Weber State University

Biennial Report on Assessment of Student Learning Cover Page

Department/Program: Department of Earth and Environmental Science

Academic Year of Report: 2021 and 22 (covering Summer 2020 through Spring 2022)

Date Submitted: November 17, 2022

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Program page link:

A. Mission Statement

_x_____Information is current; no changes required.

Update if not current:

B. Student Learning Outcomes

(Please include certificate and associate credential learning outcomes)

_x_____Information is current; no changes required.

Update if not current:

C. Curriculum Grid

(Please review your current curriculum grid and verify that at least one course has been identified for each outcome in which you expect your students to demonstrate the desired competency of a graduating student. This could be shown in a variety of ways: classroom work, clinical or internship work, a field test, an ePortfolio, etc. You may request access to the Google Sheet on our site if that is easiest, or we can make the updates. Please reach out to oie@weber.edu if you wish to have access)

_x_____Information is current; no changes required.

Update if not current

Department Learning Outcomes (DLOs)

Core Courses in the EES Department	LO 1: Problem-solving Skills	L0 2: Communication Skills	LO 3: Computer & Information Literacy	LO 4: Earth Materials	LO 5: Earth History	LO 6: Surface Processes	LO 7: Tectonic Processes	LO 8: Earth Systems	LO 9: Capstone
GEO 1110 Dynamic Earth: Physical Geology	I	I		I	I	I	I, A	I	
GEO 1115 Physical Geology Lab	I			E		I	I		
GEO 1220 Historical Geology	I	I	I		E, A		R	E, A	I
GEO 2050 Earth Materials		I	I	E, A					
GEO 3150 Geomorphology	R	E	I	R	R	E, A	R	R	I
GEO 3550 Sedimentology & Stratigraphy	E	E, A	R	E	R		R	R	I
GEO 3710 Introduction to GIS	R	R	E, A						
GEO 4060 Geoscience Field Methods	E, A	R	R	R	R	R	R, A		E, A
GEO 4510 Geology Field Camp	R	R	R	R	R	R	R		E, A
GEO 4560 Environmental Geochemistry	E, A	E, A	E	R				E, A	

A. *Note:* I = introduced; E = emphasized; R = reinforced; A = comprehensively assessed

D. Program and Contact Information

_x_____Information is current; no changes required. Update if not current:

E. Assessment Plan

We have traditionally asked programs to report on outcome achievement by students at the course level. We are encouraging programs to consider alternative assessment approaches and plans that are outcome-based as opposed to course-based, though course-based assessment can continue to be used. A complete assessment plan will include a timeline (which courses or which outcomes will be assessed each year), an overall assessment strategy (course-based, outcome-based, reviewed juries, ePortfolio, field tests, etc.), information about how you will collect and review data, and information about how the department/program faculty are engaged in the assessment review.

_x Information is current; no changes required.

Update if not current:

F. Student Achievement

F.A.: For undergraduate programs only: Percent of students completing degrees after 90 credit hours within 2 years and a reflection on that metric. Here are instructions on how to access this information:

Summary and Conclusions from Time to Baccalaureate Degree from 90 Credit Hour Mark:

From 2014-15 through 2020-21, our department averages a 52.7% completion within 2 years of 90CH. Our approach to the student success in our program is to advise students to take appropriate math courses as soon as possible. This also translates to taking chemistry series and physics series classes as soon as possible. We also consult students about their realistic time commitment related to taking their semester teaching load.

Program Review Unit

Earth and Environmental Sci

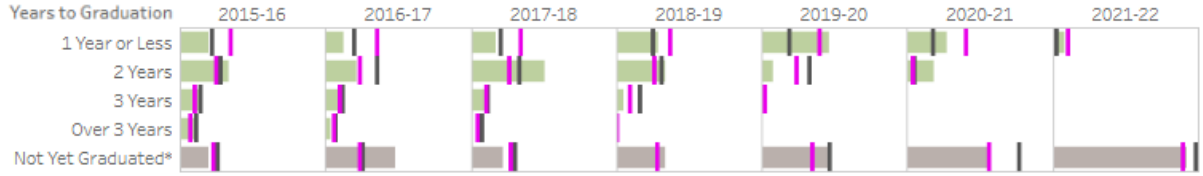
Data as of: 11/14/22 2:45 AM

Time to Baccalaureate Degree from 90 Credit Hour Mark

View Comparisons?

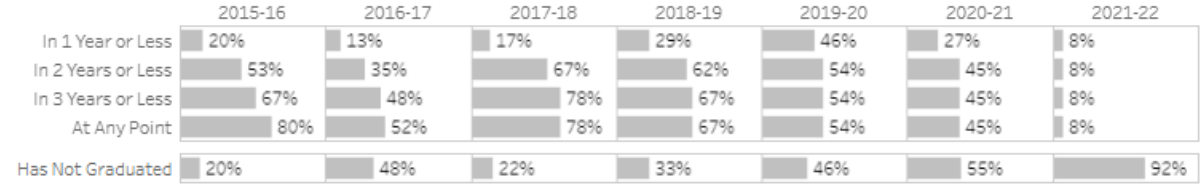
Yes

Light gray & green bars are department percentages. Dark Gray benchmark bars indicate college percentage. Fuchsia benchmark bars indicate university percentage. If the light gray or green bar passes the benchmark lines, then that measure is performing above what your college and/or university is producing.

