Academic Assessment Report
BEST PRACTICES IN STUDENT LEARNING OUTCOMES
(Ph.D. / CROP, SOIL, and ENVIRONMENTAL SCIENCES)
(MAY 2016)

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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 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.

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 appropriate depth and breadth of discipline specific knowledge required to function as expert crop, weed, environmental, soil, 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 to general and professional audiences.
   b. Students will demonstrate the ability to integrate, organize, and effectively present

written reports of technical/scientific information to general and professional audiences.

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.

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.
- 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.

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.

Key Personnel (who is responsible for the assessment of this measure).
- Graduate advisory / dissertation examination committee is the responsible party.

Summary of Findings
- The development of the CSES Graduate Student Learning Objectives (SLO) Assessment rubric was a new initiative for the CSES Dept. The rubric was adapted by combining items from several Association of American Colleges and Universities (AACU) rubrics into one rubric that encompassed the SLO for the CSES Ph.D. graduate program. This one rubric will facilitate assessment of SLO during the graduate students' dissertation defenses by each student's graduate advisory committee, i.e. the committee working most closely with each student during each person's development and education as a graduate student. The CSES Graduate SLO Assessment rubric was approved by CSES faculty during a faculty meeting in the spring 2016.
- For the two rubrics completed during the spring 2016 semester, CSES/CEMB Ph.D. students rate between proficient to mastering discipline specific knowledge, showing that they have a solid grasp of knowledge related to their field upon degree completion.

Recommendations
- The CSES faculty are adjusting to the new practice of implementing the assessment program at dissertation defenses by completing the CSES Graduate SLO Assessment rubric. It will take some time and constant reminders to instill the practice as part of the process during the committee evaluation. However, as program assessment has been a topic at three of four faculty meetings this spring 2016, there has been much discussion about assessment goals, student learner outcomes, and mechanisms to achieve outcomes, which is important to the educational process and to align curriculum to achieve student learner outcomes.
- As the rubric is a new initiative, it has been implemented for use with only a small population of graduating Ph.D. students. Therefore, caution must be exercised in extrapolating results across

the entire Ph.D. population; it is not known how representative these data are of the Ph.D. program. As of now, it is too soon to make sound recommendations about curriculum changes for the Ph.D. program, in particular because these data are for students participating in the department and a university-wide interdisciplinary program.
- The use of the CSES Graduate SLO Assessment rubric has to be implemented in the process of completing dissertation defenses such that completing the rubric is a routine practice for advisory committee members.

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.
- 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.

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.

Key Personnel (who is responsible for the assessment of this measure).
- Graduate advisory / dissertation examination committee is the responsible party.

Summary of Findings
- For the two rubrics completed, CSES/CEMB Ph.D. students rate between basic and proficient for critical thinking. Critical thinking requires higher level cognitive skills, including analysis, synthesis and evaluation and as such is more difficult to achieve proficiency and mastery. Thus, it may not be surprising that students score lower in critical thinking than discipline specific knowledge.

Recommendations
- CSES needs to continue to collect data to determine if adequate training is being provided for students to fully develop critical thinking skills.

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.
- 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.

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.

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

- Graduate advisory / dissertation examination committee is the responsible party.

Summary of Findings

- For the two rubrics completed, CSES/CEMB Ph.D. students rate between basic and proficient for problem solving. Problem solving requires comprehension, analysis, and synthesis of potentially different kinds of information. Similar to critical thinking, it may not be surprising that students score lower in problem solving than discipline specific knowledge.

Recommendations

- CSES needs to continue to collect data to determine if adequate training is being provided for students to fully develop problem solving skills.

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.
- 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.

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.

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

- Graduate advisory / dissertation examination committee is the responsible party.

Summary of Findings

- For the two rubrics completed, CSES/CEMB Ph.D. students are proficient in oral communication skills. 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, the rating was proficient for oral presentation skills.

Recommendations
- CSES needs to continue to collect data to determine if the initial assessment is reflective of the total populations of CSES graduate students.

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.
- 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.

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.

Key Personnel (who is responsible for the assessment of this measure).
- Graduate advisory / dissertation examination committee is the responsible party.

