

Academic Assessment Report

BEST PRACTICES IN STUDENT LEARNING OUTCOMES

(B.S. DEGREE/ ENVIRONMENTAL, SOIL, AND WATER SCIENCE)

(MAY 2016)

Contact

Robert Bacon, Dept Head
Crop, Soil, and Environmental Sciences Dept.
115 Plant Science Bldg
479-575-5715
rbacon@uark.edu

CSES Mission

The mission of the Department of Crop, Soil, and Environmental Sciences is to provide superior education programs at the undergraduate and graduate levels, conduct innovative research and extension programs in the crop, soil, and environmental sciences and provide superior service for citizens of Arkansas and the nation.

Program Goals

(Program goals are broad general statements of what the program intends to accomplish and describes what a student will be able to do after completing the program. The program goals are linked to the mission of the university and college.)

1. Graduates have the discipline-specific knowledge in soil, water, and environmental sciences required to perform successfully in private, government, or academic entry-level positions.
2. Graduates are able to critically analyze, synthesize, and evaluate new information to make informed decisions.
3. Graduates have the ability to solve complex, multidisciplinary problems.
4. Graduates are able to prepare and synthesize information to effectively communicate, both orally and in writing.

Student Learning Outcomes

(Student Learning Outcomes are defined in terms of the knowledge, skills, and abilities that students will know and be able to do as a result of completing a program. These student learning outcomes are directly linked to the accomplishment of the program goals.)

1. Students will demonstrate the discipline specific knowledge required to function as environmental, soil, and/or water science professionals.
2. Students will demonstrate the ability to critically evaluate situations or scenarios to arrive at well thought out and supported decisions and outcomes.
3. Students will demonstrate the ability to work through and solve complex, multidisciplinary problems.
4. Communication skills
 - a. Students will demonstrate the skills required to effectively communicate technical/scientific information in oral platforms.
 - b. Students will demonstrate the ability to integrate, organize, and effectively present written reports of technical/scientific information.

Assessment Measure for Outcome 1

- Achievement will be measured using **pre- and post-assessments**.
- This is a **direct** measure of student learning.
- Learning will be measured by generating an assessment of 20 test questions from the ESWS faculty to cover environmental, soil, water, and ecological concepts. These areas represent essential concepts for discipline specific knowledge of students completing an environmental, soil, and water science degree.
- The initial assessment was generated by ESWS faculty during the spring 2016. The ESWS teaching faculty submitted questions to the CSES Assessment committee for a pool from which to develop an assessment covering essential concepts. The assessment was piloted by having students in a senior level course complete the questions during a class period at the end of the spring 2016 semester. Because the assessment was not created earlier, the pre-assessment was not given to incoming ESWS students. However, performance on the post-assessment questions will help faculty determine if questions are targeting the appropriate concepts at the appropriate levels of learning (e.g. levels of learning using Bloom's Taxonomy). In the fall, the pre-assessment will be given to a section of ENSC 1001L Environmental Science Laboratory (FA) designated for enrollment of ESWS and Honors students. The post-assessment will be given during a class period (see below for possible courses) of an advanced ESWS course in the spring semester. Target populations are at least half of the incoming fall freshmen and half of the spring graduating ESWS class.
- Scores will be calculated for each assessment with the range, average, and median calculated for the pre and post-assessments to calculate the change in scores from pre- to post-assessment.

Acceptable and Ideal Targets (not required for indirect measures)

- The use of pre- and post-assessments are a new initiative for CSES; therefore, we are unsure of how "incoming" students in particular will perform on the pre-assessment.
- Acceptable: We are initially targeting a 50% increase in the mean and/or median test scores between the two populations (incoming and graduating students).
- Ideal: We are initially targeting an 80% increase in the mean and/or median test scores between the two populations (incoming and graduating students).

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

- ENSC 1001L Environmental Science Laboratory (FA), required course for all ESWS students, is the target course for the pre-test.
- ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population, are the target courses for the post-test.

Summary of Findings

- Sixteen students enrolled in ENSC 4263 Environmental Soil Science (SP even) took the post-assessment in the spring 2016. As we will be giving the pre-assessment for the first time in the fall 2016, we cannot calculate a change in scores. However, we wanted to pilot the post-assessment to begin collecting assessment data.

- Students wrote feedback on the post-assessment itself. They were not satisfied that the post-assessment reflected their knowledge gained during their tenure as ESWS students. They felt that the assessment did not focus on conceptual understanding that was emphasized in the ESWS degree program. They did not like computation-based questions, and felt that they will “look up” equations and so should not be expected to know equations, but should be given an equation sheet from which to choose an equation. One student commented that the assessment was “over-analytical” and two specifically remarked that there should be more “real-world” questions.
- The post-assessment contained 20 individual questions. The questions were developed to address important concepts in ESWS. Some questions were straight knowledge based questions that required only memorized information to answer correctly. Several questions required that the students apply formulas that ought to have been well known to the students upon graduation and to calculate answers. Those questions had low success rates for students. Other questions required comprehension and understanding of processes in order to answer correctly, while a couple of questions required analysis in order to answer correctly.
- Student scores ranged from 6/20 (30%) to 15/20 (75%) with an average of 9.4/20 (47%) and a median of 9/20 (45%).

