively.

Recommendations

- Assessment showed that students' achievement in oral presentations were quite variable and many students did not perform at a proficient level for senior undergraduate students.
- We will continue to collect data during the next few years to assess performance in oral communication. Supporting and delivering a concise, well supported scientific presentation can be difficult, especially when working with others. However, the development of these skills are critical to functioning in the workforce in the applied sciences. These are skills that employers often complain are lacking in college graduates.

Assessment Measure for Outcome 4b

- Achievement will be assessed using a **written communication rubric** for laboratory reports and technical/scientific proposals or term papers where the student has analyzed, synthesized and evaluated information from independent sources as part of a class project and/or completed an independent research project as part of a special problems, research project or internship class.
- This is a **direct** measure of student learning.

Acceptable and Ideal Targets (not required for indirect measures).

- Acceptable: 70% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

Key Personnel (who is responsible for the assessment of this measure).

- ENSC 3263 Environmental Soil Conservation (FA even), ENSC 4021L Water Quality Laboratory (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), and ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for

ESWS students that should capture at least half of the senior population, are the target courses for assessment of writing.

- CSES 462V Internship, Special Problems, and Honors thesis research provide opportunities where students have completed independent research projects provide other opportunities where students have to write papers in which they organize data and information they have analyzed, synthesized and evaluated to clearly and fluently convey a message.

Summary of Findings

- Writing skills were not assessed during 2018-2019.

Recommendations

- Initial assessment in 2016-2017 suggested that most students averaged a basic level of achievement in written communication skills. Assessment in 2017-2018 indicated that while most students may be proficient at expressing context and purpose in their writing, most writing skills remain at a basic level.
- Writing skills should be assessed during 2019-2020 to compare to initial assessment results. If future assessment data indicate less than desired proficiency, curriculum revision to include more opportunities for development of writing skills should be supported by administration.

Overall Recommendations

- Current assessment approaches are beginning to provide enough data to establish baseline understanding of student achievement given the measures implemented in 2016. Continued data collection during the 2019-2020 academic year will allow faculty to better evaluate if and where changes to the student learner outcomes, and/or curriculum would better serve ESWS students.

Action Plan

- Continued use and evaluation of the pre- and post-assessment and student learning outcome rubrics.
- Continued discussion about how best to implement rubrics in assessment. For example, ENSC 3933 frequency of offering has recently been increased from every other spring to every spring providing a new opportunity for evaluating critical thinking skills and possibly writing skills.

Supporting Attachments

- Pre-/post-assessment for ESWS program
- Critical thinking rubric adapted from Association of American Colleges and Universities
- Problem solving rubric adapted from Association of American Colleges and Universities
- Oral communication skills rubric adapted from Association of American Colleges and Universities
- Written communication skills rubric adapted from Association of American Colleges and Universities