

Program Assessment Report
M.S. in Crop, Soil, and Environmental Sciences
University of Arkansas
Academic Year 2019-2020

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, weed, soil, water, and environmental sciences required to perform successfully in appropriate-level private, government, or academic 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, with technical or scientific and non-technical audiences.
5. Graduates have expertise in research and analytical skills through completion of a thesis research project.

4. Student Learning Outcome 1. Students will demonstrate the appropriate depth and breadth of discipline specific knowledge required to function as expert crop, weed, environmental, soil, or water science professionals.

A. Assessment Measure for Outcome 1

- Achievement will be measured at the completion of a student's program during the **thesis defense, scored using a rubric.**
- This is a **direct** measure of student learning.
- Graduate advisory / thesis examination committee is the responsible party.
- We aim to capture at least 50% of graduating students.
- Depth and breadth of discipline specific knowledge learned will be assessed through oral questions posed by a thesis examination committee. The length of the defense and number and type of questions will be subject to the committee's discretion based on the student's background and research focus and responses to questions.
- The rubric used for scoring is attached to this assessment plan.

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

- Acceptable: 70% of M.S. students defending their thesis will score "proficient" or greater.

- Ideal: 90% of M.S. students defending their thesis will score “proficient” or greater.

C. Summary of Findings

- Seventeen CSES Graduate Student Learning Objectives (SLO) Assessment rubrics were completed for seven different CSES M.S. students. Among the rubrics completed, faculty indicated basic to mastery level of discipline specific knowledge with proficient average (3.0) and median (3.0) scores. Six of the seven students averaged proficient scores for the rubrics submitted by advisory committee members indicating acceptable targets in reaching proficient learning of discipline specific knowledge among M.S. graduates.
- Our limited sample size indicates that M.S. graduates tend to have an adequate grasp of knowledge; however, a minor proportion of students may have trouble answering some important questions related to their field upon degree completion.

D. Recommendations

- Use of the CSES Graduate SLO Assessment rubric should continue for MS graduates for curriculum assessment as the practice appears to have become established and is generating useful baseline data for assessment.

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 at the completion of a student’s program during the **thesis defense, scored using a rubric.**
- This is a **direct** measure of student learning.
- Graduate advisory / thesis examination committee is the responsible party.
- We aim to capture at least 50% of graduating students.
- Ability to think critically will be evaluated through oral questions posed by a thesis examination committee. The length of the defense and number and type of issues and scenarios posed to the student to evaluate critical thinking ability will be subject to the committee’s discretion based on the student’s background and research focus and responses to questions.
- The rubric used for scoring is attached to this assessment plan.

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

- Acceptable: 60% of M.S. students defending their thesis will score “proficient” or greater.
- Ideal: 80% of M.S. students defending their thesis will score “proficient” or greater.

C. Summary of Findings

- Seventeen CSES Graduate Student Learning Objectives (SLO) Assessment rubrics were completed for seven different CSES M.S. students. Among the rubrics completed, faculty indicated unprepared/beginning level to proficient/just above proficient for critical thinking with an average just below proficient (2.8) and median score at proficient (3.0). When averaging scores by student, three out of the seven students scored at the 3.0 or proficient level, indicating proficiency for critical thinking was not reached for half or more of the graduating M.S. students.

D. Recommendations

- Critical thinking requires higher level cognitive skills, including analysis, synthesis and evaluation and as such it is more difficult to achieve proficiency and mastery. Thus, it may not be surprising that average and median ratings are a bit lower than those for discipline specific knowledge. The CSES faculty need to continue to monitor assessment results to determine if they reflect the M.S. population and whether changes may be required for those students who do not indicate proficiency at the conclusion of their M.S. program.
- While CSES faculty need to be cautious about extrapolating assessment results to the general M.S. population at this juncture and should continue to collect data to determine if education is adequate for most students to fully develop critical thinking skills, initial trends are that critical thinking skills is an area that could benefit from curriculum development. A few notes on individual rubrics indicated that some students have learning disabilities and others have interests that do not include further graduate school; these and other factors may need to be considered in curriculum design.

