

2017-2018 Yearly Assessment Report for the Bachelor of Science in Environmental Science

Name of Program: B.S. in Environmental Science

Type of Program: Major & Minor

College of Arts and Sciences

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Mission Statement

There have been no changes to the mission statements for either the major or minor in the past year. The mission statements for both the major and minor are identical.

The mission of the Department of Environmental Science is to provide an interdisciplinary and integrated science curriculum in order to develop skills for solving environmental problems in a socially just manner. The program prepares students for careers and graduate study and to be good stewards of the environment.

This mission statement was approved by the department in a general meeting on 24 April 2015.

Program Goals

- Provide an interdisciplinary and integrated science curriculum to develop skills for solving environmental problems.
- Prepare students for careers and graduate study in environmental fields.
- Ground our students in social justice to be good stewards of the environment for future generations.

These program goals were approved by the department in a general meeting on 24 April 2015.

Program Learning Outcomes

No changes have been made to the Program Learning Outcomes for either the ENVS major or minor in the past year.

Students who complete the BS in ENVS degree requirements will be able to:

- PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues.
- PLO 2 – Apply the scientific method to environmental issues.
- PLO 3 – Skillfully communicate knowledge of environmental science.

- PLO 4 – Demonstrate knowledge of environmental conditions so as to promote active participation and social justice.

These program learning outcomes were approved by the department in a general meeting on 24 April 2015.

Students who complete the Minor in ENVS requirements will be able to:

- PLO 1 – Explain the range and interdisciplinary nature of environmental issues.
- PLO 2 – Apply the scientific method to environmental issues.
- PLO 3 – Articulate knowledge of basic concepts in environmental science.

These program learning outcomes were approved by the department in a general meeting on 24 March 2017.

Summary of 2017-2018 AY Assessment Plan

During the 2017-2018 academic year, we assessed PLOs 1, 2 & 3 for the BS in ENVS but did not assess any PLOs for the minor program. The reason for the latter was that there were no students with a declared ENVS minor during the fall of 2017.

Specifically, during the 2015-2016, 2016-2017, the department focused its efforts on starting to assess learning, specifically PLOs 1, 2, & 3. Two courses were selected for this initial process; they are Air & Water w/Lab (ENVS-212 & ENVS-212L) and Methods of Environmental Monitoring (ENVS-410 & ENVS-410L). To accomplish this assessment, final presentations in the form of oral or poster format were evaluated by course instructors as well as invited faculty using standardized and calibrated rubrics for assessing progress relative to the program learning outcomes addressed by the specific course. In the 2017-2018 academic year, the department continued this same assessment for the ENVS-410 course only. The reason for this continuation was the result of two faculty members being placed on emergency family/sick leave, leaving the department understaffed and overwhelmed. So, while we had planned on assessing PLO4, that plan was delayed by one year until we were back at full staffing.

Methods

As discussed, final presentations in the form of oral or poster formats were evaluated by course instructors as well as several faculties within the department using standardized rubrics for assessing progress relative to program learning outcomes addressed by the specific course. The courses in which assessment was performed were Air & Water w/Lab (ENVS-212 & ENVS-212L) and Methods of Environmental Monitoring (ENVS-410 & ENVS-410L). These courses were chosen because the former is typically taken by students during the fall semester of their second year and the latter is the senior capstone course taken during spring semester of the final year of study. By

selecting these two courses we expect to be able evaluate progress to program learning outcomes as the degree progresses and also at its culmination.

Three program learning outcomes are addressed in these two courses, PLO1, PLO2, and PLO3 were the PLOs evaluated in this analysis. Since this was an evaluation by faculty as students presented their work, it was a direct assessment of student capabilities. As defined by the curricular map, Table 1, PLO1 and PLO2 were expected to be developing upon completion of the Air & Water course, ENVS-212, and PLO3 was expected to be at the introductory level upon completion of the course. All three PLOs were expected to be mastered upon completion of the degree as measured by the senior capstone course, Methods of Environmental Monitoring, ENVS-410.

Regarding assessment of the minor in Environmental Studies, during the 2017-2018 academic year, there were three declared ENVS minors, so no meaningful assessment could be performed. As of the census date for fall semester 2018, there are there are 5 students registered in the minor. Obviously, these low numbers require that we consider the effectiveness of the minor and the department will focus on this in the next few years.