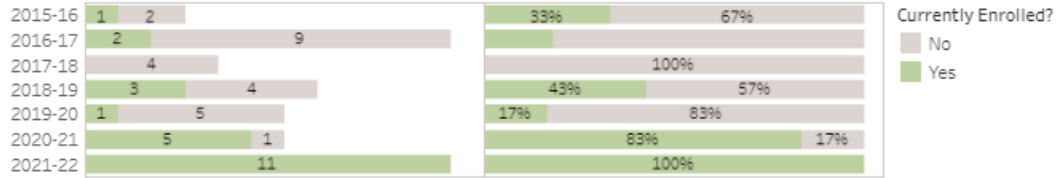


Additive Program Unit Percentages

Data for the most recent three years reflect in-progress students and may change over time



Has Not Graduated by Currently Enrolled



Overall Numbers and Percentages

		2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
1 Year or Less	University	993 (35%)	1051 (36%)	1024 (34%)	1144 (37%)	1169 (39%)	1154 (40%)	310 (10%)
	College	39 (22%)	39 (20%)	45 (20%)	49 (25%)	38 (19%)	33 (17%)	4 (2%)
	Program	3 (20%)	3 (13%)	3 (17%)	6 (29%)	6 (46%)	3 (27%)	1 (8%)
2 Years	University	701 (25%)	704 (24%)	771 (26%)	792 (26%)	707 (24%)	127 (4%)	
	College	49 (28%)	69 (35%)	73 (32%)	61 (31%)	64 (32%)	10 (5%)	
	Program	5 (33%)	5 (22%)	9 (50%)	7 (33%)	1 (8%)	2 (18%)	
3 Years	University	280 (10%)	303 (10%)	300 (10%)	290 (9%)	55 (2%)		
	College	24 (13%)	24 (12%)	25 (11%)	32 (16%)	4 (2%)		
	Program	2 (13%)	3 (13%)	2 (11%)	1 (5%)	0 (0%)		
Over 3 Years	University	193 (7%)	178 (6%)	113 (4%)	9 (0%)			
	College	20 (11%)	14 (7%)	15 (7%)	0 (0%)			
	Program	2 (13%)	1 (4%)	0 (0%)	0 (0%)			
Not Yet Graduated*	University	658 (23%)	701 (24%)	792 (26%)	848 (27%)	1035 (35%)	1600 (55%)	2679 (89%)
	College	46 (26%)	51 (26%)	67 (30%)	55 (28%)	91 (46%)	145 (77%)	220 (98%)
	Program	3 (20%)	11 (48%)	4 (22%)	7 (33%)	6 (46%)	6 (55%)	11 (92%)

**Students who have not yet graduated may or may not be enrolled.*

G: Evidence of Learning

There are varieties of ways in which departments can choose to show evidence of learning.

G.A : Evidence of Learning: Courses within the Major

(**This is a sample page for purpose of illustration only**; a blank template can be found on the next page or at this site)

STUDENT LEARNING OUTCOMES AND ASSESSMENT

Measurable Program-Level Learning Outcomes:

Department of Earth and Environmental Sciences Assessment Plan

4-Year Cycle presented below was originally approved in January 2015 and updated for this report.

Persons Responsible for Collecting and Analyzing the Data: The tenure-track faculty of the Department of Earth and Environmental Sciences will serve as the Assessment Committee to oversee and implement the department's assessment plan, with the Chair of Geosciences serving as the committee chair.

Assessment Measures to be Used: The Earth and Environmental Sciences assessment plan examines the Physical Science (PS) outcomes in each of the general education courses offered by the department, the program-level learning outcomes for geoscience majors, and the high-impact learning practices utilized in the department's various curricula. Each general-education and department program level learning outcome (PLO) will be assessed by at least one direct measure (DM), typically a course-specific assessment instrument or assignment. Indirect measures, such as exit surveys of program graduates, will be used to supplement the PLOs direct measures.

Four-Year Assessment Cycle:

1. 2020-2022 (data collected); **subject report submitted November 2022**

Program-Level Learning Outcomes 1-9

Courses: GEO 1110, 1220, 2050, 3080, 3150, 3550, 4210, 4060

Summary of exit interviews

2. 2022-2023 (data collected); report to be submitted Fall 2024

General Education: Physical Science Intended Learning Outcomes (ILOs) 1-8

Courses: GEO 1030; 1060; 1110, 1130; 1350

High-Impact Educational Practices: Undergraduate Research; Internships; Study Abroad;

Capstone courses (GEO 4060, 4510)

Repeat beginning 2026.

This proposed assessment cycle is meant to be flexible and can change as needed. For example, if data from one year indicate a need to improve student learning with respect to a particular set of PLOs, the plan would be adjusted in such a way to allow the department to collect and analyze data shortly after making changes to course materials or assessment instruments related to the PLOs in question. We will continue to explore ways to improve learning and teaching in the Department of Earth and Environmental Sciences. This report focuses on program level outcomes.

Our department uses outcome-based assessment. At the end of their program of study in the Department of Earth and Environmental Sciences, our graduates will have a set of basic intellectual skills that they can apply to a variety of situations and will have a knowledge and understanding of core concepts in the Earth sciences. We have grouped program learning outcomes into two categories: Basic Skills and Earth Science Skills. The Basic Sills category includes three learning outcomes, while the Earth Science Sills category includes six learning outcomes.

- **BASIC SKILLS – EES graduates will:**

1. be able to collect data, apply algebraic and graphical techniques to analyze data, and interpret results. **{Problem-Solving Skills}**

2. be able to clearly express geoscience concepts orally and in writing, present results from laboratory and field investigations, and effectively incorporate appropriate maps and graphs into presentations and reports. **{Communication Skills}**

3. be proficient in the use of appropriate technologies – including basic computer skills (word processing, spread sheets), geospatial skills (GPS, accessing geospatial databases), and information-literacy skills (searching, compiling, and evaluating information from scientific literature and web resources). **{Computer & Information-Literacy Skills}**

- **EARTH SCIENCE SKILLS – EES graduates will:**

4. be able to identify common minerals and rocks, describe rock characteristics, and interpret the environments/conditions (igneous, sedimentary, or metamorphic) in which rocks formed. **{Earth Materials}**

5. be able to identify major physical and biological events in Earth history and describe the methods used to interpret this history, including radiometric dating, fossil succession, and stratigraphic correlation. **{Earth History}**

6. be able to identify landforms from maps and imagery, construct topographic profiles, and interpret the development of landforms in terms of common surface processes. **{Surface Processes}**

7. have a general understanding of plate tectonics (plate motions, plate boundaries, and types of tectonic activity), and be able to analyze/interpret basic structural relations from geologic map data and cross sections. **{Tectonic Processes}**

8. be able to describe key geological cycles – including the hydrologic cycle, rock cycle, and carbon cycle. **{Earth Systems}**

9. have demonstrated an understanding of scientific methodology and the interdisciplinary nature of the geosciences, culminating in a capstone experience involving collection and analysis of multiple data sets to interpret Earth processes. **{Capstone Experience}**

The PLOs were the focus of 2014-2015 assessment report (no major curricular or pedagogic changes were needed), and are the focus of an assessment report in November 2022.