Summary of Findings
- For the two rubrics completed, CSES/CEMB Ph.D. students rated between proficient to mastery in written communication skills. 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 these scores are reflective of the entire CSES graduate student body.

Recommendations
- CSES needs to continue to collect data to determine if the initial assessment is reflective of the total populations of CSES graduate students.

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.
- 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.

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.

Key Personnel (who is responsible for the assessment of this measure).
- Graduate advisory / dissertation examination committee is the responsible party.

Summary of Findings
- For the two rubrics completed, CSES/CEMB Ph.D. students rated between proficient to mastery for developing essential skills and contributing to the advancement of science through production of original and independent research. The Ph.D. program is based strongly on production of dissertation research that requires skills development and production of novel, publishable research that contributes to the advancement of the student's discipline. Thus, the student has multiple years to develop and refine relevant skills for utilization in science.

Recommendations
- Given the limited dataset collected during spring 2016, CSES needs to continue to collect data to determine if the initial assessment is reflective of the total populations of CSES graduate students.

Overall Recommendations
- At this time, data are limited 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, without the empirical data, it is difficult to determine if sufficient percentage of the student body is doing so in all stated learning outcomes.
- Thus, CSES needs to continue to collect data to assess the Ph.D. program.

Action Plan
- There has been discussion at a CSES faculty meeting to include the CSES Graduate SLO Assessment rubric in the CSES Graduate Student Handbook so that all incoming students are fully aware of student learning outcomes for the Ph.D. program.
- To institutionalize the implementation of assessment during dissertation defenses, a department policy should be developed where each CSES graduate student **<u>must</u>** inform the CSES Dept (i.e. the CSES Dept Head and CSES Office Manager) of a scheduled defense **two weeks prior** to the defense and obtain a "CSES Exit" packet. Among other items, the CSES Exit packet has the CSES Graduate SLO Assessment rubric for each Advisory Committee member to complete and return to Rachael Armstrong in 115 PTSC.
- The CSES Dept needs to collect data from CSES Graduate SLO Assessment rubrics during 2016-2017 in order to compile a more complete baseline dataset of competency levels among graduate students.

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.)

ORAL COMMUNICATION VALUE RUBRIC

for more information, please contact value@aacu.org

Definition

Oral communication is a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone	Milestones		Benchmark
	Exemplary	Proficient	Basic	Developing
Organization	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation.
Language	Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience.
Delivery	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.
Supporting Material	A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/authority on the topic.	Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/authority on the topic.
Central Message	Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.)	Central message is clear and consistent with the supporting material.	Central message is basically understandable but is not often repeated and is not memorable.	Central message can be deduced, but is not explicitly stated in the presentation.

Crop, Soil, and Environmental Sciences
Oral Communication Performance
Assessment Rubric

Student   _____

Degree   ESWS   CPSC

Course   _____

Assignment   _____

Date   _____

Student Learning Outcomes   **Score using Rubric**

1.   Organization   _____

2.   Language   _____

3.   Delivery   _____

4.   Supporting Material   _____

5.   Central Message   _____

CRITICAL THINKING VALUE RUBRIC

for more information, please contact value@aacu.org

Definition

Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion, and can be demonstrated in assignments that require students to complete analyses of text, data, or issues..

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone Exemplary	Milestones Proficient	Basic	Benchmark Developing
Explanation of issues	Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.	Issue/problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issue/problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown.	Issue/problem to be considered critically is stated without clarification or description.
Evidence *Selecting and using information to investigate a point of view or conclusion*	Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.	Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with some interpretation/evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) without any interpretation/evaluation. Viewpoints of experts are taken as fact, without question.
Influence of context and assumptions	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.
Student's position (perspective, thesis/hypothesis)	Specific position (perspective, thesis/hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.
Conclusions and related outcomes (implications and consequences)	Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly.	Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and implications) are identified clearly.	Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.