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

A. Assessment Measure for Outcome 3

- Achievement will be measured at the completion of a student's program during the **thesis defense, scored using a rubric.**
- This is a **direct** measure of student learning.
- Graduate advisory / thesis examination committee is the responsible party.
- We aim to capture at least 50% of graduating students.
- Ability to think logically and progressively through multiple dimensions of a complex scenario or issue to solve problems will be evaluated through oral questions posed by a thesis examination committee. The length of the defense and number and type of issues and scenarios posed to the student to evaluate problem solving ability will be subject to the committee's discretion based on the student's background and research focus and responses to questions.
- The rubric used for scoring is attached to this assessment plan.

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

- Acceptable: 60% of M.S. students defending their thesis will score "proficient" or greater.
- Ideal: 80% of M.S. students defending their thesis will score "proficient" or greater.

C. Summary of Findings

- Seventeen CSES Graduate Student Learning Objectives (SLO) Assessment rubrics were completed for seven different CSES M.S. students. Among the rubrics completed, faculty indicated basic to proficient/just above proficient for problem solving ability with an average just below proficient (2.8) and median score at proficient (3.0). When averaging scores by student, four of the seven students scored a 3.0, indicating proficiency for problem solving ability and 57% of assessor rubrics completed indicated that students were at a proficient level for a M.S. degree.
- Assessment at the thesis defense by examination committees using the CSES Graduate SLO Assessment rubrics indicates that more than half but less than the 60% target of the M.S. graduates are proficient at problem solving and all could benefit from continued development of those skills.

D. Recommendations

- Problem solving requires comprehension, analysis, synthesis, and evaluation of potentially different kinds of information. While it is encouraging that more than half of the graduates demonstrated proficient achievement in problem solving, others are not as developed in those skills. CSES faculty need to be cautious in extending these results to the larger M.S. population at this juncture; however, the department needs to continue to collect data and to evaluate the best educational opportunities for all students to fully develop problem solving skills.

8. Student Learning Outcome 4a. Students will demonstrate the skills required to effectively communicate technical/scientific information in oral platforms to general and professional audiences.

A. Assessment Measure for Outcome 4a

- Achievement will be measured at the completion of a student's program during the **thesis defense, scored using a rubric.**
- This is a **direct** measure of student learning.
- Graduate advisory / thesis examination committee is the responsible party.
- We aim to capture at least 50% of graduating students.
- Effective oral communication will be evaluated during a presentation and question and answer period during the thesis defense. The thesis advisory / examination committee will evaluate the delivery of presentation, effectiveness of visual aids, and quality and organization of content. The committee will also ask questions following the presentation. The length of the question and answer period (number and type of questions posed to the student) will be subject to the committee's discretion based on the student's background and research focus, presentation provided by the student, and responses to questions.
- The rubric used for scoring is attached to this assessment plan.

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

- Acceptable: 70% of M.S. students defending their thesis will score "proficient" or greater.
- Ideal: 90% of M.S. students defending their thesis will score "proficient" or greater.

C. Summary of Findings

- Seventeen CSES Graduate Student Learning Objectives (SLO) Assessment rubrics were completed for seven different CSES M.S. students. Among the rubrics completed, faculty indicated basic to mastery level for oral communication skills with an average and median at proficient (3.0). When averaging scores by student, five of the seven students scored at least the 3.0 value indicating proficiency for oral communication skills for more than 70% of students assessed.

Recommendations

- Assessment at the thesis defense by examination committees using the CSES Graduate SLO Assessment rubrics indicates that most of the M.S. graduates are proficient oral communicators and that developing oral communication skills is likely a strength of the CSES Department.
- CSES graduate students generally enroll in CSES 5103 Scientific Presentations where they learn how to construct and deliver effective oral presentations, must deliver a departmental seminar with a passing grade, and often give multiple oral presentations at scientific meetings. Thus, it may not be surprising that, even with a small sample size, graduate students demonstrate proficiency for oral presentation skills.

- Indications at this time suggest that CSES should continue with the current courses and programs developing oral communication skills.

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

A. Assessment Measure for Outcome 4b

- Achievement will be measured at the completion of a student’s program during the **thesis defense, scored using a rubric.**
- This is a **direct** measure of student learning.
- Graduate advisory / thesis examination committee is the responsible party.
- We aim to capture at least 50% of graduating students.
- Effective written communication skills will be evaluated through the written thesis. The thesis advisory / examination committee will evaluate the quality and organization of content, quality of references, style, and adherence to convention in writing, attention to detail, and overall effectiveness and credibility in delivery.
- The rubric used for scoring is attached to this assessment plan.

