Program Assessment Report
B.S. in Crop Science
University of Arkansas
Academic Year 2021-2022

1. Department Name & Contact Information

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2. Department 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.

3. Program Goals

1. Graduates have the discipline-specific knowledge in crop 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.

4. Student Learning Outcome 1. Students will demonstrate the discipline specific knowledge required to function as crop science professionals.

A. Assessment Measure for Outcome 1

- Achievement is measured using **pre- and post-assessment**.
- This is a ***direct*** measure of student learning.
- Pre- and post-assessment includes 25 test questions from the CPSC faculty covering crop science/physiology, weed science/pest management, crop production, and soil fertility/plant nutrition. These areas represent essential concepts for discipline-specific knowledge of students completing a crop science degree.
- The initial pre- and post-assessment was generated by the CPSC faculty during the spring 2016. Target populations are at least half of the (incoming) and half of the fall graduating CPSC class.
- Scores are calculated for each assessment with the range, average, and median calculated for the cohort of pre- or post-assessments. We target calculation of the change in scores from pre- to post-assessment.

B. Acceptable and **Ideal Targets** (<u>not required</u> for indirect measures)

- Acceptable: We are targeting a 50% increase in the mean and/or median test scores between the two populations (incoming and graduating students).

- Ideal: We are targeting a 75% increase in the mean and/or median test scores between the two populations (incoming and graduating students).

C. Summary of Findings

- In 2022, there are six years of knowledge data using the same post-tests, and four years where both pre- and post-assessment test results are available. In those four years where pre- and post-test were administered the same year, student scores improved between pre- and post-assessment testing in 3 of the years, but in 2022, scores did not improve (4% lower) between post-test performance in CSES 4013 and pre-test performance in CSES 2103. In contrast, post-test scores improved 8% between 2022 and 2021. This year and last year, pre-test assessments were given late during the spring semester, which may explain the relatively high scores of pre-tests, or the lower gains between pre- and post-testing (7% increase in scores in 2021 and 4% decrease in 2022). The 50% (acceptable) and 75% (ideal) gains in scores are large increases if students do well initially on pre-tests.

D. Recommendations

- The CSES Department is hiring several new faculty and the CPSC curriculum is undergoing revision. If pre-test/post-test is a helpful assessment technique for student learning outcome 1, then reconsideration of course and timing of test should be implemented to capture true learning gains from curriculum.
- The target course for pre-testing should be selected to most likely capture CPSC students entering the major as freshmen, or new students, in the first semester of enrollment.
- The target course for post-testing should continue to be CSES 4013. CSES 4013 was moved to spring semester a few years ago to help with scheduling and should capture students who are close to graduating in their final semester.

5. **Student Learning Outcome 2.** Students will demonstrate the ability to critically evaluate situations or scenarios to arrive at well thought out and supported decisions and outcomes.

A. Assessment Measure for Outcome 2

- Achievement will be measured using a critical thinking scenario and assessed 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 crop science contexts.

B. Acceptable and **Ideal Targets** (<u>not required</u> for indirect measures)

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 75% of seniors assessed will score proficient or greater.

C. Recommendations

- Critical thinking was not evaluated for CPSC in 2021-2022. The CPSC curriculum is undergoing revision in 2022-2023. With curriculum revision, CSES faculty should consider how best to assess critical thinking as a student learning outcome. An option may include a critical thinking exercise on the post-assessment targeting learner outcome #1 that would be scored independently using the critical thinking rubric.

D. Student Learning Outcome 3. Students will demonstrate the ability to work through and solve complex, multidisciplinary problems.

6. Assessment Measure for Outcome 3

A. Achievement will be measured using a problem based scenario and scored using a **problem solving rubric**.

- This is a ***direct*** measure of student learning.
- CSES 4224 Soil Fertility, a required course for all CPSC students, is the target course for the problem solving assessment.
- Assessment scenarios will be generated to cover application of problem solving in crop science contexts.

B. **Acceptable** and **Ideal Targets** (<u>not required</u> for indirect measures)

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 75% of seniors assessed will score proficient or greater.

C. **Summary of Findings**

- In 2022, five CPSC students were evaluated during a complex, multi-step, real-world computation and decision making problem-solving exercise. Students were assigned a complex problem where they first worked through real-world data and determined whether soil test or plant tissue concentrations were better predictors of crop yield. They then worked in consultation with others to develop their own fertilization philosophy and had to explain their logic substantiating recommendation decisions with data.
- Scores for all components rated a median level of proficient and this score held for at least 60% for all components of the rubric. Scores ranged from basic to proficient or basic to mastery for each component except for identifying strategies, which spanned from unprepared to mastery.
- For a small number of students, more effort for learning how to identify strategies in problem solving may be beneficial, in particular as these data aligned with data for the Environmental, Soil, and Water Science students for 2021-2022 in problem solving.

D. **Recommendations**

- Problem solving does require comprehension, application, analysis, synthesis, and evaluation, i.e. learning at high cognitive levels. In general, faculty should continue to consider and articulate where and when students have opportunities to develop (learn and repeatedly practice) cognitive skills in problem solving across the curriculum.

