

Weber State University
Biennial Report on Assessment of Student Learning

Cover Page

Department/Program: Master of Science in Data Science (MSDS)
Academic Year of Report: 2022 and 2023 (covering Summer 2021 through Spring 2023)
Date Submitted:
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The Institutional Effectiveness website hosts a page for each program that displays assessment reports and information. All available biennial assessment and program review reports are located at the bottom of the program's page on our site. As a part of the biennial report process, we ask that you please review your page for completeness and accuracy, and indicate below the changes that need to be made in sections A-E.

Program page link: https://www.weber.edu/ie/Results/Data_ScienceM.html

A. Mission Statement

Information is current; no changes required: Yes _____ No X

No current mission statement is listed.

Update if not current:

Mission Statement:

- Prepare students with practical skills in computing, mathematics, and business to be successful in today's world of data analytics and data science.
- To give students a clear understanding of computer programming paradigms and languages useful for modern processes of data wrangling, cleaning, database management, machine learning, and other practical statistics from computers. To give students a clear understanding of the mathematical foundations of statistics, clustering, factoring, and other foundations necessary to help students in their careers.
- To help students articulate and communicate findings from data to help business-oriented needs.

B. Student Learning Outcomes

(Please include certificate and associate credential learning outcomes)

Information is current; no changes required: Yes _____ No X

Update if not current:

Student outcomes for this program are the following:

- Demonstrated ability to apply mathematical and statistical principles to the analysis of data

- Demonstrated ability to develop and implement data analysis strategies base on theoretical principles, ethical considerations, and detailed knowledge of the underlying data
- Demonstrated ability to identify and classify relevant variables to develop appropriate machine learning and statistical models for effective actionable insight into the underlying data

An additional criterion specific to graduate programs is that students demonstrate an ability to apply masters level knowledge to the specialized area of data science. Students will be required to maintain a reasonably high level of performance while enrolled in the program. Students must achieve a B- or better in all required classes for the MS degree and graduate with a GPA of 3.2 or higher.

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 oi@weber.edu if you wish to have access)

Information is current; no changes required: Yes _____ No X

Update if not current:

Master of Science in Data Science Curriculum Grid	Applying knowledge of computing and mathematics	Analyze problems, identify, and define requirements	Design, implement, & evaluate computer-based systems	Function in teams	Professional, ethical, security, and social behavior	Communicate Effectively	Engage in continuing professional development	Use current techniques, skills, and tools	Apply mathematics, algorithms, and computer theory	Apply design and development principles	Apply mathematical concepts to real-world situations
CS 6570 - Data Science Algorithms I	I	I						I			
CS 6580 - Data Science Algorithms II	R	R		R		R		R		E	R
CS 6550 - Advanced Database		R	R					E		E	

Management Systems											
ECON 6550 - Econometrics	E										R
MATH 6400 - Advanced Statistical Learning	I								R		E
MATH 6450 - Applied Statistics & Regression	I								R		E
MATH 6500 - Factor and Cluster Analysis	I								R		E
MPC 6840 - Data Visualization & Storytelling					I	I	I				
CS 6705 - Applied Cloud Computing	E		R	R						I	
MATH 6900 - Capstone in Statistics and Data Science	E										E
I = introduced, R= Reinforced, E=Emphasized											

D. Program and Contact Information

Information is current; no changes required: Yes **No** **X**

Update if not current:

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Master of Science in Data Science Website (<https://weber.edu/msds>)

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 should 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
- information about how the department/program faculty are engaged in the assessment review.

Information is current; no changes required: Yes X No

Update if not current:

F. Student Achievement

Please come back to this section later. The dashboard is being updated and is not yet on Site Manager. OIE will send out an email when it is ready.

Percent and number of students completing degrees within 2 years of achieving 90+ credit hours (or just time to graduation for graduate programs) and a reflection on that metric.

Here are instructions on how to access this information:

1. Log into the eWeber portal
2. Search for, and select the app, "Report Gallery"
3. Agree to the FERPA warning
4. In the Report Gallery search for Program Review Undergraduate - you can enter that text into the search bar or you can scroll down the list of dashboards until you find it.
5. Select the tab at the top labeled "Time to Grad" at the top of the page.
6. Select your Program Unit and Program Level on the right side
7. Select Priority 1 under Priority

You should now be in the right settings for understanding your program's time to graduation. Please reflect on what you are seeing, discuss any highlights or concerns, and outline what initiatives the program is doing to address the numbers shown. If you require assistance or have questions, please email oi@weber.edu. You may use a screenshot of the information shown in the dashboard as a part of your report.

G. Evidence of Learning

There are a variety of ways in which you can choose to show evidence of learning, including the traditional Evidence of Learning Rubric, the updated Evidence of Learning worksheet, a narrative describing your assessments and evidence of student learning, or other tools such as ePortfolios, Signature Assignments, juried reviews, and so on, or a combination of any of these.