Crop, Soil, and Environmental Sciences
Undergraduate Student Critical Thinking Performance
Assessment Rubric

Student   _____

Degree   ESWS   CPSC

Course   _____

Assignment   _____

Date   _____

Student Learning Outcomes   **Score using Rubric**

   1.   Explanation of issues   _____

   2.   Evidence   _____

   3.   Influence of context and assumptions   _____

   4.   Student's position (perspective, thesis/hypothesis) _____

   5.   Conclusions and related outcomes   _____
        (implications and consequences)

PROBLEM SOLVING VALUE RUBRIC

for more information, please contact value@aacu.org

AAC&U Association of American Colleges and Universities

Definition

Problem solving is the **process** of designing, evaluating, and implementing a strategy to answer an open-ended question or achieve a desired goal, involving problems that range from well-defined to ambiguous in a simulated or laboratory context, or in real-world settings..

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone Exemplary	Milestones Proficient	Basic	Benchmark Developing
Define Problem	Demonstrates the ability to construct a clear and insightful problem statement with evidence of all relevant contextual factors.	Demonstrates the ability to construct a problem statement with evidence of most relevant contextual factors, and problem statement is adequately detailed.	Begins to demonstrate the ability to construct a problem statement with evidence of most relevant contextual factors, but problem statement is superficial.	Demonstrates a limited ability in identifying a problem statement or related contextual factors.
Identify Strategies	Identifies multiple approaches for solving the problem that apply within a specific context.	Identifies multiple approaches for solving the problem, only some of which apply within a specific context.	Identifies only a single approach for solving the problem that does apply within a specific context.	Identifies one or more approaches for solving the problem that do not apply within a specific context.
Propose Solutions/Hypotheses	Proposes one or more solutions/hypotheses that indicates a deep comprehension of the problem. Solution/hypotheses are sensitive to contextual factors as well as all of the following: ethical, logical, and cultural dimensions of the problem.	Proposes one or more solutions/hypotheses that indicates comprehension of the problem. Solutions/hypotheses are sensitive to contextual factors as well as the one of the following: ethical, logical, or cultural dimensions of the problem.	Proposes one solution/hypothesis that is "off the shelf" rather than individually designed to address the specific contextual factors of the problem.	Proposes a solution/hypothesis that is difficult to evaluate because it is vague or only indirectly addresses the problem statement.
Evaluate Potential Solutions	Evaluation of solutions is deep and elegant (for example, contains thorough and insightful explanation) and includes, deeply and thoroughly, all of the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is adequate (for example, contains thorough explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is brief (for example, explanation lacks depth) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is superficial (for example, contains cursory, surface level explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.
Implement Solution	Implements the solution in a manner that addresses thoroughly and deeply multiple contextual factors of the problem.	Implements the solution in a manner that addresses multiple contextual factors of the problem in a surface manner.	Implements the solution in a manner that addresses the problem statement but ignores relevant contextual factors.	Implements the solution in a manner that does not directly address the problem statement.
Evaluate Outcomes	Reviews results relative to the problem defined with thorough, specific considerations of need for further work.	Reviews results relative to the problem defined with some consideration of need for further work.	Reviews results in terms of the problem defined with little, if any, consideration of need for further work.	Reviews results superficially in terms of the problem defined with no consideration of need for further work

Crop, Soil, and Environmental Sciences
Problem Solving Performance
Assessment Rubric

Student   _____

Degree   ESWS   CPSC

Course   _____

Assignment   _____

Date   _____

Student Learning Outcomes   **Score using Rubric**

1.   Define Problem   _____

2.   Idenitifying Strategies   _____

3.   Propose Solutions/Hypotheses   _____

4.   Evaluate Potential Solutions   _____

5.   Implement Solution   _____

6.   Evaluate Outcomes   _____

WRITTEN COMMUNICATION VALUE RUBRIC

for more information, please contact value@aacu.org

Definition

Written communication is the development and expression of ideas in writing. Written communication involves learning to work in many genres and styles. It can involve working with many different writing technologies, and mixing texts, data, and images. Written communication abilities develop through iterative experiences across the curriculum.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