A significant indirect measure of the PLOs is the results from the **exit interviews** that we routinely conduct with all graduating seniors. During the interviews the graduates are asked about their satisfaction with college- and department-level advising and their perceptions of the strengths and weaknesses of our programs. In addition, they are asked to self-report, using a Likert-type scale, on their level of mastery of the nine (9) PLOs. The averages (Table 1; 2020-2022) for the individual learning outcomes range from a low of 4.05(PLO #4: Earth Materials) to a high of 4.70 (PLO #9: Scientific Method/Capstone Experience). Overall, these data support the direct measures of student learning from course-level assessments.

	Program	BA or BS	Problem-solving Skills	Communication Skills	Technology Skills	Earth Materials	Earth History	Surface Processes	Tectonic Processes	Earth Systems/Cycles	Scientific Method/Capstone
11/08/20	Geol	BS	5	4	5	5	4	5	4	5	4.5
11/10/20	Geol	BS	5	5	5	4.5	4.5	5	5	5	5
11/10/20	AEG	BS	5	5	4	4	5	5	5	5	4.5
11/17/20	AEG	BS	4.5	5	4.5	4.5	4.5	5	5	5	5
11/17/20	Geol	BS	5	5	5	4.5	5	5	5	5	5
12/03/20	Geol	BS	4.5	5	4.5	5	5	5	4.5	5	5
12/03/20	Geol	BS	4.5	5	4.5	4	5	5	5	5	5
02/25/21	AEG	BS	4	5	3.5	3	5	4	4	5	5
03/05/21	Geol	BS	3	4	3	3	3	3.5	3.5	3.5	3
04/01/21	AEG	BS	4.5	4	4	3.5	4.5	4.5	4	4	4.5
04/09/21	Geol	BS	4.7	4.4	4.7	4	5	5	5	5	5
11/01/21	Geol	BS	4	4.5	3.5	4.5	4	4.5	4	4	4.5
11/02/21	Geol	BS	3.5	4.5	4	4.5	5	4	5	4.5	5
11/09/21	Geol	BS	4.5	4	4.5	3.5	4.5	4.5	4	4.5	4.25
12/09/21	AEG	BS	4.5	4.5	5	4	4	4.5	4	4.5	5
04/07/22	AEG	BS	5	5	4	5	5	5	4.5	5	5
04/15/22	Geol	BS	4.5	4	4.5	3.5	4.5	4.5	4.5	4.5	4
04/20/22	Geol	BS	4.5	5	4	4	4.5	5	4	4	5
09/30/22	Geol	BS	4	4	4	3	4.5	5	5	5	5
Ave:			4.43	4.57	4.27	4.05	4.55	4.68	4.47	4.66	4.70

Table 1: Summary of PLOs based on Exit Interviews.

Direct PLOs measures:

PLO #1: Problem Solving Skills.

Graduates will be able to collect data, apply algebraic and graphical techniques to analyze data, and interpret results.

Measure 1: The program learning outcomes centered around Problem Solving skills were assessed in GEO 3710 Introduction to GIS classes from Fall 2020 to Spring 2022. In this course students complete a final project in which they must demonstrate a wide variety of concepts and skills using the ArcGIS Pro Software, and a report. Both of these elements require students to be able to resolve multi-step problems and effectively create and execute a plan to successfully complete the assignment. Students must recreate a section of a geology map from scratch and report on their effort afterwards in short communication including figures. To note, students must also have a "what went wrong", and "lessons learned" section to show reflexive thinking on their executed plan to complete the work.

This PLO were assessed for Fall 2020, Spring 2021, Summer 2021, Fall 2021, and Spring 2022. The project assignment succeeded in achieving the Problem Solving learning outcome with students scoring an average of 83% and 88% of students earning a 70% or above on the assignment. The assessment indicates that students have a wide variety of Problem Solving skills and used them to complete the assignment. While the Problem Solving skills outcome was met, additional opportunities to practice Problem Solving skills also occur throughout the program in multiple courses. Any assignment or exam that requires procedural thinking and synthesis of skills is a great assessment tool for Problem Solving skills, and these occur in early and later courses than GEO 3710, particularly in the Field Course. It is a good sign that students are achieving proficiency with employing their Problem Solving skills at this high rate.

Year	Average Score (%)	Percent Passing	Enrollment	Comments
Fall 2020	82	86	22	Worth noting that these assessment data were gathered from GEO 3710 online classes only. Summer 2021 term is anomalous in that a low number of students took the course, but were highly successful, showing evidence of self selecting their best modality. Fall 2021 and Spring 2022 shows a notable dip, in scores. Anecdotally, some students did turn in their work, but it was less than complete, causing lower scores. We believe this phenomena resulted in the lower scores those two terms.
Spring 2021	90	93	15	
Summer 2021	96	100	4	
Fall 2021	79	83	12	
Spring 2022	77	84	19	
All classes	83	88	72	

The program learning outcomes related to centered around Problem Solving skills were assessed in GEO 3710 Introduction to GIS classes from Fall 2020 to Spring 2022. In this course students complete a final

project in which they must demonstrate a wide variety of concepts and skills using the ArcGIS Pro Software, and a report. Both of these elements require students to be able to resolve multi-step problems and effectively create and execute a plan to successfully complete the assignment. Students must recreate a section of a geology map from scratch and report on their effort afterwards in short communication including figures. To note, students must also have a "what went wrong", and "lessons learned" section to show reflexive thinking on their executed plan to complete the work.