Recommendations

- Having had the students pilot the post-assessment brought forth the realization that many of the post-assessment questions are being asked at a low cognitive level. The ESWS faculty need to review the assessment questions. The faculty need to review and articulate expectations of ESWS related knowledge within the knowledge dimension (factual, conceptual, procedural, and metacognitive). Faculty also need to review essential knowledge in ESWS for the target cognitive (remembering, understanding, applying, analyzing, evaluating, and creating) and affective levels (receiving, responding, valuing, organizing, and internalizing/characterizing).
- While application of concepts to the real-world is certainly emphasized in the ESWS degree program, there may also be a mismatch in the student expectations and the information that will be immediately apparent and readily supplied to the student to solve problems in the real-world after graduation. The expectation of a constantly supplied “equation sheet”, for example, to answer any particular question asked may need to be better addressed within the curriculum.
- A better fit for assessment across all appropriate domains, in which faculty can articulate the targeted levels of learning, may be scenario-based questions. Four to five questions derived from four to five different “world-based” scenarios could target different knowledge dimensions and cognitive processes and would likely fit into the affective domain cultured by ESWS faculty and developed by ESWS students.

Assessment Measure for Outcome 2

- Achievement will be measured using a critical thinking scenario (administered during class, potentially included on the post-assessment for learner outcome #1) and rated using a **critical thinking rubric**.
- This is a **direct** measure of student learning.
- Assessment scenarios will be generated to cover application of critical thinking in environmental, soil, water, or ecological contexts.

Acceptable and Ideal Targets (not required for indirect measures)

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

- Ideal: 90% of seniors assessed will score proficient or greater.

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

- ENSC 4023 Water Quality (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population, are the target courses for the critical thinking assessment.

Summary of Findings

- Seven seniors enrolled in ENSC 4263 Environmental Soil Science (SP even) completed a critical thinking exercise which was assessed independently by two ESWS faculty using the critical thinking rubric during the spring 2016. Overall ratings ranged from developing to basic. Scores for explanation of issues, evidence, and student's position (perspective, thesis/hypothesis) ranged mainly from developing to basic with some students scoring proficient. Scores for influence of context and assumptions, and conclusions and related outcomes, were all developing to basic. Students tended to state issues, although not always clearly or completely. Evidence was not deeply questioned, frequently taken as fact, and students need to work on developing interpretations from information. There was a lack of questioning of assumptions, especially students' own assumptions, while they did identify some relevant contexts for scenarios. Students tended to simplify, even if they acknowledged complexities, and demonstrated a lack of logical evaluation. Students did relate outcomes, but conclusions were tied to information because information was chosen to fit a desired conclusion.

Recommendations

- Critical thinking requires analysis, synthesis, and evaluation, i.e. learning at high cognitive levels. Faculty need to consider and articulate where and when students have opportunities to develop (learn and repeatedly practice) those cognitive skills within the curriculum. If assessment continues to show lower than desired achievement, learning opportunities within the curriculum should be enhanced.
- This is an area that should be watched for improvement as assessment data collection continues.

Assessment Measure for Outcome 3

- Achievement will be measured using a problem based scenario (administered during class, potentially included on the post-assessment for learner outcome #1) and scored using a **problem solving rubric**.
- This is a *direct* measure of student learning.
- Assessment scenarios will be generated to cover application of problem solving in environmental, soil, water, or ecological contexts.

Acceptable and Ideal Targets (not required for indirect measures)

- Acceptable: 50% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

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

- ENSC 4023 Water Quality (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), ENSC 4034 Analysis of Environmental Contaminants (SP even), optional

advanced courses for ESWS students that should capture at least half of the senior population, are the target courses.

Summary of Findings

- A problem was given to seven ENSC 4263 Environmental Soil Science (SP even) seniors to pilot-test the application of the problem solving rubric in assessment of problem solving abilities of ESWS students.
- It was discovered in applying the rubric to assessment of elements of problem-solving that the particular problem was not well suited for assessment using the rubric.

Recommendations

- It is recommended that the Department Head make sure that all faculty have the assessment rubrics. Referencing the rubrics when designing questions will help faculty develop scenarios and questions for use within ESWS courses.
- Problem solving questions for assessment should be developed in the future in conjunction with the use of the rubric to facilitate assessment of the student learning outcome.

Assessment Measure for Outcome 4a

- Achievement will be assessed using an **oral communication rubric** during oral presentations where the student has compiled and evaluated the scientific literature as part of a class project and/or completed an independent research project as part of a special problems, research project or internship class.
- This is a **direct** measure of student learning.

