Institutional Effectiveness Report

Academic Year: 2018-2019
Academic Program: B.S. in Environmental and Sustainability Studies
Department/Unit: School of Environmental Studies
College: Interdisciplinary Studies
Submission Date: September 2019
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I. Department Mission:

The School of Environmental Studies will foster in students the desire to lead purposeful professional lives through the application of scientific principles to environmental issues within the social, political, and economic framework of our society.

Concentrations and Options: The B.S. degree program in Environmental and Sustainability Studies (ESS) has three concentrations. Two of the three concentrations have additional curricular options nested within them as summarized below:

Concentration 1. Environmental Science
        Option 1.1. Biology
        Option 1.2. Chemistry
        Option 1.3. Natural Resources
Concentration 2. Society, Culture and Communication
        Option 2.1. Communication and Media
        Option 2.2. Social Science and Policy
        Option 2.3. Leadership and Environmental Management
Concentration 3. Environmental Technology

History and Enrollment: The ESS degree program was initiated in Fall 2012 and will be starting its eighth academic year in August 2019. Enrollment has been steady at approximately 40-45 students for the past several years. Two students graduated in 2014-2015, eight in 2015-2016, 12 in 2016-2017, 14 in 2017-2018, and 13 in 2018-2019. The concentration with the highest number of students is Environmental Science, especially in the Biology and Natural Resources options.

II. Program Goals and Student Learning Outcomes:

Program Goal 1: Graduates will be able to analyze and propose sustainable solutions for complex, real-world environmental problems.
Program Goal 2: Graduates should understand and integrate ideas from the ecological, social, and physical sciences with technological solutions.

Learning Outcome 1: Students will communicate scientific information effectively in writing, orally, and visually.

Learning Outcome 2: Students will demonstrate the ability to work collaboratively on interdisciplinary teams.

Learning Outcome 3: Students will demonstrate the ability to integrate social, economic, biological, chemical, and physical science knowledge to identify, formulate, and solve environmental problems.

III. Assessments

Assessment Tools for Learning Outcomes:

- **Rubric for senior capstone course** (direct measure).
  Each senior capstone proposal and final project will be assessed by faculty using rubrics that evaluate the proposal or final presentation based on criteria such as the quality of the research question, introduction, literature review, documentation, methodology, proposal structure, and budget (Appendices 1-2). (Outcomes 1, 2, 3)

- **Senior exit survey** (indirect measure).
  Each graduating senior will complete a departmental exit survey on or near the time of the exit interview with the program director. The survey has 31 questions to rate the quality of program components from the student's perspective on a scale from 1 (poor) to 4 (excellent). (Outcomes 1, 2, 3)

- **IDEA student evaluation results** (indirect measure). IDEA evaluations are administered for each course in the curriculum. Students can rate their learning progress in key areas such as interdisciplinary teamwork, oral and written communication, and critical thinking skills. (Outcomes 1, 2, 3)

IV. Rationale for Outcomes and Assessments (Process for Data Analysis):

- **Rubric for senior capstone course:** The rubric shown in Appendix 1 generates a score that can be converted to an index ranging from 0 to 100 that can be tracked from year-to-year to provide a quantitative assessment of program quality as reflected by the quality of student team proposals and projects. The rubric scores will be monitored by the director and discussed with program faculty and the dean each year during the Fall Semester associate faculty meeting. Another rubric (Appendix 2) was developed this year to evaluate the capstone presentation that is given in the second semester (Spring Semester) of the two-semester capstone sequence.

- **Senior exit survey:** The written survey provides the opportunity for quantitative feedback from students about specific aspects of the degree program, including the curriculum, advising, facilities and related student experiences while at TTU. In addition, a number of survey questions are directly related to specific learning outcomes. The results are summarized by the director and discussed with program faculty and the dean during the Fall Semester meeting each year.
- **IDEA student evaluation results:** The director of the school will monitor the percent of instructors identifying interdisciplinary training/teamwork, oral communication, written communication and critical thinking as a key course objective, and the percent of students who report citing progress in these related skills to their course. The results will be summarized by the director and discussed with the associate faculty committee and dean during the Fall Semester meeting each year.

V. Results

Rubric for senior capstone course. (Outcomes 1, 2, 3). In the capstone sequence the first course (ESS 4001) entails development of a proposal to conduct a specific project while the second course (ESS 4002) involves actually carrying out the project. During Fall 2018, the capstone teams designed a project focused on illegal dumpsites in the Upper Cumberland region. The average student team score in Fall 2018 on the proposal phase of the project was 91 out of 100 (91%), compared to scores of 88% in Fall 2017, 80% in Fall 2016, 86% in Fall 2015, 93% in Fall 2014, and 70% in Fall 2013. The capstone instructors developed a new rubric for evaluation of the final presentation in ESS 4002, as shown in Appendix 2, that was implemented in the 2018-2019 academic year. The students in Spring 2019 scored 93% on their capstone presentation, representing our first data point obtained using this new rubric.

