# Annual/Biennial Program Assessment Report

Undergraduate Assessment reports are to be submitted annually. The report deadline is October 15th .

Academic Year Assessed: 2022-2023
College: Agriculture
Department: LRES
Submitted by: Catherine Zabinski

Graduate Assessment reports are to be submitted biennially. The report deadline is October 15th .

**Program(s) Assessed**
*List all majors (including each option), minors, and certificates that are included in this assessment:*

|  |  |
| --- | --- |
| **Majors** | **Options** |
| Environmental Science | Environmental Sciences, Environmental Biology, Geospatial & Environmental Analysis, Land Rehabilitation, Soil and Water Sciences  |

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**Have you reviewed the most recent Annual Program Assessment Report submitted and Assessment and Outcomes Committee feedback? (*please contact Assistant Provost Deborah Blanchard if you need a copy of either one).***

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The Assessment Report should contain the following elements, which are outlined in this template and includes additional instructions and information.

1. Past Assessment Summary.
2. Action Research Question.
3. Assessment Plan, Schedule, and Data Source(s).
4. What Was Done.
5. What Was Learned.
6. How We Responded.
7. Closing the Loop.

Sample reports and guidance can be found at: <https://www.montana.edu/provost/assessment/program_assessment.html>

1. **Past Assessment Summary.** Briefly summarize the findings from the last assessment report conducted related to the PLOs being assessed this year. Include any findings that influenced this cycle’s assessment approach. Alternatively, reflect on the program assessment conducted last year, and explain how that impacted or informed any changes made to this cycle’s assessment plan.

Although we set up a schedule for assessment of each of our learning outcomes on a rotating 5-year basis, our Outcomes Assessment Committee decided it would be more helpful if we focused on one learning outcome, specifically “Knowledge of the theory and practice of data analysis in environmental sciences, including statistical analysis, model building, and graphical presentation of data.” To do a better job of assessing that outcome, we used VALUE Rubrics (www.aacu.org/value/rubrics) as a source of Learning Outcomes for Quantitative Literacy, selecting components that were relevant for our major. Our goal is to assess courses that are required at each level for our students, to determine whether they are increasing skills and knowledge in a progressive way, and to better inform how we structure our curriculum. For the 2021-2022 annual report, we assessed a sophomore level course to see where students were at with components of quantitative literacy. Students in our sophomore level course scored below the threshold we set for a sophomore-level course. Given that the thresholds were somewhat arbitrary, we have set up a working group to coordinate a review of how we approach quantitative literacy in our courses that are required for all of our majors. While we have defined what we want our graduating seniors to achieve, this assessment represents stepping back from that to track progress from freshman to senior year. While this seems like a logical approach, it takes some thoughtful integration to coordinate a cumulative structure across courses in a multi-disciplinary department.

1. **Action Research Question.** What question are you seeking to answer in this cycle’s assessment?

The question we are addressing with our assessment plan is whether students are increasing their quantitative reasoning skills as they move through our curriculum, and in particular, what attributes of quantitative literacy are improving, and what attributes we need to focus more on in sophomore- or junior- or senior-level classes.

1. **Assessment Plan, Schedule, and Data Source(s).**
2. Please provide a multi-year assessment schedule that will show when all program learning outcomes will be assessed, and by what criteria (data).

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| ASSESSMENT PLANNING CHART |
| PROGRAM LEARNING OUTCOME | 2020-2021 | 2021-2022 | 2022-2023 | 2023-2024 | 2024-2025 | ***Data Source\**** |
| 1. Implement core theoretical principles and applications in evolutionary, ecological and physical environmental sciences.
 |  |  |  |  | X | Embedded exam questions, multiple 400-level ENSC courses |
| 1. Critically assess the quality and source of environmental science information.
 |  |  |  | X |  | Embedded within ENSC 499 |
| 1. Interpret, analyze and communicate quantitative evidence in environmental sciences, including statistical analysis, model building, and graphical presentation of data.
 |  | X | X |  |  | Embedded in with assignments in ENSC 210 Assignments in ENSC 391 |
| 1. Write and present scientific material effectively.
 |  |  |  | X |  | Final paper and presentation for ENSC 499 |
| 1. Summarize ethical implications of conducting and applying environmental science.
 | X |  |  |  | X | Embedded in final exam for ENSC 499 |

b) What are the threshold values for which your program demonstrates student achievement?