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

- Acceptable: 70% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

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

- CSES 3023 CSES Colloquium (FA), an upper division, professional development, communication-intensive course that should capture at least capture at least half of the senior population, is the target course for the assessment.
- CSES 462V Internship, Special Problems, and Honors thesis defenses provide other opportunities where students present and the oral communication rubric can be used to evaluate communication skills.

Summary of Findings

- CSES Colloquium is a fall course and most internships occur during the summer with presentations given during the fall semester, so oral communication skills have not been assessed yet.

Recommendations

- Data will be collected during the 2106-2017 academic year to assess performance in oral communication.

Assessment Measure for Outcome 4b

- Achievement will be assessed using a **written communication rubric** for laboratory reports and technical/scientific proposals where the student has analyzed, synthesized and evaluated information from independent sources as part of a class project and/or completed an independent research project as part of a special problems, research project or internship class.
- This is a **direct** measure of student learning.

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

- Acceptable: 70% of seniors assessed will score proficient or greater.
- Ideal: 90% of seniors assessed will score proficient or greater.

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

- ENSC 4021L Water Quality Laboratory (FA), ENSC 4263 Environmental Soil Science (SP even), CSES 4553 Wetland Soils (SP odd), and ENSC 4034 Analysis of Environmental Contaminants (SP even), optional advanced courses for ESWS students that should capture at least half of the senior population, are the target courses for assessment of writing.
- CSES 462V Internship, Special Problems, and Honors thesis research provide opportunities where students have completed independent research projects provide other opportunities where students have to write papers in which they organize data and information they have analyzed, synthesized and evaluated to clearly and fluently convey a message.

Summary of Findings

- CSES Colloquium and Water Quality are fall courses and most internships occur during the summer with presentations given during the fall semester, so written communication skills have not been assessed yet.

Recommendations

- Data will be collected during the 2106-2017 to assess performance in written communication.

Overall Recommendations

- It is imperative that the new procedures being developed for the ESWS Assessment Plan become ingrained as part of the academic culture of faculty such that implementation is seamless and an integrated component of faculty's teaching. If it is a chore to be remembered, then implementation of program assessment components are not likely to succeed.
- A full year of data collection should provide baseline data for faculty to consider in curriculum review. Faculty should consider moving toward articulation of expectations of ESWS related knowledge not just as essential concepts but within the knowledge dimension (factual, conceptual, procedural, and metacognitive), the cognitive dimension (remembering, understanding, applying, analyzing, evaluating, and creating) and affective dimension (receiving, responding, valuing, organizing, and internalizing/characterizing).

Action Plan

- During the summer, the Department Head and Assessment Committee will make sure that teaching faculty have necessary rubrics and are prepared to use them in fall courses.
- The pre-assessment needs to be given during class in the fall, while the post-assessment will be administered during class in the fall and/or spring semester.

- Assessment implementation and progress will be a topic at most faculty meetings during the 2016-2017 academic year.
- Data generated during the 2016-2017 academic year will be used to determine if action is needed to alter assessment, student learner outcomes, and/or curriculum.
- Data from implementation of the pre/post-assessment in particular may offer an avenue to articulate program expectations within the knowledge, cognitive, and affective domains (using Bloom's Taxonomy). Faculty can then consider whether the pre/post-assessment accomplishes assessment as desired or if it needs revision to properly assess achievement of student learning outcomes within the framework of the existing ESWS curriculum.

Supporting Attachments

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

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 Exemplary	Milestones		Benchmark Developing
		Proficient	Basic	
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		Benchmark Developing
		Proficient	Basic	
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 <i>Selecting and using information to investigate a point of view or conclusion</i>	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.

PROBLEM SOLVING VALUE RUBRIC

for more information, please contact value@aacu.org



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		Benchmark Developing
		Proficient	Basic	
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

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 <i>Includes considerations of audience, purpose, and the circumstances surrounding the writing task(s).</i>	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 <i>Formal and informal rules inherent in the expectations for writing in particular forms and/or academic fields (please see glossary).</i>	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.

Environmental, Soil, and Water Science
Pre- and Post- Curriculum Knowledge Assessment

Name _____

Date _____

Semester and Year entered ESWS _____

PRE

POST

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

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, $\text{C/N} = 9$) 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 $0.0001/\text{d}$?
 - 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) CO₂ and H₂O
 - 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.

<u>Std. ($\mu\text{g S/mL}$)</u>	<u>abs</u>
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 $\text{SO}_4^{2-}\text{-S}$ ($\mu\text{g S/g}$) 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 $(\text{NH}_4)_2\text{SO}_4$ 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 |
| <i>E. coli</i> | 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

**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 | _____ |

**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. Identifying Strategies	_____
3. Propose Solutions/Hypotheses	_____
4. Evaluate Potential Solutions	_____
5. Implement Solution	_____
6. Evaluate Outcomes	_____

