Academic Assessment Report

BEST PRACTICES IN STUDENT LEARNING OUTCOMES
(B.S. DEGREE/ ENVIRONMENTAL, SOIL, AND WATER SCIENCE)
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Contact
Robert Bacon, Dept Head
Crop, Soil, and Environmental Sciences Dept.
115 Plant Science Bldg
479-575-5715
rbacon@uark.edu

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.)

5. Graduates have the discipline-specific knowledge in soil, water, and environmental sciences required to perform successfully in private, government, or academic entry-level positions.
6. Graduates are able to critically analyze, synthesize, and evaluate new information to make informed decisions.
7. Graduates have the ability to solve complex, multidisciplinary problems.
8. 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 will be measured using **pre- and post-assessments**.
- This is a ***direct*** measure of student learning.

- Learning will be measured by generating an assessment of 20 test questions from the ESWS faculty to cover environmental, soil, water, and ecological concepts. These areas represent essential concepts for discipline specific knowledge of students completing an environmental, soil, and water science degree.
- The initial assessment was generated by ESWS faculty during the spring 2016. Feedback and performance by graduating seniors in 2016 on the initial post-assessment questions was evaluated and several questions were revised partially or completely.
- Target populations are at least half of the incoming fall freshmen and half of the spring graduating ESWS class.
- Scores will be 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** (<u>not required</u> for indirect measures)

- The use of pre- and post-assessments are a 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), required course for all ESWS students, is the target course 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

- Rather than giving the pre-assessment for the first time in the fall 2016, we revised the pre- and post-assessment based on feedback from students on the initial post-assessment given during the spring 2016 and faculty review of the assessment. Part of the ESWS faculty considerations are levels of learning embodied in the questions. Students had commented that the initial assessment was "over-analytical" and requested more "real-world" questions. However, faculty did intentionally leave analytical questions on the assessment as this ability is essential to being a component applied scientist.

Recommendations

- The pre- and post-assessment need to be given to students during the 2017-2018 academic year and reevaluated. Faculty evaluation of the assessment (as of the curriculum) will be an iterative process until we are satisfied that we are capturing essential concepts and knowledge skills in this assessment.

Assessment Measure for Outcome 2

- Achievement will be measured using a critical thinking scenario (administered during class, potentially included on the post-assessment for learner outcome #1) 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 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

- Critical thinking was not evaluated during 2016-2017.

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. Opportunities for assessment should be sought in 2017-2018 to continue to evaluate if achievement is at an acceptable level.

Assessment Measure for Outcome 3

- Achievement will be measured using a problem based scenario (administered during class, potentially included on the post-assessment for learner outcome #1) 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 was not specifically evaluated using the assessment rubric during 2016-2017.

Recommendations

- Opportunities for assessment in problem solving should be sought during 2017-2018 to continue to evaluate if achievement is at an acceptable level. Referencing the rubrics when designing questions should help faculty develop scenarios and questions for use within ESWS courses. Furthermore, problem solving questions for assessment developed in conjunction with the use of the rubric should facilitate assessment of the student learning outcome.

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 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
- CSES Colloquium is a fall course, although not specifically required, is generally composed of a majority of ESWS students. Most students enroll in CSES 3023 as seniors, although some students are juniors when they take the course. In the fall 2016, 8 of the twelve students enrolled in the course were ESWS seniors.
- Performance was evaluated during a 10-12 minute presentation that was given as a member of a research team. Teams selected overarching topics and individuals' subtopics within a team supported a single overarching thesis. Students were taught how to work in a team, research and cite evidence, and develop and deliver a presentation to a scientific audience of peers. Scores were assessed for organization, language, delivery, supporting material, and central message. The breakdown is as follows:
  Organization: basic for the minimum to exemplary for the maximum with an average and median of proficient;
  Language: basic for the minimum to proficient for the maximum with an average in between and basic and proficient and a median level closer to basic;
  Delivery: basic for the minimum to proficient for the maximum with an average in between and basic and proficient and a proficient median;
  Supporting material: basic for the minimum to proficient for the maximum with an average and median achievement in between and basic and proficient;
  Central message: basic for the minimum to proficient for the median and the maximum with an average achievement in between and basic and proficient.

Recommendations
- Data collection will continue during the 2107-2018 academic year to assess performance in oral communication. More information is needed before any conclusions can be drawn about achievement in oral communication.

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

- ENSC 3263 Environmental Soil Conservation is a fall course offered in even years. Students have 14 weeks to prepare a 10-page minimum term paper.
- The written communication rubric was applied to the term papers for six senior ESWS students enrolled during the fall 2016 semester. Student learning outcomes assessed using the rubric include 1) Context of and Purpose for Writing, 2) Content Development, 3) Genre and Disciplinary Conventions, 4) Sources and Evidence, and 5) Control of Syntax and Mechanics.
- Ratings for each outcome ranged from developing to exemplary, except for Context of and Purpose for Writing which ranged from below developing to exemplary and Content Development which ranged from developing to proficient. The average for each outcome hovered around a basic level.

Recommendations

- Data will be collected in future years to evaluate whether this level of achievement in written communication in this subpopulation is indicative of the larger ESWS population of students.

Overall Recommendations

- It is imperative that the new procedures being developed for the ESWS Assessment Plan become ingrained as part of the academic culture of faculty such that implementation is a seamless and an integrated component of faculty's teaching.
- Continued data collection should provide baseline data for faculty to consider in curriculum review.

Action Plan

- The pre-assessment needs to be given to incoming students, while the post-assessment needs to be administered during an upper division ESWS class in the fall and/or spring semester to evaluate change in learning during the ESWS degree.
- Assessment implementation and progress will be a topic at faculty meetings.
- Data generated during the 2017-2018 academic year will be used to determine if action is needed to alter assessment, student learner outcomes, and/or curriculum.

Supporting Attachments

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