Whichever method you choose, please include:

1. Each learning outcome addressed in the course, and an interpretation of the outcomes as necessary to help outside reviewers understand the learning goals
2. The methods used to assess learning for each outcome – ideally, each outcome will be measured with at least two different methods, e.g., multiple quiz questions and a signature assignment, multiple exam questions and lab reports, course discussions and homework assignments, etc.
3. The threshold of acceptable performance – preferably a multi-stepped threshold, such as “80% of students will score 80% or better on the set of quiz questions” – and brief explanation for why that target was selected
4. The results of the assessment for each outcome. If possible, include specifics such as the number of students who meet, exceed, or fall short of the threshold.
5. A reflection on, or interpretation of, the findings. For example, if 100% of students correctly answer all quiz questions, might they need to be too easy?
6. A plan of action to address the findings, even if the threshold was met, and/or reflection on changes made as a result of (or in the interim since) the last biennial report.
7. How you plan to monitor and assess the success of changes you will make/have made (“close the loop”).

If individual faculty who provide data or participate in the assessment of these courses would like feedback or support from GEIAC or the Office of Institutional Effectiveness, provide their names and contact information here:

Types of Assessment

- 1) Course-based assessment
 - a. This is the format we have traditionally suggested programs use for assessment. The familiar ‘evidence of learning worksheets’ are included in the template and can also be accessed from the IE website.

2) Outcome-based assessment

- a. Moving from course-based to outcome-based assessment has the potential for programs to gather and reflect upon data that are more meaningful, and to connect assessment findings from throughout the program. The approach may be much easier for associates and certificate programs where only select students in classes are earning the credential. For more information email (oiie@weber.edu)
- b. Reporting options include:
 - i. A traditional evidence-of-learning [worksheet](#) with an outcome (across multiple courses) as the focus (instead of a course with multiple outcomes).
 - ii. A report that is more [narrative-based](#).
 - iii. Other tools such as an ePortfolio in which key or signature assignments have been identified by the faculty, and uploaded by the student with their reflection. The key or signature assignments are aligned to student learning outcomes. (ePortfolio is an excellent assessment tool for certificates and associate degrees.)
 - iv. There are other approaches such as juried reviews, physical portfolios, field tests, etc.

3) General Education course assessment needs to continue to be reported at the course level using either the [traditional template](#) or a more [narrative-based format](#). See the [Checklist and Template](#) page for area-specific worksheets as well.

Note: if you cannot download templates directly from this document, please visit our [template page](#) for downloads.

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](#))

Sample only - Evidence of Learning: Courses within the Major – Sample only						
Measurable Learning Outcome: Students will...	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	“Closing the Loop”
Learning Outcome 1:	<p>Measure 1: A set of 10 multiple choice questions from Exam 1</p> <p>Measure 2: Student presentations</p>	<p>Measure 1: 85% of students will score 80% or better on 10 questions</p> <p>Measure 2: Using a rubric to assess the presentation, 90% of students will achieve a score of 75% or above.</p>	<p>Measure 1: 93% of students scored 80% or better on 10 questions</p> <p>Measure 2: the threshold was met, but students performed poorly (avg. = 1.8) on one criterion.</p>	<p>Measure 1: Students successfully demonstrated interpretation skills</p> <p>Measure 2: unclear where the issue is</p>	<p>Measure 1: No curricular or pedagogical changes needed at this time</p> <p>Measure 2: provide better explanation of the expectations for this criterion and re-assess.</p>	Analyze the performance on the lower-scoring criterion and determine if clarity of instruction improved student performance.
Learning Outcome 2:	<p>Measure 1: Results of standardized test</p> <p>Measure 2: Students are surveyed about their perceived competence of the outcome</p>	<p>Measure 1: 85% of students will score at or above the national average.</p> <p>Measure 2: On a 5 point Likert scale, 90% of students will indicate 4 or 5</p>	<p>Measure 1: 90% of students scored above national average</p> <p>Measure 2: Less than half of students felt competence with this outcome.</p>	<p>Measure 1: Students successfully demonstrated competence; lowest average score was in transfer of knowledge, where only 69% of questions were answered correctly.</p> <p>Measure 2: Students tested well, but their perceived competence was lower than expected.</p>	<p>Measure 1: Faculty agree to include review of transfer in all related courses; this outcome will be reassessed during next review</p> <p>Measure 2: Students will be given more opportunity to practice this skill with immediate feedback.</p>	

*Can be a mix of [direct](#) and [indirect](#) measures, but at least one measure must be direct

**Evidence of Learning Worksheet: Courses within the Major – Copy as needed (see appendix for alternative format) Course:
Semester taught: Sections included:**

Evidence of Learning: Courses within the Major						
Measurable Learning Outcome	Method of Measurement*	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	“Closing the Loop”
Learning Outcome 1:	Measure 1:	Measure 1:	Measure 1:	Measure 1:		
	Measure 2:	Measure 2:	Measure 2:	Measure 2:		
Learning Outcome 2:	Measure 1:	Measure 1:	Measure 1:	Measure 1:		
	Measure 2:	Measure 2:	Measure 2:	Measure 2:		

*Direct and indirect: at least one measure per objective must be a direct measure.