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| --- |
| **Threshold Values** |
| **PROGRAM LEARNING OUTCOME** | **Threshold Value** | **Data Source(s)\*** |
| Interpret, analyze and communicate quantitative evidence in environmental sciences, including statistical analysis, model building, and graphical presentation of data. |  |  |
| Subcomponents:Representation: ability to convert relevant information into various mathematical forms  | 80% score above a 2 and 50% scoring 3 or more on a 1-4 scoring rubric; | Randomly selected final projects from ENSC 391 |
| Calculation | 80% score above a 2 and 50% scoring 3 or more on a 1-4 scoring rubric | Randomly selected final projects from ENSC 391 |
| Application/analysis: Ability to make judgements and draw conclusions based on quantitative analysis of data | 80% score above a 2 and 50% scoring 3 or more on a 1-4 scoring rubric | Randomly selected final projects from ENSC 391 |
| Communication: Expressing quantitative evidence in spoort of the argument or purpose of the work | 80% score above a 2 and 50% scoring 3 or more on a 1-4 scoring rubric | Randomly selected final projects from ENSC 391 |

1. **What Was Done.**
2. Was the completed assessment consistent with the program’s assessment plan? If not, please explain the adjustments that were made.

 **Yes** No

## How were data collected and analyzed and by whom? Please include method of collection and sample size.

The final project in ENSC 391 Fundamentals of Environmental Data Analysis was used as source material to evaluate student competencies. Two faculty members, Geoff Poole and Andrew Felton evaluated student projects and scored them for each of the outcome components. There were 28 students enrolled in the course, and 19 final projects, since some students worked in pairs. We scored all projects, and randomly selected a subset of 10 to use in our summary statistics.

1. Please provide a rubric that demonstrates how your data were evaluated.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Indicators** | **Beginning - 1** | **Developing- 2** | **Competent- 3** | **Accomplished- 4** |
| Representation | Completes conversion of information but result is inaccurate | Completes conversion of information but result is only partially accurate | Competently converts relevant information | Skillfully converts relevant info into insightful mathematical portrayal |
| Calculation | Calculations attempted but are not successful or comprehensive | Calculations attempted are either not successful or not comprehensive | Calculations are all successful and sufficient | Calculation successful, sufficient, and elegant |
| Application/ Analysis | Uses the quantita-tive analysis of data as the basis for tentative, basic judgements | Uses the quantita-tive analysis of data as the basis for basic judgements, drawing plausible conclusions | Uses the quantita-tive analysis of data to draw competent judgements and appropriately qualified conclusions | Uses the quantitative analysis of data for deep and thoughtful judgements |
| Communication | Presents an argument for which quantitative evidence is pertinent but does not provide explicit numerical support | Uses quantitative information, but does not effectively connect it to the argument  | Uses quantitative information in connection with the argument, but data is presented in a less than completely effective format | Uses quantitative information in connection with the argument, presents in effective format, clear explanation |

1. **What Was Learned.**
2. Based on the analysis of the data, and compared to the threshold values established, what was learned from the assessment?

|  |  |  |
| --- | --- | --- |
| **% Reaching Threshold** | **80% > or = 2** | **50% > or = 3** |
| Representation | 92% | 54% |
| Calculation | 92% | 31% |
| Application/ Analysis | 85% | 70% |
| Communication | 100% | 77% |
| Mean Result | 92.3% | 58% |

We established our thresholds for our junior level course at two levels, with 80% reaching or exceeding the 2nd level in the 4-point rubric, to be sure that most of our students were advancing to at least a developing stage; and 50% of our students reaching the 3rd level or competence. This approach is to address our interest in having all of our students reach a certain level by the time they graduate, but also incorporating into our classes the capacity for students who are interested in excelling. Not all of our students are quantitatively-oriented; but some of our students will go on to pursue careers in programing and modeling and managing large data sets. We are interested in making sure that all of our students reach an acceptable level of quantitative literacy, but that we provide options in our classes for those who are specifically interested in focusing on this as a program strength.