This PLO were assessed for Fall 2020, Spring 2021, Summer 2021, Fall 2021, and Spring 2022. The project assignment succeeded in achieving the Problem Solving learning outcome with students scoring an average of 83% and 88% of students earning a 70% or above on the assignment. The assessment indicates that students have a wide variety of Problem Solving skills and used them to complete the assignment. While the Problem Solving skills outcome was met, additional opportunities to practice Problem Solving skills also occur throughout the program in multiple courses. Any assignment or exam that requires procedural thinking and synthesis of skills is a great assessment tool for Problem Solving skills, and these occur in early and later courses than GEO 3710, particularly in the Field Course. It is a good sign that students are achieving proficiency with employing their Problem Solving skills at this high rate.

PLO #2: Communication Skills and PLO #5 Earth History.

Graduates will be able to clearly express geoscience concepts orally and in writing, present results from laboratory and field investigations, and effectively incorporate appropriate maps and graphs into presentations and reports. **{Communication Skills}**

Graduates will be able to identify major physical and biological events in Earth history and describe the methods used to interpret this history, including radiometric dating, fossil succession, and stratigraphic correlation. **{Earth History}**

Measure 1: The program learning outcomes centered around Earth history and communication skills were both assessed in GEO 1220 Historical Geology classes from Fall 2019 to Fall 2021. In this course students complete a summative assessment in which they choose a peer reviewed scientific journal article related to an aspect in Earth's history to investigate and assess. The students are expected to read, analyze and digest the information and then communicate what they learn through a written essay assignment and a class presentation at the end of the semester. The details of the assignment have been included in an additional document.

These PLOs were assessed for Fall 2019, Fall 2020, Spring 2021, and Fall 2021. Each course succeeded in achieving the Earth History and Communication Skills learning outcomes with 90% of students collectively achieved both learning outcomes. The assessment indicates that students have a good understanding of Earth's history and good communication skills. While the communication skills outcome was met, additional opportunities to practice communication skills, and specifically oral communication skills could be beneficial. GEO 1220 is only the second course Geology, Applied Environmental Geosciences, and Earth Science Teaching majors take in the progression of the major and thus it is impressive that they show good communication skills, however, it is not surprising that they could benefit from addition experience presenting.

Year	Oral (% Pass)	Written (% Pass)	Complete Assignment (% Pass)	Enrollment	Comments
Fall 2019	78	89	89	9	One student did not submit/present assignment and one student did not receive above a 70% on the oral assessment of the project, however, the student's combined score was still above a 70% overall
Fall 2020	100	100	100	5	All students met the program level learning outcomes outline in Earth history and communication skills
Spring 2021	85	85	85	14	One student did not submit/present assignment and one student did not receive a 70% or above on the paper and did not give a presentation
Fall 2021	100	100	100	3	All students met the program level learning outcomes outlined in Earth history and communication skills
All classes	87	90	90	31	The Earth history and communication skills were met with greater than 70% of students successfully completing the learning outcomes

PLO #3: Technology Skills

Graduates will be proficient in the use of appropriate technologies – including basic computer skills (word processing, spread sheets), geospatial skills (GPS, accessing geospatial databases), and information-literacy skills (searching, compiling, and evaluating information from scientific literature and web resources).

Measure 1: The program learning outcomes centered around Technology skills were assessed in GEO 3710 Introduction to GIS classes from Fall 2020 to Spring 2022. In this course students complete a laboratory assignment in which they must demonstrate first a conceptual knowledge and then skills using the ArcGIS Pro Software. Both of these elements require the ability to operate a computer in a more than perfunctory way; retrieve, analyze and summarize text, as well as use the complicated software to understand how the projection and coordinate system of a map changes the properties of what is being shown. Students use a digital or hard copy text book to with a lecture given by an instructor to understand the concepts and then use the text book for a software tutorial. Lastly, students are asked to complete a series of challenging questions the put the concepts and software into practice.

This PLO were assessed for Fall 2020, Spring 2021, Summer 2021, Fall 2021 (online and face-to-face), and Spring 2022. The laboratory exercise succeeded in achieving the Technology learning outcome with students scoring an average of 87% and 88% of students earning a 70% or above on the laboratory assignment. The assessment indicates that students have a wide variety of technology skills and the ability to use them. While the Technology skills outcome was met, additional opportunities to practice Technology skills, and specifically working with quantitative skills could be beneficial. The laboratory assignment in GEO 3710 is a course taken later in the degree progression, and is offered with in person and online modality. It is a good sign that students are achieving proficiency with using technology at this high rate. NOTE: Students who started the course but stopped completing assignments, including the evaluated assignment, and did not finish the class were not counted in the analysis (e.g., 2 of 14 students in the Fall 2021 face-to-face course were not counted so the data from 12 students were included in this analysis).

Year	Average Score (%)	Percent Passing	Enrollment	Comments
Fall 2020	88	91	22	The assessment data were gathered from GEO 3710 online classes and the Fall 2021 face-to-face course. Summer 2021 term is anomalous in that a low number of students took the course, but were highly successful, showing evidence of self selecting their best modality. Spring 2022 shows a notable dip, in scores. Anecdotally, some students did not turn in their laboratory assignment and few noted a degree of exhaustion with the state of the world. We believe this dip in scores is accounted for with that lack of scores showing up for this particular assignment used as the assessment element.

PLO #4: Earth Materials.

Graduates will be able to identify common minerals and rocks, describe rock characteristics, and interpret the environments/conditions (igneous, sedimentary, or metamorphic) in which rocks formed.

Measure 1. GEO 1115 (Physical Geology Lab; 2 sections, 42 total students). Assessment was completed using a lab focused on sedimentary rocks and depositional environments. The lab involved observation and interpretation of 20 sedimentary rock samples that represented various time slices in Utah's geologic history. Students described rock characteristics, sedimentary structures and fossils and interpreted changing sedimentary environments.