	Capstone Exemplary	Milestones		Benchmark Developing
		Proficient	Basic	
Context of and Purpose for Writing *Includes considerations of audience, purpose, and the circumstances surrounding the writing task(s).*	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context).	Demonstrates awareness of context, audience, purpose, and to the assigned tasks(s) (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s) (e.g., expectation of instructor or self as audience).
Content Development	Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.	Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.	Uses appropriate and relevant content to develop and explore ideas through most of the work.	Uses appropriate and relevant content to develop simple ideas in some parts of the work.
Genre and Disciplinary Conventions *Formal and informal rules inherent in the expectations for writing in particular forms and/or academic fields (please see glossary).*	Demonstrates detailed attention to and successful execution of a wide range of conventions particular to a specific discipline and/or writing task (s) including organization, content, presentation, formatting, and stylistic choices	Demonstrates consistent use of important conventions particular to a specific discipline and/or writing task(s), including organization, content, presentation, and stylistic choices	Follows expectations appropriate to a specific discipline and/or writing task(s) for basic organization, content, and presentation	Attempts to use a consistent system for basic organization and presentation.
Sources and Evidence	Demonstrates skillful use of high-quality, credible, relevant sources to develop ideas that are appropriate for the discipline and genre of the writing	Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the discipline and genre of the writing.	Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the discipline and genre of the writing.	Demonstrates an attempt to use sources to support ideas in the writing.
Control of Syntax and Mechanics	Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error-free.	Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.	Uses language that generally conveys meaning to readers with clarity, although writing may include some errors.	Uses language that sometimes impedes meaning because of errors in usage.

Crop, Soil, and Environmental Sciences
Written Communication Performance
Assessment Rubric

Student   _____

Degree   ESWS   CPSC

Course   _____

Assignment   _____

Date   _____

Student Learning Outcomes   **Score using Rubric**

1.   Context of and Purpose for Writing   _____

2.   Content Development   _____

3.   Genre and Disciplinary Conventions   _____

4.   Sources and Evidence   _____

5.   Control of Syntax and Mechanics   _____

Name_____

Date_____

Semester and Year entered ESWS_____   PRE   POST

1.   The dissolved oxygen in a BOD sample at 1:20 dilution is initially 11.4 mg liter^{-1}. After
      5 days at 20°C the dissolved oxygen was 3.6 mg liter^{-1}. The BOD_5 of the sample is
      a)   7.8 mg liter^{-1}
      b)   31.2 mg liter^{-1}
      c)   72 mg liter^{-1}
      d)   156 mg liter^{-1}

2.   Which of the following is/are true regarding water pollution?
      a)   water pollution occurs naturally
      b)   water pollution can be accelerated by human activity
      c)   water is considered polluted when it is unusable for a particular purpose
      d)   all of the above

3.   Diversity is
      a)   highest at intermediate levels of disturbance
      b)   calculated with the following equation $dN/dt = rN (1-N/K)$
      c)   the number of different species in a community
      d)   calculated with the following equation $N_t = N_o\, e^{rt}$

4.   The H^+ concentration in moles L^{-1} of an aqueous sample with a pH of 6.8 is
      a)   6.8
      b) 6.8×10^5
      c) 1.5845×10^{-7}
      d) $10^{6.8}$

5.   Twenty dry tons of poultry litter compost (40% C, C/N = 9) was applied to an acre in
      March. How much net mineralization would occur in 137 days if its first order rate
      constant for N mineralization was 0.0001/d?
      a)   0.56 tons
      b)   0.11 tons
      c)   0.54 tons
      d)   12.66 tons

6.   Computer-based mapping, analysis, and location-based data management that can be
      used to solve problems is
      a)   Geographic Information System (GIS)
      b)   Global Positioning System (GPS)
      c)   Raster Imaging
      d)   Remote Sensing

7.   Which of the following are considered the five soil-forming factors?
a)   climate, relief, time, organisms, and plants
b)   color, relief, time, organisms, and rocks
c)   country, topography, temperature, animals, and rocks
d)   parent material, relief, time, organisms, and climate

8.   The fine-earth fraction of soil has what upper-limit of physical dimension?
a)   2 microns
b)   2 mm
c)   0.2 mm
d)   0.02 m