Curriculum Map 1

Table 1 - The curricular map below describes when and how each learning outcome is introduced, developed, or mastered as a student progresses through various courses within the B.S. in ENV/S degree. I = Introduced, D = Developed, M = Mastered


Program Learning Outcomes / Course	PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues.	PLO 2 – Apply the scientific method to environmental issues.	PLO 3 – Skillfully communicate knowledge of environmental science.	PLO 4 – Demonstrate knowledge of environmental conditions so as to promote active participation and social justice.
110 Introduction to Environmental Science (LAB)	I	I	I	I
210 Ecology & Human Impacts (LAB)	D	D	I	I
212 Air & Water (LAB)	D	D	I	
250 Environmental Data Analysis	I	D	I	
410 Methods of Environmental Monitoring (FIELD/LAB)	M	M	M	M
311 Environmental Chemistry	D		D	
320 Restoration Ecology (FIELD/LAB)	D	D	D	I
321 Wetland Ecology (FIELD/LAB)	D	D	D	I
325 California Ecosystems (LAB)	D	D	D	D
330 Environment & Ecosystem Health	M		M	I
335 Marine Environments (LAB)	D	D	D	
350 Energy & Environment	D	D	D	D

360 Climate Change: Science & Policy	D	D	D	D
366 Environmental Policy	M	D	D	D
370 Intro to Landscape Ecology & GIS	D	D	M	D
380 Environmental Engineering	I		D	

Curriculum Map 2

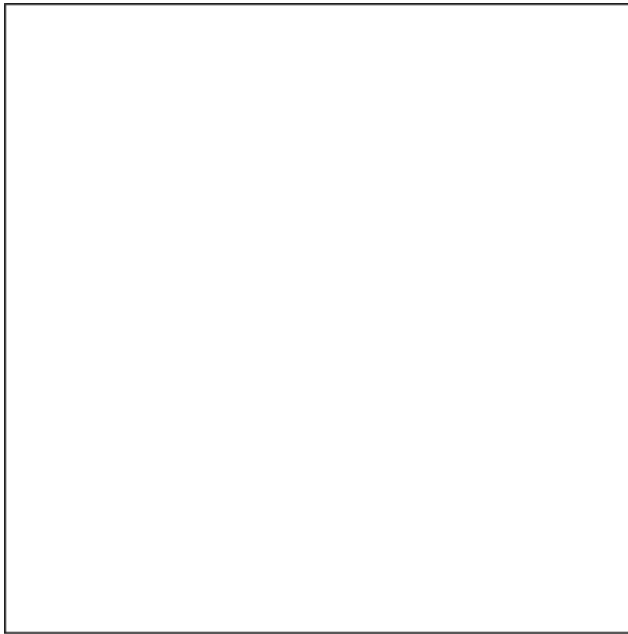
Table 2 - The curricular map below describes when and how each program learning outcomes (PLOs) for the B.S. in ENVS degree maps onto the Institutional Learning Outcomes (ILOs) for the University of San Francisco.

Program Learning Outcomes / Institutional Learning Outcomes	PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues.	PLO 2 – Apply the scientific method to environmental issues.	PLO 3 – Skillfully communicate knowledge of environmental science.	PLO 4 – Demonstrate knowledge of environmental conditions so as to promote active participation and social justice.
ILO 1 – Students reflect on and analyze their attitudes, beliefs, values, and assumptions about diverse communities and cultures and contribute to the common good.				✓
ILO 2 – Students explain and apply disciplinary concepts, practices, and ethics of their chosen academic discipline in diverse communities.	✓	✓		✓
ILO 3 – Students construct, interpret, analyze, and evaluate information and ideas derived from a multitude of sources.	✓	✓		
ILO 4 – Students communicate effectively in written and oral forms to interact within their personal and professional communities.			✓	
ILO 5 – Students use technology to access and communicate information in their personal and professional lives.			✓	
ILO 6 – Students use multiple methods of inquiry and research processes to answer questions and solve problems.		✓		

ILO 7 – Students describe, analyze, and evaluate global interconnectedness in social, economic, environmental and political systems that shape diverse groups within the San Francisco Bay Area and the world.				
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Results

Program learning outcomes 1-3 were evaluated at the completion of ENVS-212, Air & Water, and ENVS-410, Methods of Environmental Monitoring. These PLOs were evaluated by department faculty observing presentations of posters in ENVS-212 and oral (conference-style) presentations in ENVS-410. In each case, all departmental faculty were invited to attend and evaluate student efforts, and many were able to attend at least some of the student presentations. A total of seven different faculty evaluated some or all of the student presentations for each course.