Learning Outcome 4.	Method:	Threshold:	Findings:	Interpretation:	Action Plan:
	Measure 1. Responses to lab questions in GEO 1115.	70% of students will score ≥ 80% on lab questions	95% of students scored above 80% on questions	Threshold met. Students adequately demonstrated understanding of sedimentary rocks and depositional environments.	No curricular or pedagogical changes needed at this time

Measure 2. GEO 2050 (Earth Materials; 1 section, 8 students). Assessment was completed using an exam focused on minerals. The exam consisted of 20 short answer and multiple choice questions that covered mineral properties, chemistry, and structure, observation of 28 hand-samples for which students needed to observe properties and identify each mineral, and observation of 5 minerals in thin-section using a petrographic microscope to identify minerals.

Learning Outcome 4.	Method:	Threshold:	Findings:	Interpretation:	Action Plan:
	Measure 2. Responses to exam questions in GEO 2050.	70% of students will score 70% or better on questions. Average score of all students is ≥ 70%	100% of students scored above 70%. Average score for all students was 85%.	Threshold met. Students adequately demonstrated understanding of Earth Materials and their properties.	No curricular or pedagogical changes needed at this time

PLO #6: **Surface Processes**.

Graduates will be able to identify landforms from maps and imagery, construct topographic profiles, and interpret the development of landforms in terms of common surface processes.

Measure 1. GEO 1110 (Physical Geology; 2 sections, 47 total students). Assessment was completed for an exercise where students used Google Earth to interpret glacial, river, and tectonic landform features and processes.

Learning Outcome 6.	Method:	Threshold:	Findings:	Interpretation:	Action Plan:
	Measure 1. Responses to questions in GEO 1110.	70% of students will correctly identify 80% or more of landforms	79% of students identified >80% of the landforms. Some students did not complete the exercise due to purported technical difficulties.	Threshold met. Most students adequately demonstrated abilities to identify landforms and interpret surface processes.	Continue to use Google Earth as a tool to view Earth features, and evaluate use on multiple platforms to insure access to all students.

Measure 2. GEO 4060 (Field Methods Project; 2 sections, 22 total students). Assessment was completed using a project that included mapping and characterization of surficial deposits and landforms. Students used aerial and LIDAR imagery to map various landslide, alluvial fan, river, and Lake Bonneville deposits. Deposits were characterized from field observations.

Learning Outcome 6.	Method:	Threshold:	Findings:	Interpretation:	Action Plan:
	Measure 2. Project in GEO 4060.	70% of students will score 70% or better on mapping and description of surficial deposits	93% of students scored above 70% on geologic map and unit descriptions of deposits	Threshold met. Students adequately demonstrated skills to map and describe surficial deposits and landforms.	No changes needed at this time.

PLO :7: Tectonic Processes.

Graduates will have a general understanding of plate tectonics (plate motions, plate boundaries, and types of tectonic activity), and be able to analyze/interpret basic structural relations from geologic map data and cross sections.

Measure 1. GEO 1115 (Physical Geology Lab; 2 sections, 42 total students). Assessment was completed using a lab on plate tectonics. The lab involved analysis of plate boundaries in relation to earthquakes, volcanism, landforms (topography), and plate motions using sea floor stripe data and hot spot traces. Students identified different types of boundaries based on tectonic activity.

Learning Outcome 7.	Method:	Threshold:	Findings:	Interpretation:	Action Plan:
	Measure 1. Responses to lab questions in GEO 1115.	70% of students will score 80% or better on lab questions	95% of students scored above 80% on questions.	Threshold met. Students demonstrated understanding of plate boundaries and associated tectonic processes.	No curricular or pedagogical changes needed at this time

Measure 2. GEO 4060 (Field Methods Project; 2 sections, 22 total students). Assessment was completed using a project that included mapping and measurement of structural features, analysis of structural relations, and construction of cross sections.

Learning Outcome 7.	Method:	Threshold:	Findings:	Interpretation:	Action Plan:
	Measure 2. Project in GEO 4060.	70% of students will score 70% or better on structural analysis and cross sections	100% and 86% of students scored above 70% on structural analysis and constructing cross sections, respectively	Threshold met. Students adequately demonstrated structural analysis skills. Cross section skills could be improved for some students.	Additional emphasis will be placed on construction of cross sections.

PLO #8: Earth Systems/Cycles

Graduates be able to describe key geological cycles – including the hydrologic cycle, rock cycle, and carbon cycle.

Measure 1: The assessment for Earth Systems/ Cycles was performed in GEO 3080 Applied Hydrology course (3 sections, 23 total students). The assessment used data from 2020 to 2022. The assessment is based on assignment 4 which allows students to work with multiple sets of data related to hydrologic cycle, Earth energy cycle and global climate change. The assignment includes interpretation of several data charts and comparison between these charts.

Earth Materials	Learning Outcome 8.	Measure 1 (CRN 21223):	Assessment	Measure 1:	Measure 1:	Measure 1:
		Interpretation of several sets of data representing hydrologic cycle, Earth energy budget and global climate change.	70% of students will score 70% or better on questions. Average score of all students on selected questions is ≥ 70%	100% of students scored above 70%. Average score for all students was 87%.	Threshold met. Students adequately demonstrated understanding of Earth Materials and their properties.	No curricular or pedagogical changes needed at this time

PLO #9: Capstone Experience

Graduate will have demonstrated an understanding of scientific methodology and the interdisciplinary nature of the geosciences, culminating in a capstone experience involving collection and analysis of multiple data sets to interpret Earth processes.

Measure 1. GEO 4060 (Field Methods Project; 2 sections, 22 total students with a total of four student groups). Assessment was completed using a capstone project that integrated mapping of surficial deposits and active fault scarps, active landslides, and flood hazards, using a combination of aerial and LIDAR imagery. Student groups completed a geotechnical report summarizing geologic hazards in the context of a proposed residential development. Assessment was based on the group project report and associated graphics.

Learning Outcome 9.	Method:	Threshold:	Findings:	Interpretation:	Action Plan:
	Measure 1. Capstone project report in GEO 4060.	80% of student groups will score 70% or better on project report	All student groups scored above 70% on the final report.	Threshold met. Students adequately demonstrated abilities to integrate multiple data sets and prepare a capstone project report. Writing style of two groups could have been improved.	Continue to use capstone project in GEO 4060. Incorporate additional peer evaluation within groups prior to submission of final project report.