Additional narrative (optional – use as much space as needed):

Evidence of Learning: General Education Courses

(Area-specific EOL grids can be found at https://www.weber.edu/ie/Review_and_Assessment/Checklists_and_Templates.html; they can replace this page.)

Course:		Semester taught:		Sections included:		
Evidence of Learning: General Education						
Measurable Learning Outcome	Method of Measurement	Target Performance	Actual Performance	Interpretation of Findings	Action Plan/Use of Results	“Close the Loop”
Students will...						
Learning Outcome 1:	Measure 1	Measure 1	Measure 1:	Measure 1:	Measure 1:	
	Measure 2:	Measure 2:	Measure 2:	Measure 2:	Measure 2:	
Learning Outcome 2:	Measure 1:	Measure 1:	Measure 1:	Measure 1:	Measure 1:	
	Measure 2:	Measure 2:	Measure 2:	Measure 2:	Measure 2:	
Learning Outcome 3:	Measure 1:	Measure 1:	Measure 1:	Measure 1:	Measure 1:	
	Measure 2:	Measure 2:	Measure 2:	Measure 2:	Measure 2:	

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

It is proposed that these assessment results will be reviewed by the General Education Improvement & Assessment Committee, who will provide feedback on evidence of continuous improvement.

Alternative Evidence of Learning Grid

Course Name & Number:	Outcome:	
	Measure 1	Measure 2
Method of Measurement		
Target Performance		
Actual Performance		
Reflection/Interpretation		
Action Plan		
Assessment of Changes/Closing the Loop		

Additional narrative (optional – use as much space as needed):

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: #####	Recommendation	Progress Description
Recommendation 1	Text of recommendation	##### +1 progress
		##### +2 progress
		##### +3 progress
		##### +4 progress
Recommendation 2	Text of recommendation	##### +1 progress
		##### +2 progress
		##### +3 progress
		##### +4 progress
Recommendation 3	Text of recommendation	##### +1 progress
		##### +2 progress
		##### +3 progress
		##### +4 progress
(add as needed)		

Additional narrative:

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	2019-20	2020-21	2021-22	2022-23
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)				
Full-time Tenured				
Full-time Non-Tenured (includes tenure-track)				
Part-time and adjunct				
With Master's Degrees				
Full-time Tenured				
Full-time Non-Tenured				
Part-time and adjunct				
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				
Full-time Non-tenured				
Part-time				

Appendix C

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

Glossary

Student Learning Outcomes/Measurable Learning Outcomes

The terms ‘learning outcome’, ‘learning objective’, ‘learning competency’, and ‘learning goal’ are often used interchangeably. Broadly, these terms reference what we want students to be able to do AFTER they pass a course or graduate from a program. For this document, we will use the word ‘outcomes’. Good learning outcomes are specific (but not too specific), are observable, and are clear. Good learning outcomes focus on skills: knowledge and understanding; transferrable skills; habits of mind; career skills; attitudes and values.

- Should be developed using action words (if you can see it, you can assess it).
- Use compound statements judiciously.
- Use complex statements judiciously.

Curriculum Grid

A chart identifying the key learning outcomes addressed in each of the curriculum’s key elements or learning experiences (Suskie, 2019). A good curriculum:

- Gives students ample, diverse opportunities to achieve core learning outcomes.
- Has appropriate, progressive rigor.
- Concludes with an integrative, synthesizing capstone experience.
- Is focused and simple.
- Uses research-informed strategies to help students learn and succeed.
- Is consistent across venues and modalities.
- Is greater than the sum of its parts.

Target Performance (previously referred to as ‘Threshold’)

The level of performance at which students are doing well enough to succeed in later studies (e.g., next course in sequence or next level of course) or career.

Actual Performance

How students performed on the specific assessment. An average score is less meaningful than a distribution of scores (for example, 72% of students met or exceeded the target performance, 5% of students failed the assessment).

Closing the Loop

The process of following up on changes made to curriculum, pedagogy, materials, etc., to determine if the changes had the desired impact.

Continuous Improvement

An idea with roots in manufacturing, that promotes the ongoing effort to improve. Continuous improvement uses data and evidence to improve student learning and drive student success.

Direct evidence

Evidence based upon actual student work; performance on a test, a presentation, or a research paper, for example. Direct evidence is tangible, visible, and measurable.

Indirect evidence

Evidence that serves as a proxy for student learning. May include student opinion/perception of learning, course grades, measures of satisfaction, participation. Works well as a complement to direct evidence.

HIEE – High Impact Educational Experiences

Promote student learning through curricular and co-curricular activities that are intentionally designed to foster active and integrative student engagement by utilizing multiple impact strategies. Please see <https://weber.edu/weberthrives/HIEE.html>