Senior exit survey. (Outcomes 1, 2, 3). Fourteen graduating seniors completed exit surveys in 2017-2018, and nine graduating seniors completed surveys in 2018-2019, with results shown in Table 1. These two cohorts of students represented the third and fourth graduating groups of seniors in our recently established degree program. Students rated the quality of the ESS program (1 = poor; 2 = fair; 3 = good; 4 = excellent) for questions related to developing their communication skills, interdisciplinary teamwork, and environmental problem solving. The average score on scientific literature increased to 3.9 this year, the highest of the four years to date. The average score on communication skills has remained relatively stable at 3.6 or 3.7 for the past three years. Progress on working collaboratively on an interdisciplinary capstone team increased from 3.5 to 3.8 this past year, while the environmental problem-solving average scores have remained stable at 3.8 or 3.9 for the past three years.

Table 1. Average scores from ESS senior exit survey results for four survey questions related to student learning outcomes. Questions about the quality of the ESS program components could be answered on a scale of 1 (poor) to 4 (excellent). The values shown for each year are the mean scores on a scale of 1 to 4 from those students who provided answers to each specific question. Sample sizes (n = number of students who completed the senior exit survey) are shown for each academic year.

Survey Question	Associated Learning Outcome	Academic Year			
		2015-2016 ($n = 6$)	2016-2017 ($n = 8$)	2017-2018 ($n = 14$)	2018-2019 ($n = 9$)
Use of scientific literature	1. Communication skills	3.2	3.7	3.6	3.9
Communicating scientific information	1. Communication skills	3.3	3.6	3.6	3.7
Collaborative capstone teamwork	2. Interdisciplinary teamwork	--	--	3.5	3.8
Environmental problem solving	3. Environmental problem solving	3.5	3.8	3.9	3.9

IDEA student evaluation results. (Outcomes 1, 2, 3). IDEA results were analyzed for all undergraduate ESS courses taught during 2017-2018 and 2018-2019. Results from the previous three academic years are also shown for comparison (Table 2). In the past two years, average scores for student progress on teamwork, oral and written communication, and critical thinking were generally greater than 4.0. The one exception occurred in 2018-2019 for oral and written communication when the average was 3.8, but only two instructors selected that particular IDEA objective for evaluation that year. It was encouraging to see program-wide average ratings generally above 4.0 on a 5-point scale, as observed in previous years. Across all five years, the average teamwork score ranged from 4.3 to 4.5 and the average teamwork score ranged from 4.1 to 4.4, both showing strong interannual stability. On the other hand, the oral and written communication average score was more variable across years, peaking with a high score of 4.7 in 2016-2017 and dipping to a low score of 3.8 in 2018-2019.

Table 2. Student-rated progress on three IDEA Objectives related to student learning outcomes for ESS courses taught during the past five academic years. Abbreviations: column headings "15" = academic year 2014-2015, "16" = 2015-2016, and so forth; "no" indicates that a course either was either not offered or not evaluated in that particular year; and "--" indicates that the instructor did not select that particular IDEA objective as important or essential.

| | IDEA Objectives | | | | | | | | | | | | | | |
| | Acquiring skills in working with others as a member of a team | | | | | Developing skill in expressing myself orally or in writing | | | | | Learning to analyze and critically evaluate ideas, arguments, and viewpoints | | | | |
Course	15	16	17	18	19	15	16	17	18	19	15	16	17	18	19
ESS 1020	4.3	--	4.6	--	no	--	--	4.4	--	no	--	--	3.6	--	no
ESS 1100	4.4	--	--	4.7	4.6	3.8	--	--	--	--	4.3	3.8	--	4.6	4.5
ESS 3000	4.3	no	no	3.3	4.2	4.1	no	no	3.6	3.9	4.7	no	no	3.4	3.8
ESS 3710	--	--	--	--	--	3.6	--	--	--	--	3.6	--	--	--	--
ESS 4001	4.7	4.1	4.7	4.8	5.0	4.0	3.4	--	4.4	--	3.7	3.9	4.5	--	--
ESS 4002	4.7	4.5	4.9	4.6	4.3	4.5	--	--	4.5	--	4.2	--	--	--	--
ESS 4093	no	--	no	4.0	--	no	4.7	no	4.5	--	no	4.7	no	4.4	4.3
ESS 4300	no	no	3.0	--	--	no	no	--	--	3.7	no	no	--	--	--
ESS 4900	no	no	5.0	--	no	no	no	5.0	--	no	no	no	5.0	--	no
Average Score	4.5	4.3	4.4	4.3	4.5	4.0	4.1	4.7	4.3	3.8	4.1	4.1	4.4	4.1	4.2