9.   What precursor air pollutants emitted from industrial and mobile sources result in ozone formation
a)   VOC and NO_x
b) NO_x and SO_x
c) CO_2 and H_2O
d)   CO and NO_x

10.   Which of the following is not an ecological consequence of acid deposition?
a)   decreased aquatic diversity and increased risk of harmful algal blooms
b)   eutrophication
c)   leaching of basic cations from soil and aluminum toxicity to plants
d)   weathering from acid inputs that increases buffering capacity of soils

11.   The problem that we currently face in global climate change is not that the earth has never been so warm, but the rapid changes in climate. Current models estimate that the average global temperature may rise between 2 and 6°C during the next century leading to which of the following consequences?
a)   a consistent increase in temperature across the globe
b)   inconsistent rates of change across species and locations altering ecology
c)   rapid adaptation of plants and animals to new phenology and abiotic conditions
d)   warmer climatic with unchanged precipitation patterns

12.   Which of the following soil microorganisms are generally most numerous in a typical agricultural soil?
a)   bacteria
b)   fungi
c)   nematodes
d)   protozoa

13.   Sulfate is extracted in 50 mL extract solution from 22 g of moist soil, reacted chemically to form a precipitate, and absorbance of light in the solution is measured in a spectrophotometer. The dry weight of a 10-g soil sample at equivalent moisture content was 8.1 g. The calibration curve for absorbance data based on standard solutions is shown below. The regression of the calibration curve gave an $R^2 = 0.997$, with a slope = 0.018, and the y-intercept = 0.002.

Std. (µg S/mL)   abs
0   0.002
12.5   0.205
25   0.478
50   0.883

The extraction solution absorbance of the soil sample is 0.381. Given these data, what is the concentration of SO_4^{-2}-S (µg S/g) in the soil?
a)   0.06
b)   2.6
c)   21.1
d)   58.8

14.   During an analysis for soil test phosphorus of Mehlich-III soil extract analyzed by inductively coupled plasma- atomic emission spectroscopy, the laboratory technician extracts and analyzes a laboratory duplicate to check the precision of the method. This is an example of
a)   quality assurance
b)   quality control
c)   field duplicate
d)   MDL

15.   Ammonium sulfate $(NH_4)_2SO_4$ is broadcast onto to a silty clay soil which is at a temperature of 25 °C and a moisture content of 0.3 g g^{-1}. What would be the immediate loss mechanism of concern for N?
a)   denitrification
b)   nitrification
c)   volatilization
d)   leaching

16.   Estimate the CEC of a Mollisol at pH = 7, with 16% 2:1 smectite clay (average CEC of 80 cmol$_c$/kg), 3% kaolinite clay (average CEC of 8 cmol$_c$/kg), and 3.5% OM (average CEC of 200 cmol$_c$/kg).
a)   288
b)   35.83
c)   22.5
d)   20.04

17. A soil core 10 cm long and 2.5 cm in diameter is collected from a moist field. The moist soil weight in the core is 132 g. The empty core weight is 35 g. The dry soil weight is 78 g. What is the volumetric moisture content of the soil?
   a)   0.20
   b)   0.24
   c)   0.30
   d)   0.41

18. Stream A supplies Town X's drinking water. Should one be concerned about the quality of Town X's drinking water?

   nitrate   5 ppm
   phosphate   10 ppb
   oxygen   8.5 ppm
   E. coli   25/100 mL

   a)   fecal contamination and possible presence of pathogens
   b)   excessive nitrate
   c)   excessive phosphate
   d)   low dissolved oxygen

19. Which of the following best describes the three key characteristics of a wetland?
   a)   hydrophobic vegetation, hydrology, and organic soil
   b)   hydrophobic vegetation, continuous ponded water, and hydric soil
   c)   hydrophilic vegetation, continuous ponded water, and hydric soil
   d)   hydrophytes, hydrology, and hydric soil

20. Which of the following water characteristics represents a eutrophic lake?
   a)   low dissolved P concentration
   b)   low light absorbance reading
   c)   long Secchi disk reading
   d)   low chlorophyll-a reading