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

- Acceptable: 60% of M.S. students defending their thesis will score “proficient” or greater.
- Ideal: 80% of M.S. students defending their thesis will score “proficient” or greater.

C. Summary of Findings

- Seventeen CSES Graduate Student Learning Objectives (SLO) Assessment rubrics were completed for seven different CSES M.S. students. Among the rubrics completed, faculty indicated unprepared/beginning to mastery level for written communication skills with a proficient (3.0) median score and 2.9 average score. When averaging scores by student, four of the seven students scored at 3.0, indicating proficiency for written communication skills for 57% of assessed graduating M.S. students.

D. Recommendations

- While CSES graduate students generally enroll in CSES 5103 Scientific Presentations, the Scientific Writing course has not been taught in several years. There is not as much opportunity to write during the curriculum as there are opportunities to present orally and present research posters. Thus, it remains to be determined if this early demonstration of written proficiency is reflective of the entire CSES graduate student body.
- Opportunities to communicate in written formats to diverse audiences should be encouraged throughout all graduate students’ degree plan.

9. Student Learning Outcome 5. Students will contribute to the advancement of science by acquiring skills (e.g. conceptual, statistics, laboratory or field skills, etc.) to fulfill project requirements to generate original and independent research data.

A. Assessment Measure for Outcome 5

- Achievement will be measured at the completion of a student’s program during the **thesis defense, scored using a rubric.**

- This is a **direct** measure of student learning.
- Graduate advisory / thesis examination committee is the responsible party.
- We aim to capture at least 50% of graduating students.
- Demonstration of mastery of research and analytical skills (e.g. conceptual, statistics, laboratory or field skills, etc.) will be assessed during the thesis defense. The thesis advisory / examination committee will evaluate the independence and quality of the student's development of skills in completion of the research through oral questioning in the thesis defense and reading of the written thesis. The length of the defense and number and type of questions will be subject to the committee's discretion based on the student's background and research focus and responses to questions.
- The rubric used for scoring is attached to this assessment plan.

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

- Acceptable: 70% of M.S. students defending their thesis will score "proficient" or greater.
- Ideal: 90% of M.S. students defending their thesis will score "proficient" or greater.

C. Summary of Findings

- Seventeen CSES Graduate Student Learning Objectives (SLO) Assessment rubrics were completed for seven different CSES M.S. students. Among the rubrics completed, faculty indicated basic to mastery level for research and analytical skills with an average (3.3) and median (3.0) demonstrating proficiency. When averaging scores by student, all seven of the seven students scored at least the 3.0 value indicating proficiency for research and analytical skills, and thus all students demonstrated proficiency in research and analytical skills.

D. Recommendations

- Development of research and analytical skills is emphasized during the M.S. program; therefore, it may not be surprising that graduate students demonstrate proficiency in these skills.
- Continued assessment using the CSES SLO Assessment rubric is recommended.

10. Overall Recommendations

- The expectation is that the majority of students are receiving an excellent education and developing knowledge and skills to be proficient or demonstrate mastery as scientific professionals.
- Use of the CSES Graduate Student Learning Objectives (SLO) Assessment rubrics seems to be becoming an established practice for M.S. graduate defenses. The update of the CSES Graduate Student Handbook, publishing of the CSES Graduate Student Handbook on the CSES website, and continual reminders from the CSES administrative office to faculty and students that students need to inform the departmental office of impending thesis defenses and get rubrics to their committee members has helped make implementation of these rubrics more commonplace.
- Assessment data are accumulating and this is the fourth year CSES has collected CSES SLO Assessment rubric assessment data, which means that data are starting to show areas of strengths and areas that may benefit from re-evaluation and/or revision.
- Early indications are that knowledge, oral communication skills and research and analytical skills are strengths for CSES and that critical thinking and problem solving are more difficult skills for students to develop. A few more years of data may reinforce that some new approaches to strengthen critical thinking and problem solving abilities may be worth investment.