*Figure SEQ Figure * ARABIC 1 - Graphical results of assessment of student learning for PLOs 1, 2, & 3 over three academic years. The value of above each bar is the mean value and the error bars represent ± 1 standard deviation.*

The results of this direct evaluation are show in Figure 1. The values presented were defined in a grading rubric that was identical for both courses ranging from a score of 1 (Inadequate Knowledge) to a score of 4 (Mastery of Knowledge), as defined in Table 3. Faculty were instructed to assess student performance on their presentations by giving them a score for each learning outcome listed as described within the rubric. Faculty were further instructed to compare the students' level of

knowledge with what would be expected of that student upon graduation with a B.S. in Environmental Science.

Table 3 - Scoring rubric used to evaluate student progress towards mastering various PLOs.

Program Learning Outcome	Mastery of Knowledge Score = 4	Developing Knowledge Score = 3	Introductory Knowledge Score = 2	Inadequate Knowledge Score = 1
PLO 1 – Explain the interdisciplinary nature and complexities of environmental issues	Relationship between the study conducted and complexities of environmental issues are well explained. Student uses anecdotal evidence & examples in a robust and meaningful way.	Student has a solid understanding of the complexities of environmental issues. Explanations of interdisciplinary connections are at a basic level and are relevant to the topic.	Student has a limited understanding of how their topic relates to other environmental issues. They are not able to describe meaningful interdisciplinary connections.	Student has a little to no understanding of how their topic relates to other environmental issues. When asked how their presentation relates to other environmental topics, they are not able to respond.
PLO 2 – Apply the scientific method to environmental issues	Student utilizes the scientific method associated with their presentation in a clear and logical fashion.	Student correctly utilizes the scientific method at a basic level or higher. Explains aspects of the scientific method that relate to the project.	Understands the elements associated with the scientific method and a rudimentary understanding of how those elements are connected.	Understands some but not all of the elements associated with the scientific method and lacks a rudimentary understanding of how those elements are connected.
PLO 3 – Skillfully communicate knowledge of environmental science	Student fully understands the scientific context and implications of the material presented. They are able to highlight examples of their project with anecdotal evidence & examples in a	Student presents a problem statement and solution. Knowledge expands upon the information in the presentation with multiple external examples. Level of knowledge exceeds a basic level.	Student presents a problem statement and solution. Knowledge is limited to the information in the presentation with few external examples and in limited context. Level of knowledge	Student fails to clearly present a problem statement and result. Knowledge is limited, and some information presented is not understood.

	robust and meaningful way.		exceeds a basic level.	
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The specific numerical results of the assessment process are shown in Table.

Table 4 - Results of three academic years of assessing PLOs 1, 2, & 3 for the BS in Environmental Science.

AY 2015-2018	ENVS-212	ENVS-410
PLO1	2.36 ± 0.70	3.41 ± 0.61
PLO2	2.63 ± 0.63	3.45 ± 0.63
PLO3	2.58 ± 0.76	3.45 ± 0.54

The results clearly demonstrate with scientific validity that students completing ENVS-212, Air & Water, have introductory to developing knowledge of program learning outcomes 1-3. Similarly, the results demonstrate that upon completion of ENVS-410, Methods of Environmental Monitoring, students have between developing and mastery of all three program learning outcomes. These results align with the expectations of our curricular map, Table 1, for each of these two courses. Moreover, given that mastery of each program learning outcome measured falls within one standard deviation of the average of our data, we can conclude that graduating seniors do master program learning outcomes 1-3 upon completion of the senior capstone course.

Upon repeating the same assessment of three of our four PLOs for the past three academic years, we find our results to be consistent and clear. While we are not achieving 100% mastery of all three PLOs, we are succeeding in effectively teaching them to range between developing and mastery with all student groups assessed. As the assessment was of small student groups, we can resolve the data to the level of an individual.

Closing the Loop

Now that we have completed the assessment of our PLOs and find that the program is successfully delivering the content stated in our PLOs, it is ambiguous as to how to continue. First off, we are going to use this new academic year to try to evaluate the 4th PLO, one that is squishy or very subjective. That assessment is critical to completing the assessment program for our degree.

Considering the results obtained from our assessment, it is clear we are achieving PLOs 1, 2, & 3. However, during this assessment it became clear that there are also some weaknesses in our curriculum delivery that could improve. Specifically, there are some basic scientific processes and techniques that need to be reinforced more between when they are first delivered in the curriculum and when they are applied in subsequent coursework. We believe that the response should range

from simply reminding students of some of the scientific processes they routinely use, to incorporating continued curriculum in courses throughout the major. As a result, this year, we are reviewing the course learning outcomes for our foundational courses and considering revisions to our curriculum that reinforces the important concepts that should build and be reinforced throughout the major. This may result in curricular submissions to the curriculum committee, depending on the extent of the changes needed.