Appendix A

Most departments or programs receive a number of recommendations from their Five/Seven-Year Program Review processes. This page provides a means of updating progress towards the recommendations the department/program is enacting.

Date of Program Review: 2019-20	Recommendation	Progress Description
Recommendation 1	Improved assessment of student learning in HIEEs	A departmental level committee has been established.
		Assessment of Capstone experiences provided in this report Reflect ongoing progress in addressing this issue.
Recommendation 2	Reevaluate curriculum assessment grid	A departmental level committee has been establish. An ongoing progress and discussions are aimed at providing recommendations for the next biennial report.
Recommendation 3	Need for an instrument technician for the College of Science.	This recommendation has been addresses and the College of Science has a full time lab technician.
Recommendation 4	Limited budget	In current fiscal situation this issue has not been effectively addressed

Additional narrative:

Response to Identified Areas for Improvement:

Areas for Improvement highlighted in the review team's report largely parallel the major near-term challenges that we raised in our self-study report of December 2019:

1. Improved assessment of student learning in HIEEs. A departmental level committee has been established.

2. Reevaluate curriculum assessment grid, as each degree program may need its own curriculum grid (as opposed to the departmental grid now used across all degree programs). A departmental level committee has been established.

3. Need for an instrument technician for the College of Science. Such a position would be very supportive of the University's emphasis on HIEEs and workforce readiness.

4. Limited budget. Increased number of faculty, inflation, persistent need to update instructional technology, and the increasing cost of implementing HIEEs are straining the department's static budget.

We will work with the Dean of the College of Science to address issues 3 and 4 above.

Appendix B

Please provide the following information about the full-time *and adjunct faculty* contracted by your department during the last academic year (summer through spring). Gathering this information each year will help with the headcount reporting that must be done for the final Five-Year Program Review document that is shared with the State Board of Regents.

Faculty Headcount	2018-19	2019-20	2020-21	2021-22
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)				
Full-time Tenured	6	6	7	6
Full-time Non-Tenured (includes tenure-track)	3	3	2	2
Part-time and adjunct			1	2
With Master's Degrees				
Full-time Tenured				
Full-time Non-Tenured	1	1	1	1
Part-time and adjunct	3	3	3	2
With Bachelor's Degrees				
Full-time Tenured				
Full-time Non-tenured				
Part-time and adjunct				
Other				
Full-time Tenured				
Full-time Non-tenured				
Part-time				
Total Headcount Faculty				
Full-time Tenured	6	6	7	5
Full-time Non-tenured	4	4	3	3
Part-time	3	3	4	4

Please respond to the following questions.

1) Looking back at your previous biennial report where you identified strategies for improvement, what progress has been made in implementing improvements?

In our previous biennial report we have identified high impact learning experiences as an area of needed assessment improvement. We have started addressing this issue in evaluating our capstone experiences presented in this report. Our discussion how to address this issue will continue.

2) Please take a few minutes to review the new DFWI dashboard in the Report Gallery. This dashboard allows you to see the percentage of students in each course who earn a D+, D, D-, E, W, UW, or NC grade. The data can be filtered by several parameters. Reflect on the DFWI rates overall and of your underserved minority students versus your Caucasian students:

    a. What are you seeing?

    b. What concerns you?

    c. What additional data could be beneficial?

Overall, there are two courses which recorded elevated percentages of DFWI: GEO 3710 and GEO 3840. While the pandemic sprung upon us many a challenge, it also offered an opportunity for some, and being awarded a CARES grant two years in a row affected the student outcomes in these courses. The CARES Grants were for students seeking Geospatial Certificates and were to be of no cost to the student. For example, we funded 20 students with full scholarships for tuition, books, and fees for four semesters, which corresponds to Fall 20 and Spring21, and Fall 21 and Spring 22. The Geospatial Certificates are programs that occur over one year with a very tight course schedule. It is required to enroll students in early November before they know how they have completed the first term in December. The attrition rate from Fall to Spring terms for students receiving CARES grants was comparatively high, and for a number of reasons. However, a number of students simply vanished by the end of October each year, before withdrawing. Another group of students in this CARES cohort would fall behind in courses by early December, but already be registered for classes in January, leaving the Instructor little choice but grant Incompletes so that may continue on to the next term. However, frequently, students would vanish after the break and not return for their spring term.

The CARES grant was a blessing for those that earned a certificate, but for some they were unable to complete it for a number of reasons. From follow up conversations with those students that the Instructor was able to contact (as some never answered emails and phone calls), a pattern emerges from multiple stories. One student was a postal worker, who became caught between needing to work many extra hours during the holiday season, which very much prevented them from finishing their work. Another was a parent that was caught between working their part time job and caring for multiple children without much free time, as their care provider closed due to contracting long covid. Another student had used the grant to complete some schooling and training and then was able to earn employment out of state in the field. A final thread to share is that of a student that suffered a mental health crisis that was exacerbated by the pandemic, loneliness, and becoming ill. These converging

stories all paint students in crisis - students experiencing an issue beyond the classroom and not being able to overcome it to complete courses or certificates.