11. Action Plan

- To continue to institutionalize the implementation of assessment during defenses, the departmental practice of informing new graduate students about the CSES Graduate Student Handbook including that each CSES graduate student **must** inform the CSES Department (i.e. the CSES Department Head and CSES Office Manager) of a scheduled defense **two weeks prior** to the defense and obtain a “CSES Exit” packet that includes the CSES Graduate SLO Assessment rubric should continue and become routine. The promotion of this informal CSES policy has benefitted completion and return to Daniela Kidd in 115 PTSC of the CSES Graduate SLO Assessment rubrics.
- The CSES Department needs to continue to promote the collection of assessment data during graduate student defenses as a routine part of the process of completing a graduate degree.
- Each Advisory Committee member needs to be reminded that these rubrics are for curriculum and program assessment and are not returned to the individual graduate student. Comments written directly to the students will not be received by the individual student. Assessments are compiled for understanding at the program level and data are reported anonymously.

12. Supporting Attachments

- CSES Graduate SLO Assessment rubric adapted from multiple Association of American Colleges and Universities rubrics (e.g. critical thinking, problem solving, oral and written communication skills, etc.)

Crop, Soil, and Environmental Sciences
Thesis/Dissertation Defense Performance Assessment Rubric

Student Learning Outcomes

To assist with program assessment, in which of the following student learning outcomes did the student demonstrate proficiency? Mark performance on a scale of 1 (not prepared, unskilled) to 4 (advanced, mastery of skill) in each Learning outcome box.

Learning outcome	4 Advanced/Mastery	3 Proficient/Adequate	2 Developing/Beginning	1 Unprepared/Unskilled
Depth and breadth of discipline related knowledge	Shows higher levels of learning - Clearly explains key concepts and principles; Understands current, relevant literature, and gaps in science; apply concepts to analyze new situations; demonstrates mastery of technical, statistical and/or relevant computer skills	Understands and applies key concepts and principles; Understands current, relevant literature; Collects, summarizes, correctly analyzes data; demonstrates competency of technical, statistical and/or computer skills relevant to discipline	Understands and applies key concepts and principles; some understanding of relevant literature; demonstrates adequate use of some technical, statistical and/or computer skills relevant to discipline	Incomplete and uncomprehensive knowledge of basics principles and ability to apply principle and concepts; demonstrates incomplete or unrefined use of technical, statistical and/or computer skills relevant to discipline
Critical thinking	Clearly and comprehensively states issue/problem. Thoroughly reviews literature and interprets data to evaluate scenarios and create solutions to new problems. Systematically and methodically analyzes own and others' assumptions and carefully evaluates relevance of contexts and limitations of a position. Thesis is imaginative, multidimensional, and conclusions are logical and reflect informed evaluation.	Issue/problem is stated, described, and clarified critically, so that understanding is not seriously impeded by omissions. Interpretation/evaluation is supported with evidence from the literature, but literature and experts are subject to questioning. Identifies own and others' assumptions, relevant contexts when presenting a position. Conclusions are logical and related to outcomes.	Issue/problem is stated critically, but is incompletely defined or explored. Literature review is incomplete, and there is little questioning of experts and assumptions. Acknowledges different sides of an issue. Conclusion is logically tied to information but is unidimensional and related to only some of the outcomes.	Unclear or ill-described issue/problem. Information is collected without interpretation or evaluation. Viewpoints of experts are not questioned. Shows emerging awareness of assumptions. Simple and obvious position. Conclusion is inconsistently tied to some of the information discussed; related outcomes are oversimplified.