VI. Modifications and Continuing Improvement: Program Changes due to Assessments

The ESS degree program produced a self-study report and participated in an academic audit during 2017-2018. The external review team suggested that we revisit our program goals and student learning outcomes to better align the goals/outcomes with our curricular offerings. Furthermore, the review team recommended that we create ample opportunities for direct assessment of student learning in multiple courses at multiple points throughout the 4-year degree program. Therefore, the SOES faculty devoted a large portion of their 2018 and 2019 summer faculty retreats to overhauling the curriculum and redesigning the program goals and student learning outcomes.

For curricular changes, we are submitting those modifications to the university curriculum committee during Fall Semester 2019 for review and approval. The changes entail offering more internship credit opportunities in the curricular tracks, adding a required course on global sustainability, and removing some unnecessary electives.

For program goals and student learning outcomes, the SOES faculty decided to replace our current program goals and student learning outcomes with the threshold learning outcomes presented in *The Learning and Teaching Academic Standards*

Statement for Environment and Sustainability by Phelan and co-authors (Phelan, L., McBain, B., Ferguson, A., Brown, P., Brown, V., Hay, I., Horsfield, R., Taplin, R. 2015. Learning and Teaching Academic Standards Statement for Environment and Sustainability. Sydney: Office for Learning and Teaching. ISBN 978-0-646-93614-7.) Our rationale for wholesale replacement of our current learning outcomes is as follows: (1) our current system does not lend itself well to direct assessment of student learning throughout all four years of the degree program; (2) the Phelan approach is a respected and up-to-date system used by a number of other universities in North America (e.g., George Mason University) and around the world; and (3) the Phelan approach provides a better fit to our interdisciplinary degree and a more comprehensive match to all seven of our curricular tracks.

The Phelan approach contains 15 learning outcomes organized into four domains as shown below. According to Phelan et al. (2015), "The bachelor degree qualifies individuals who apply a broad and coherent body of knowledge in a range of contexts to undertake professional work and as a pathway for further learning. Upon completion of a bachelor degree in the field of Environment and Sustainability, or a bachelor degree with a major in Environment and Sustainability, graduates will attain the following [threshold learning outcomes]."

Domain 1. Transdisciplinary knowledge
1. Demonstrate a broad and coherent knowledge of:
    1.1. environments at various scales, interdependencies between human societies and environments, and sustainability;
    1.2. key environmental and sustainability challenges and their drivers; and
    1.3. holistic systems thinking and complexity.

Domain 2. Systemic understanding
2. Demonstrate an understanding of diverse approaches to environment and sustainability, including:
    2.1. disciplinary and transdisciplinary approaches to identifying and conceptualizing environmental and sustainability challenges;
    2.2. different frameworks for knowing;
    2.3. their own and others' values, knowledge, ethical positions and interests; and
    2.4. the particular values, knowledge, ethical positions and interests of indigenous peoples globally.

Domain 3. Skills for environment and sustainability
3. Demonstrate well-developed cognitive, technical and communication skills through:

3.1. addressing research questions by identifying, synthesizing and applying appropriate knowledge and evidence from diverse sources;

3.2. thinking critically and creatively in designing and evaluating sustainable alternatives and envisioning sustainable futures;

3.3. applying tools, methods, skills and theoretical knowledge for environment and sustainability practice;

3.4. working both independently and collaboratively;

3.5. communicating with diverse groups in various contexts using a range of written, oral and visual means; and

3.6. engaging with Indigenous approaches to environmental and sustainability challenges.

Domain 4. Ethical practice

4. Demonstrate an ethical professional, public and personal conduct by having capacity to:

4.1. reflect on and direct their own learning and practice in the context of environment and sustainability; and

4.2. participate constructively in decision-making consistent with principles of sustainable development.

The next steps in adopting and implementing the new learning outcomes will be (1) formulating program goals that align well with the outcomes, (2) presenting the new goals and outcomes to the ESS associate faculty for their review and approval, and (3) developing assessment tools to directly measure student mastery of the learning outcomes at multiple points along the 4-year degree program. The Phelan system will be presented to the ESS associate faculty during the 2019-2020 academic year. SOES faculty and ESS associate faculty will also be developing a locally written major field exam which can include questions designed to assess knowledge of the learning outcomes. Some of our current indirect assessment tools (e.g., IDEA evaluations and senior exit surveys) and direct assessment tools (e.g., capstone rubrics) can be retained and applied to the new Phelan system.