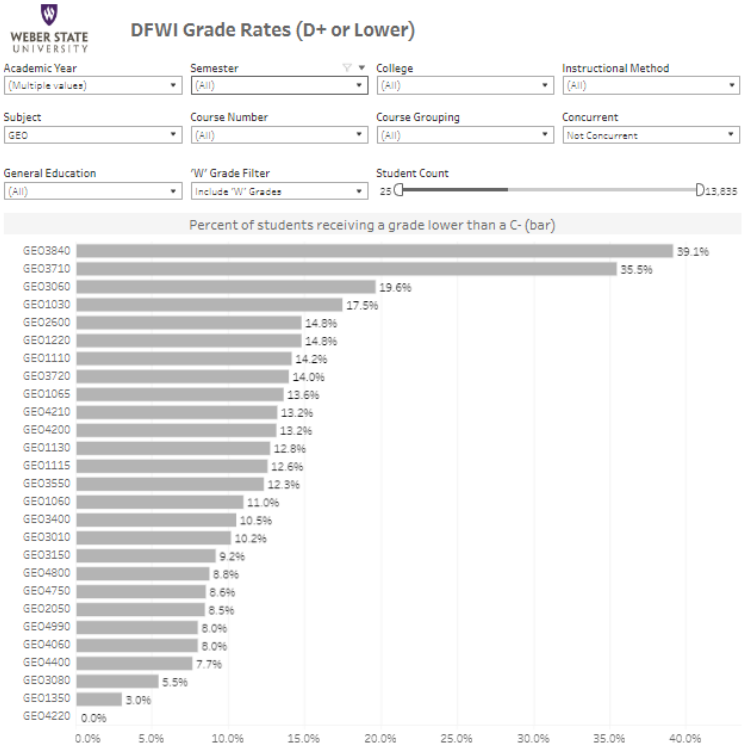
The Instructor for both GEO 3840 and 3710 was proactive in their efforts to help students as best as possible. Several accommodations and efforts were made to help students in these courses, and others. The Instructor was very willing to offer Incompletes for students, particularly CARES students in Fall term as they were expected to be immediately in Spring term. In addition, the Instructor reached out to students frequently through email and Canvas messaging to students that had not turned in assignments in two weeks. In addition, the Instructor was more than willing to waive all late penalties on any assignment as long as the student made weekly progress. If a student could not finish some coursework, the Instructor advised them to pass in something to receive some credit for their work. Where it was thought necessary the Instructor connected students with on campus mental health counselling or academic advising, and also used the Starfish system to alert academic advisors of an issue. In summary, our department has and will continue to discuss possible strategies which might include assigning partial credit for not fully complete assignments.

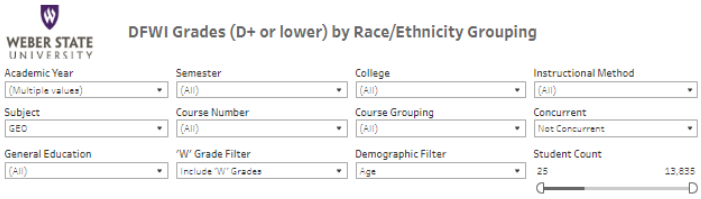
Several students that were involved in CARES program were also relatively older than our typical students with a higher percentage of male students. This is reflected in DFWI data by age grouping and gender grouping. In two courses (GEO 1110 and 1115) higher percentages for freshman and sophomore might reflect that students who recently graduated from high schools might require additional instructions and assistance. Similarly, three courses (GEO 1030, 1110, and 1060) indicate somewhat elevated percentages of students grouped as not college ready. Two of these three courses also indicate higher percentage of ethnic minorities, first generation students and first time students. We will continue discussing in our department how we can effectively help overall underprepared students.

3) We have invited you to re-think your program assessment. What strategies are you considering? What support or help would you like?

In our department we think that our assessment methods should be even closer associated with existing and future job markets. Any information about assessment methodology of the job market would be helpful. We also think that within the next few years we might need to address a higher percentage of underprepared students who attended elementary, junior high, and high schools during COVID19 pandemic. We would appreciate any information about how other programs address this issue.

Appendix D: Charts from Report





Percent of students receiving a grade lower than a C-.

	<18	18-24	25+
GEO3840			41.7%
GEO3710		24.1%	44.3%
GEO3060		22.2%	17.2%
GEO1030	4.4%	18.2%	17.8%
GEO1220		16.4%	12.5%
GEO1110	3.6%	14.9%	12.8%
GEO3720			18.9%
GEO4210			15.4%
GEO4200			17.2%
GEO1130		12.6%	15.6%
GEO1115		15.2%	7.4%
GEO3550		12.9%	11.9%
GEO1060	5.7%	10.8%	12.1%
GEO3400			15.4%
GEO3010		7.4%	
GEO3150		4.9%	13.0%
GEO4800		8.7%	8.8%
GEO2050		8.0%	9.1%
GEO4060		3.3%	11.1%
GEO3080			8.8%
GEO1350		3.6%	
GEO4220			0.0%

WEBER STATE UNIVERSITY

DFWI Grades (D+ or lower) by Race/Ethnicity Grouping

Academic Year	Semester	College	Instructional Method
(Multiple values)	(All)	(All)	(All)

Subject	Course Number	Course Grouping	Concurrent
GEO	(All)	(All)	Not Concurrent

General Education	'W' Grade Filter	Demographic Filter	Student Count
(All)	Include 'W' Grades	Class Rank	25 – 13,835

Percent of students receiving a grade lower than a C-.

	FRESHMAN	SOPHOMORE	JUNIOR	SENIOR
GEO3840				40.0%
GEO3710			32.4%	31.0%
GEO3060				14.3%
GEO1030	33.6%	12.1%	8.9%	12.0%
GEO1220			13.5%	6.8%
GEO1110	25.0%	12.9%	10.3%	9.4%
GEO3720				13.8%
GEO4210				12.2%
GEO1130	16.0%	18.8%	2.7%	11.1%
GEO1115	25.5%	20.0%	8.0%	4.5%
GEO3550				8.7%
GEO1060	22.5%	6.7%	10.5%	6.8%
GEO3400				6.9%
GEO3010				2.7%
GEO3150				6.9%
GEO4800				8.3%
GEO2050				4.2%
GEO4060				7.6%
GEO3080				5.1%
GEO4220				0.0%

WEBER STATE UNIVERSITY

DFWI Grades (D+ or lower) by Race/Ethnicity Grouping

Academic Year	Semester	College	Instructional Method
(Multiple values)	(All)	(All)	(All)

Subject	Course Number	Course Grouping	Concurrent
GEO	(All)	(All)	Not Concurrent

General Education	'W' Grade Filter	Demographic Filter	Student Count
(All)	Include 'W' Grades	College Ready Status	25 – 13,835

Percent of students receiving a grade lower than a C-.