<p>Problem solving</p>	<p>Constructs clear and insightful problem statement with evidence of all relevant contextual factors. Proposes one or more hypotheses and tackles problem with multiple approaches. Sensitive to ethical, logical, historical, and cultural dimensions of the problem. Deep and elegant, thorough and insightful, logical explanations. Examines feasibility of solution, and weighs impacts of solution, and considers need for further work.</p>	<p>Constructs a problem statement with adequate detail and evidence of most relevant contextual factors. Identifies multiple approaches for problem solving, some of which apply within a specific context. Comprehends the problem. Sensitive to ethical, logical, historical, and cultural considerations. Evaluation of solutions is adequate, and examines feasibility of solution, weighs impacts of solution, and considers some of the needs for further work.</p>	<p>Superficial problem statement with evidence of most relevant contextual factors. Identifies a single, “off the shelf” approach for solving the problem that does apply within a specific context. Evaluation of solution(s) is brief but includes history of problem, logic/reasoning, solution feasibility, and impacts of solution. Addresses the problem, but ignores relevant contextual factors and need for further work.</p>	<p>Limited ability to define a problem statement, related contextual factors, or specific or relevant solutions. Superficial evaluation and/or irrelevant implementation of solutions that does not directly address the problem statement or consideration of need for further work.</p>
<p>Communication skills - oral</p>	<p>Clearly organized, cohesive content. Imaginative, memorable, and compelling. Presentation enhances effectiveness. Delivered at appropriate level. Polished delivery techniques (posture, gesture, eye contact, and vocal expressiveness). Confident speaker. Variety of supporting materials reference information or analysis that significantly supports the presentation or establishes credibility or authority. Central message is compelling (precise, appropriate, memorable, and strongly supported.)</p>	<p>Clear and consistent organization. Thoughtful and effective presentation. Delivered at appropriate level. Quality in delivery techniques (posture, gesture, eye contact, and vocal expressiveness. Supporting materials reference information or analysis that generally supports the presentation or establishes the presenter's credibility. Central message is clear and consistent with the supporting material.</p>	<p>Intermittently observable organizational pattern. Mundane language partially supports the presentation effectiveness. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable. Supporting materials partially supports the presentation or establishes the presenter's credibility/authority on the topic. Central message is basically understandable.</p>	<p>Organizational pattern is not observable. Unclear language. Presentation is not appropriate to audience. Delivery detracts from the understandability of the presentation, and is uncomfortable. Insufficient supporting materials make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/authority on the topic. Central message can be deduced, but is not explicitly stated in the presentation.</p>

<p>Communication skills - written</p>	<p>Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focused. Appropriate, relevant, and compelling content illustrates mastery of the subject. Detailed attention to and successful execution of organization, content, presentation, formatting, and stylistic choices. Skillful use of high-quality, credible, relevant sources to develop ideas. Clear, fluent, and virtually error-free.</p>	<p>Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s). Appropriate, relevant, and compelling content explores ideas. Organized. Credible, relevant sources to support ideas. Uses straightforward language that generally conveys meaning to readers. Few errors.</p>	<p>Demonstrates awareness of context, audience, purpose, and to the assigned tasks(s). Appropriate and relevant content develops and explores ideas through most of the work. Basic organization. Use of credible and/or relevant sources to support ideas. Generally conveys meaning, although writing may include some errors.</p>	<p>Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s). Uses appropriate and relevant content to develop simple ideas in some parts of the work. Attempts to use a consistent system for basic organization and presentation. Attempts to use sources to support ideas in the writing. Language and errors sometimes impede meaning.</p>
<p>Original & Independent Research</p>	<p>Work contributes to advancement of science; adds new contribution to science; student is independent thinker and contributes uniquely to team. Student takes ownership of project and learning by taking initiative and by mastering necessary skills (e.g. conceptual, statistics, laboratory or field skills, etc.) for comprehensive project completion.</p>	<p>Work adds to database of scientific knowledge by confirming or clarifying previous results; student works with minimal guidance. Student is proficient in skills (e.g. conceptual, statistics, laboratory or field skills, etc.) for project completion.</p>	<p>Work adds to database of knowledge but does not advance science; student completes some tasks independently. Student is proficient in some skills (e.g. conceptual, statistics, laboratory or field skills, etc.) necessary for project completion.</p>	<p>Work does not advance science; work need much supervision and review to proceed.</p>

**Crop, Soil, and Environmental Sciences
Thesis/Dissertation Defense Performance Assessment Rubric**

Graduate student: Hand a copy to each thesis/dissertation defense committee member for the defense begins.

Faculty committee member: Return completed form to Daniela Kidd in the CSES Dept Office, PTSC 115 within 1 week of defense.

Defending Graduate Student _____

Major Advisor _____

Degree M.S. Ph.D.

Date of defense _____

Student Learning Outcomes

Score using CSES Graduate SLO Rubric

- | | |
|--|-------|
| 1. Depth & breadth of discipline related knowledge | _____ |
| 2. Critical thinking | _____ |
| 3. Problem solving | _____ |
| 4a. Communication skills – oral | _____ |
| 4b. Communication skills – written | _____ |
| 5. Original & independent research | _____ |

***Rubric Scale**

4 = Advanced/Mastery

3 = Proficient/Adequate

2 = Developing/Beginning

1 = Unprepared/Unskilled

Other

Please include any comments you have regarding assessment of this graduate student's achievement towards student learner outcomes, or in assessment of the CSES graduate student program.
