Program Assessment Report
Ph.D. 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 depth and breadth of 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 contribute to the advancement of science through creation of original and independent ideas and research.

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 **dissertation defense, scored using a rubric.**
   - This is a ***direct*** measure of student learning.
   - Graduate advisory / dissertation 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 dissertation advisory/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** (<u>not required</u> for indirect measures).
- Acceptable: 70% of Ph.D. students defending their dissertation will score "proficient" or greater.
- Ideal: 90% of Ph.D. students defending their dissertation will score "proficient" or greater.

C. **Summary of Findings**
- While the use of CSES Graduate Student Learning Objectives (SLO) Assessment rubrics is becoming more routine, there are a limited number of CSES PhD students graduating each year. No Graduate SLO Assessment rubrics were completed during 2019-2020.

D. **Recommendations**
- With a limited number of CSES PhD students graduating each year, the department has to be diligent in making sure that advisors and graduate students remember to have advisory committee members complete Graduate SLO Assessment rubrics at the conclusion of every defense. Regardless, data will be limited each year and it will take a long time to accumulate sufficient data to evaluate curriculum.

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 **dissertation defense, scored using a rubric.**
- This is a *direct* measure of student learning.
- Graduate advisory / dissertation 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 dissertation 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** (<u>not required</u> for indirect measures).
- Acceptable: 70% of Ph.D. students defending their dissertation will score "proficient" or greater.
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- With a limited number of CSES PhD students graduating each year, the department has to be diligent in making sure that advisors and graduate students remember to have advisory committee members complete Graduate SLO Assessment rubrics at the conclusion of every

defense. Regardless, data will be limited each year and it will take a long time to accumulate sufficient data to evaluate curriculum.

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 **dissertation defense, scored using a rubric.**
- This is a ***direct*** measure of student learning.
- Graduate advisory / dissertation 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 dissertation 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** (<u>not required</u> for indirect measures).
- Acceptable: 70% of Ph.D. students defending their dissertation will score "proficient" or greater.
- Ideal: 90% of Ph.D. students defending their dissertation will score "proficient" or greater.

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D. Recommendations
- With a limited number of CSES PhD students graduating each year, the department has to be diligent in making sure that advisors and graduate students remember to have advisory committee members complete Graduate SLO Assessment rubrics at the conclusion of every defense. Regardless, data will be limited each year and it will take a long time to accumulate sufficient data to evaluate curriculum.

7. Student Learning Outcome 4a. Students will demonstrate the skills required to effectively communicate technical/scientific information in oral platforms to general and professional audiences. 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 4a
- Achievement will be measured at the completion of a student's program during the **dissertation defense, scored using a rubric.**
- This is a ***direct*** measure of student learning.
- Graduate advisory / dissertation 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 dissertation defense. The dissertation 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** (<u>not required</u> for indirect measures).
- Acceptable: 70% of Ph.D. students defending their dissertation will score "proficient" or greater.
- Ideal: 90% of Ph.D. students defending their dissertation will score "proficient" or greater.

C. Summary of Findings
- While the use of CSES Graduate Student Learning Objectives (SLO) Assessment rubrics is becoming more routine, there are a limited number of CSES PhD students graduating each year. No Graduate SLO Assessment rubrics were completed during 2019-2020.

D. Recommendations
- With a limited number of CSES PhD students graduating each year, the department has to be diligent in making sure that advisors and graduate students remember to have advisory committee members complete Graduate SLO Assessment rubrics at the conclusion of every defense. Regardless, data will be limited each year and it will take a long time to accumulate sufficient data to evaluate curriculum.

8. Student Learning Outcome 4b. Students will demonstrate the skills required to effectively communicate technical/scientific information in oral platforms to general and professional audiences. 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 in writing the **dissertation, scored using a rubric.**
- This is a *direct* measure of student learning.
- Graduate advisory / dissertation 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 dissertation. The dissertation 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** (<u>not required</u> for indirect measures).
- Acceptable: 70% of Ph.D. students defending their dissertation will score "proficient" or greater.
- Ideal: 90% of Ph.D. students defending their dissertation will score "proficient" or greater.

C. Summary of Findings

- While the use of CSES Graduate Student Learning Objectives (SLO) Assessment rubrics is becoming more routine, there are a limited number of CSES PhD students graduating each year. No Graduate SLO Assessment rubrics were completed during 2019-2020.

D. Recommendations

- With a limited number of CSES PhD students graduating each year, the department has to be diligent in making sure that advisors and graduate students remember to have advisory committee members complete Graduate SLO Assessment rubrics at the conclusion of every defense. Regardless, data will be limited each year and it will take a long time to accumulate sufficient data to evaluate curriculum.

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 **dissertation defense, scored using a rubric.**
- This is a ***direct*** measure of student learning.
- Graduate advisory / dissertation examination committee is the responsible party.
- We aim to capture at least 50% of graduating students.
- Contribution to the advancement of science of original and independent research and ideas and will be assessed during the dissertation defense. The dissertation advisory / examination committee will evaluate the quality of research and contribution of the scholarship to the advancement of science and the initiative, independence and quality of the student skills development in completion of the research through oral questioning in the dissertation defense and reading of the written dissertation. 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 Ph.D. students defending their dissertation will score "proficient" or greater.
- Ideal: 90% of Ph.D. students defending their dissertation will score "proficient" or greater.

C. Summary of Findings

- While the use of CSES Graduate Student Learning Objectives (SLO) Assessment rubrics is becoming more routine, there are a limited number of CSES PhD students graduating each year. No Graduate SLO Assessment rubrics were completed during 2019-2020.

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- With a limited number of CSES PhD students graduating each year, the department has to be diligent in making sure that advisors and graduate students remember to have advisory committee members complete Graduate SLO Assessment rubrics at the conclusion of every

defense. Regardless, data will be limited each year and it will take a long time to accumulate sufficient data to evaluate curriculum.

10. **Overall Recommendations**
    - Continued assessment data collection using the CSES Graduate SLO Assessment rubric is recommended. While CSES should continue to collect data, the department may have to lower acceptable target levels for annual data because of sample size limitations or evaluate the Ph.D. program with a multi-year dataset.
    - At this time, data are limited on which to draw conclusions about program effectiveness and derive recommendations to proceed in the future. 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. However, with limited data, it is difficult to determine if a sufficient percentage of the student body is doing so in all stated learning outcomes.

11. **Action Plan**
    - To continue to institutionalize the implementation of assessment during dissertation 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 for the M.S. program and should also work for the Ph.D. program.
    - 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.
    - The upper administration should consider allowing the CSES Dept and other Ph.D. programs to compile data for the Ph.D. program on a multi-year basis as the Ph.D. is a smaller and longer duration program than the M.S. program and is subject to less turnover than the M.S. program. Over time, a more complete baseline dataset of competency levels among Ph.D. graduate students will become more informative for program assessment purposes.

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. nterpretation/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.

Problem solving	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.	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.	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.	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.
Communication skills - oral	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.)	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.	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.	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.

Communication skills - written	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.	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.	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.	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.
Original & Independent Research	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.	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.	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.	Work does not advance science; work need much supervision and review to proceed.

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.

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