	College Ready	Not College Ready
GEO3840	37.3%	
GEO3710	32.7%	
GEO3060	20.4%	
GEO1030	15.6%	25.3%
GEO2600	11.5%	
GEO1220	12.0%	
GEO1110	13.5%	18.5%
GEO3720	15.6%	
GEO1065	12.2%	
GEO4210	12.0%	
GEO4200	14.3%	
GEO1130	12.3%	
GEO1115	11.6%	
GEO3550	12.3%	
GEO1060	10.0%	16.1%
GEO3400	8.3%	
GEO3010	8.5%	
GEO3150	9.5%	
GEO4800	9.1%	
GEO4750	6.3%	
GEO2050	7.0%	
GEO4990	8.0%	
GEO4060	8.3%	
GEO4400	8.0%	
GEO3080	5.9%	
GEO4220	0.0%	

WEBER STATE UNIVERSITY

DFWI Grades (D+ or lower) by Race/Ethnicity Grouping

Academic Year	Semester	College	Instructional Method
(Multiple values)	(All)	(All)	(All)

Subject	Course Number	Course Grouping	Concurrent
GEO	(All)	(All)	Not Concurrent

General Education	'W' Grade Filter	Demographic Filter	Student Count
(All)	Include 'W' Grades	Ethnicity	25 — 13,835

Percent of students receiving a grade lower than a C-.

	Asian	Black or African Ameri..	Hispanic Latino	Native Hawaiian or O..	White	Two or more races	International	Unknown
GEO3840					40.0%			
GEO3710					36.3%			
GEO3060					22.0%			
GEO1030	25.0%	36.4%	27.3%	26.8%	15.1%	16.1%	12.7%	21.2%
GEO1220					14.1%			
GEO1110			23.3%		12.9%	11.1%		15.4%
GEO3720					15.0%			
GEO1065					11.8%			
GEO4210					14.0%			
GEO4200					13.3%			
GEO1130					8.9%			
GEO1115			19.2%		11.2%			
GEO3550					9.8%			
GEO1060		28.6%	12.7%		10.2%	17.9%		11.8%
GEO3400					10.0%			
GEO3010					11.4%			
GEO3150					8.0%			
GEO4800					7.3%			
GEO4750					9.7%			
GEO2050					8.5%			
GEO4060					7.8%			
GEO3080					2.3%			
GEO4220					0.0%			

WEBER STATE UNIVERSITY

DFWI Grades (D+ or lower) by Race/Ethnicity Grouping

Academic Year	Semester	College	Instructional Method
(Multiple values)	(All)	(All)	(All)

Subject	Course Number	Course Grouping	Concurrent
GEO	(All)	(All)	Not Concurrent

General Education	'W' Grade Filter	Demographic Filter	Student Count
(All)	Include 'W' Grades	First Generation	25 — 13,835

Percent of students receiving a grade lower than a C-.

	No	Yes	UNK
GEO3840			41.7%
GEO3710	28.8%	44.1%	38.9%
GEO3060	20.0%		
GEO1030	15.6%	22.3%	17.1%
GEO1220	17.7%		5.9%
GEO1110	9.5%	15.5%	18.7%
GEO3720			8.0%
GEO4210	14.8%		
GEO1130	15.6%		10.3%
GEO1115	13.1%	0.0%	17.4%
GEO3550	12.5%		
GEO1060	8.6%	8.5%	14.9%
GEO3010	9.7%		
GEO3150	8.7%		16.0%
GEO4800	10.2%		11.4%
GEO2050	8.2%		3.6%
GEO4060	2.8%		16.0%
GEO3080	2.9%		

WEBER STATE UNIVERSITY

DFWI Grades (D+ or lower) by Race/Ethnicity Grouping

Academic Year	Semester	College	Instructional Method
(Multiple values)	(All)	(All)	(All)

Subject	Course Number	Course Grouping	Concurrent
GEO	(All)	(All)	Not Concurrent

General Education	'W' Grade Filter	Demographic Filter	Student Count
(All)	Include 'W' Grades	First-Time Students	25 – 13,835

Percent of students receiving a grade lower than a C-.

	First-Time Students	Not First-Time
GEO3840		36.4%
GEO3710		35.4%
GEO3060		19.6%
GEO1030	16.7%	17.7%
GEO2600		16.0%
GEO1220		14.9%
GEO1110	17.7%	13.4%
GEO3720		14.0%
GEO1065		15.0%
GEO4210		13.2%
GEO4200		13.2%
GEO1130		12.0%
GEO1115	21.4%	10.8%
GEO3550		12.3%
GEO1060	10.7%	11.0%
GEO3400		10.5%
GEO3010		10.2%
GEO3150		9.2%
GEO4800		8.8%
GEO4750		8.6%
GEO2050		8.6%
GEO4990		8.0%
GEO4060		8.0%
GEO4400		7.7%
GEO3080		5.5%
GEO1350		3.2%
GEO4220		0.0%

WEBER STATE UNIVERSITY

DFWI Grades (D+ or lower) by Race/Ethnicity Grouping

Academic Year	Semester	College	Instructional Method
(Multiple values)	(All)	(All)	(All)

Subject	Course Number	Course Grouping	Concurrent
GEO	(All)	(All)	Not Concurrent

General Education	'W' Grade Filter	Demographic Filter	Student Count
(All)	Include 'W' Grades	Gender	25 – 13,835

Percent of students receiving a grade lower than a C-.

	Female	Male
GEO3840	27.3%	50.0%
GEO3710	33.3%	37.3%
GEO3060	20.7%	18.5%
GEO1030	15.7%	19.5%
GEO1220	19.0%	10.5%
GEO1110	13.6%	14.8%
GEO3720	16.0%	12.0%
GEO1065		18.5%
GEO4210		12.9%
GEO1130	16.4%	9.5%
GEO1115	13.0%	12.2%
GEO3550	6.3%	17.1%
GEO1060	9.6%	12.7%
GEO3400		11.5%
GEO3010	12.9%	
GEO3150	2.6%	14.3%
GEO4800	5.7%	13.6%
GEO2050	7.3%	9.4%
GEO4060	5.9%	9.8%
GEO3080	0.0%	10.3%
GEO1350	3.6%	