Appendix 1. Rubric for ESS 4001 Capstone course to evaluate the quality of the students' research project proposal.

Rubric for a Research Project   **Student Name(s)**_____
Final Grade_____

	Thesis/ Problem/ Question	Introduction	Literature Review	Documentation	Methodology	Proposal Structure	Budget
4	Students posed a thoughtful, creative question that engaged them in challenging or provocative research. The proposal contributes to knowledge in a focused, specific area.	Provides a clear and thorough introduction and background that provides clear information about the proposed project. A novice could understand the proposed project.	Students gathered information from a variety of quality electronic and print sources, including appropriate licensed databases. Sources are relevant, balanced and include critical readings relating to the thesis or problem.	Students documented all sources, including visuals, sounds, and animations. Sources are properly cited, both in-text/in-product and on Works-Cited/Works-Consulted pages/slides. Documentation is error-free.	Students effectively and creatively used appropriate communication tools to provide a clear explanation of the proposed experimental methods	Students addressed each required section of the proposal and provided an adequate explanation/description for each section.	Students presented a detailed budget, outlining all supplies and/or equipment needed to carry out the proposed project. Budget was appropriate
3	Students posed a focused question involving them in challenging research.	Provides an introduction and background that is adequate. A novice would not be able to completely understand the proposed project.	Students gathered information from a variety of relevant sources--print and electronic.	Students documented sources with some care, Sources are cited, both in-text/in-product and on Works-Cited/Works-Consulted pages/slides. Few errors noted.	Students provided an adequate explanation of proposed experimental methods.	Students addressed each required section of the proposal. Explanation/description for each selection was less than adequate.	Students submitted a budget, but it lacked some detail. Not all supplies and/or equipment needed were listed. Budget was appropriate.
2	Students constructed a question that lends itself to readily available answers.	Provides an introduction and background that is only somewhat significant to the proposal. A novice would not be able to understand the proposed project.	Students gathered information from a limited range of sources and displayed minimal effort in selecting quality resources.	Students needed to use greater care in documenting sources. Documentation was poorly constructed or absent.	Students provided a less than adequate explanation of proposed experimental methods.	Students did not address all required sections of the proposal, but most sections were there. Explanation/description was inadequate	Students submitted a short budget with no detail. Budget was not appropriate for the proposed project.
1	Students developed a question requiring little creative thought.	Students gathered information that lacked relevance, quality, depth and balance. Even someone familiar with the proposed project would have trouble understanding.	Students did not gather any references for the proposal.	Students clearly plagiarized materials.	Students no explanation of methods to be used to carry out proposed project.	Students did not address most of the required sections of the proposal and those addressed were inadequate.	Students did not submit a budget
Comments							

Appendix 2. Rubric for ESS 4002 Capstone course to evaluate the quality of the students' research presentation.

Rubric for a Research Presentation   Student Name(s) _____Final Grade_____

	Power Point Presentation	Oral Presentation	English Grammar	Questions	Professional Appearance	Organization	Budget
4	Presentation is effective, and all information is presented thoroughly. Slides are not too wordy, and pictures are used effectively.	Presentation was professional, with smooth transitions. Students gave an effective presentation and didn't just read slides.	Proper English grammar was used.	Students were able to think about and answer all questions asked.	Students had a professional appearance.	Students addressed each part of the proposal in some fashion in the presentation.	Students presented a detailed budget, outlining all supplies and/or equipment needed to carry out the proposed project. Budget was appropriate
3	Presentation is effective, but some information is missing. Slides have more words than needed.	Presentation was effective with a few missteps in transitions. Students read from some slides, but not all of them.	Students used proper grammar most of the time.	Students were able to answer most of the questions asked.	Students dressed professionally, although there were some missteps in dress.	Each part of the proposal was presented, but some detail was lacking.	Students presented a budget, but it lacked some detail. Not all supplies and/or equipment needed were listed. Budget was appropriate.
2	Presentation is not effective in giving information. Slides are wordy.	Presentation was lacking in information and students had little additional information than was in each slide.	Presentation was too conversational.	Students had difficulty answering the majority of the questions asked.	Students did not take much care in their professional appearance (e.g. stains, wrinkles, no tie, etc.)	Students did not address all required sections of the proposal, but most sections were there. Explanation/description was inadequate	Students presented a short budget with no detail. Budget was not appropriate for the proposed project.
1	Presentation doesn't give adequate information. Slides have too many words.	The presentation was inadequate at addressing the problem. Students read exclusively from slides.	Students used poor English.	Students clearly did not understand the project and could not answer questions.	Students made no effort to dress in a professional manner.	Students did not address most of the required sections of the proposal and those addressed were inadequate.	Students did not submit a budget
Comments							