7. Student Learning Outcome 4a. Students will demonstrate the skills required to effectively communicate technical/scientific information in oral platforms.

A. 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.
- 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 opportunities where students present their experiences to an audience and the oral communication rubric can be used to evaluate communication skills.
- This is a ***direct*** measure of student learning.

B. Acceptable and **Ideal Targets** (<u>not required</u> for indirect measures).

- Acceptable: 60% of seniors assessed will score proficient or greater.
- Ideal: 80% of seniors assessed will score proficient or greater.

C. Summary of Findings

- CSES Colloquium is a fall course that is required for CPSC students. Most enroll as seniors, although some students are juniors when they take the course.
- Three of the students enrolled in the course during the fall 2021 were CPSC students.
- Performance was evaluated during a 10-12-minute presentation that was given by each student as a member of a paired research team. Teams selected overarching topics and individual's subtopic supports 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 individually for organization, language, delivery, supporting material, and central message.
- Scores for all criteria ranged from basic to proficient or mastery. The median score for organization, language, delivery, and central message was proficient (3.0), while the median was basic (2.0) for supporting material.
- Greater than 60% of students assessed scored at proficient level for four of the components, while, similar to results for Environmental, Soil and Water Science students, proficiency was not achieved for target levels of the student population in learning how to use supporting material to establish credibility and/or authority on a subject.

D. Recommendations

- Using supporting material to deliver a scientific speech is an area in which students have not met target performance in previous years in addition to this year. An area to target for improvements in learning appears to be use of supporting material to establish credibility and/or authority on a subject.
- We will continue to collect data during the next few years to assess performance in oral communication. Supporting and effectively communicating a concise, well supported scientific presentation can be difficult, especially when working with others. Development of these skills is critical to functioning in the workforce in the applied sciences.
- Oral communication skills are skills that employers often complain are lacking in college graduates. However, it is also difficult to determine how representative these data are because of the small size of the data sets.

8. Student Learning Outcome 4b. Students will demonstrate the ability to integrate, organize, and effectively present written reports of technical/scientific information.

A. Assessment Measure for Outcome 4b

- Achievement will be assessed using a **written communication rubric** for laboratory reports and technical/scientific proposals 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.
- CSES 462V Internship, Special Problems, and Honors thesis research provide opportunities where students have completed independent research projects. 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.
- This is a ***direct*** measure of student learning.

B. **Acceptable** and **Ideal Targets** (not required for indirect measures).
- Acceptable: 60% of seniors assessed will score proficient or greater.
- Ideal: 80% of seniors assessed will score proficient or greater.

C. Summary of Findings
- An internship or special problem experience is required in the CPSC degree. Writing skills were evaluated during the 2021-2022 year for three students.
- Of the five components evaluated, proficiency was achieved for more than 60% of students (67%) for context and purpose and sources and evidence. However, median scores were basic (2.0), for content and development, discipline and convention, and syntax and mechanics. Thus, as far as writing skills, students are not reaching stated writing outcomes in the CPSC curriculum.

D. Recommendations
- Crop Science faculty should reevaluate how to incorporate writing into the curriculum in a more effective approach for students to better meet stated the student learner for written communication.

9. Results of Analysis of Assessment of Student Learning Outcome

The Crop Science (CPSC) degree-seeking students have been evaluated for knowledge and oral communication skills the previous five academic years. While gains are not apparent in knowledge for the previous two years, timing of pre- and post-tests needs to be re-evaluated; timing can be evaluated while curriculum revision occurs during 2022-2023. Last year problem solving was specifically evaluated in CSES 4224 Soil Fertility, which is a required course in the CPSC degree program. Learning in problem solving seems to be sufficient in the curriculum. Assessment of writing was incorporated with use of the assessment rubric applied to internship reports. Assessment of significant writing assignments highlights the need for evaluation of how to strengthen learning of writing skills throughout the curriculum.

10. Any Changes to Degree/Certificate Planned or Made on the Basis of the Assessment and Analysis

The CPSC curriculum is undergoing revision in 2022-2023. The CPSC degree plan does provide the students with options to choose among several courses within particular “groups”, which although that structure provides flexibility to students, these course options do make it more difficult to assess a similar curriculum among students within the major. Additionally, CPSC supports a relatively large transfer student population, rather than attracting incoming high school graduates into the major as traditional freshmen. Furthermore, the difficulties of dealing with COVID-19 during the past two academic years may have affected student learner outcome performance, but may also be difficult to determine with a small population of students who are being assessed. Thus, there are several

considerations that should be accounted for in evaluating assessment data. However, the assessment information will be useful in evaluating how to proceed in CPSC curriculum revision.

11. Any Changes to the Assessment Process Made or Planned

Application of the critical thinking rubric should be considered while the CSES faculty are revising the CPSC curriculum during 2022-2023.

12. Supporting Attachments

- 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