1. What areas of strength in the program were identified from this assessment process?

These results underscore the importance of the development of this new course, Fundamentals of Environmental Data Analysis. It is evaluated as ENSC 391, a provisional course number used for short-term offerings, but the course has been incorporated into our curriculum in the new catalog as ENSC 311, and will be required for all of our majors. In our assessment of a required 200-level course conducted last year, 51% of our majors reached the 2nd level, described as developing. After taking the newly developed 300-level course, 92% of our majors reached the developing stage, and 58% reached the competent stage. This is important because ENSC 391/311 is an intensive course from an instructional perspective. As the department works out how to manage an increasing number of environmental science students, it is helpful to know how different styles of class pay off in terms of contributing to the quality of education for our graduates.

1. What areas were identified that either need improvement or could be improved in a different way from this assessment process?

By breaking down quantitative literacy into its components, we can see that students are more challenged by calculation and representation than analysis and communication. As we discuss quantitative literacy across our department’s curriculum, we can incorporate assignments and examples that help students hone those skills.

1. **How We Responded.**
2. Describe how “What Was Learned” was communicated to the department, or programfaculty. How did faculty discussions re-imagine new ways program assessment might contribute to program growth/improvement/innovation beyond the bare minimum of achieving program learning objectives through assessment activities conducted at the course level?

Our department discusses assessment reports first in curriculum committee meetings and then in faculty meetings. The change that the assessment has instigated is a realization that we need to coordinate across 100-, 200-, 300- and 400- level courses to see a progression of competencies across our curriculum, and to inform what aspects of quantitative literacy need to be addressed at each level.

1. How are the results of this assessment informing changes to enhance student learning in the program?

Because ENSC 391/311 is a new course (offered for the second time during Spring 2022), we are still calibrating the content and how it fits with other classes. While we have listed it in the new catalog as a requirement for all of our majors, for students who enrolled under an earlier catalog, the course is optional. When all of our students in their senior year have had ENSC 311, we will have a better sense of whether we can delete components of some of our 400-level courses (due to those topics being covered in ENSC 311), and have more time to develop additional components.

1. If information outside of this assessment is informing programmatic change, please describe that.

Our assessment plan focused for two years in a row on quantitative literacy, and we may end up continuing this for a 3rd year, this time evaluating progress towards learning outcomes in a 400-level course. We feel some urgency in this mission as our graduates are entering an employment world that has increasingly easy access to large data sets. Compared to even 10 years ago, there is an imperative for environmental science students to be comfortable with and competent in being able to extract information from that data to inform environmental management decisions.

1. What support and resources (e.g. workshops, training, etc.) might you need to make these adjustments?

Our student numbers continue to grow, as young people are attracted to degrees and careers in environmental sciences. While some of the subjects we teach are more difficult for faculty as class sizes have grown from 30 to 40 to 60 students, we are working to adapt our courses to larger numbers of students. But there are potentially some skills that require more-intensive approaches to teaching. Identifying those courses that need to be capped at a lower level is one thing, but having teaching resources to maintain a quality education for our students is another. The need for higher levels of quantitative literacy is evident not only in environmental sciences, but in ecology and natural resource management. Departments are fairly dependent on one another, filling holes in our curriculum with courses from sister departments. We anticipate that the demand for courses like ENSC 311 will increase rapidly.

## 7. Closing the Loop(s). Reflect on the program learning outcomes, how they were assessed in the previous cycle (refer to #1 of the report), and what was learned in this cycle. What action will be taken to improve student learning objectives going forward?

## In reviewing the last report that assessed the PLO(s) in this assessment cycle, what changes proposed were implemented and will be measured in future assessment reports?

This question has been addressed above, so just a brief synopsis: we followed up on our last year’s assessment of a 200-level course, where students did not meet our thresholds, with an assessment of a newly designed 300-level course, to determine whether we could see an improvement in student learning with the new course. In the upcoming years, we will return to assessment of quantitative literacy in our 400-level courses, to see how students are progressing across the curriculum.

## Have you seen a change in student learning based on other program adjustments made in the past? Please describe the adjustments made and subsequent changes in student learning.

Assessments in the past were focused on alternating learning outcomes, the logic being clear that over a 3-year period you would address each of your learning outcomes. The results of our assessments in the past were that students were reaching our thresholds, and that didn’t result in a sense that we needed to make a change. Our development of Fundamentals of Environmental Data Analysis was in response to a less formal outcomes assessment, a sense of faculty that our seniors were struggling with some competencies that we thought were important. They could do what we asked them to do, analytically, but usually with an accompanying cookbook style set of instructions. More formal outcomes assessment is fine-tuning our capacity to know more specifically what students are struggling with and how to address that beginning with our 100-level courses.