

Weber State University
Biennial Report on Assessment of Student Learning

Cover Page

Department/Program: Master of Science in Computer Science
Academic Year of Report: 2021 and 22 (covering Summer 2020 through Spring 2022)
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Table of Contents

- [A: Mission Statement](#)
- [B: Student Learning Outcomes](#)
- [C: Curriculum Grid](#)
- [D: Program Contact Information](#)
- [E: Assessment Plan](#)
- [F: Student Achievement](#)
- [G: Evidence of Learning](#)
- Appendices
 - [A: Recommendations](#)
 - [B: Program Faculty](#)
 - [Questions](#)
- [Glossary](#)

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.

Program page link:

A. Mission Statement

Information is current; no changes required.

Update if not current:

B. Student Learning Outcomes

(Please include certificate and associate credential learning outcomes)

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

Information is current; no changes required.

Update if not current

D. Program and Contact Information

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.

Information is current; no changes required.

Update if not current:

After many long hours of research and investigation and being distraught about how to improve assessment, Gail Niklason pointed out to us that when we officially proposed the MSCS that we wrote the following three ways of assessment:

1. Survey the students.
2. Survey graduates of the program and employers.
3. Use the results of the project and theses.
4. Analyzed and combine the results of the three.

We are very thankful for Gail! We have been getting the results from number 2 and 3 (survey graduates of the program and employers and use the results of the project and theses), but we have failed to effectively and objectively survey the students. Many attempts were made over the years, but we did not realize that we needed to more formally collect and analyze those results. As a result, we are now adding number 1 (Survey the students) in a more objective and systematic way. We hope to implement this new survey at a program level starting Spring 2023.

F. Student Achievement

F.A: For undergraduate programs only:

Not applicable. This is a graduate program.

F.B: For Graduate Programs Only: Of the students that were enrolled in your program last year, what percentage of students failed to persist? 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 Graduate - you can enter that text into the search bar or you can scroll down the list of dashboards until you find it.
- 5) Once you select the Program Review dashboard, select your program in the filter box labeled 'Program Review Unit' directly below the Weber State University logo at the top of the page.
- 6) Then select the tab labeled "Time to Grad " at the top of the page. Scroll down to "Has not Graduated by Currently Enrolled"
- 7) You may use a screenshot of the information as a part of your report

At the time of the document being written, the Report Gallery was offline.

G: Evidence of Learning

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

- 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. The critical pieces to include are:

- i. learning outcomes addressed in the course,
- ii. method(s) of measurement used,
- iii. threshold for 'acceptable – that is, the target performance,
- iv. actual results of the assessment,
- v. interpretation/reflection on findings,
- vi. the course of action to be taken based upon the interpretation,
- vii. how that action will be evaluated.

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 (ojie@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.

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

Please note that we are revamping our evidence of learning.

We made two major changes due to our assessment.

The first major change that we implemented was that we added CS 6000 (1 credit) (Fundamentals of Graduate Studies) as a required course. The following is the course description: "The purpose of this course is to introduce students in the graduate programs in the College of Engineering, Applied Science, and Technology to the expectations of graduate study and the scholarly requirement options for their program. Students will learn the difference between a research thesis and a design project as well as how to select, narrow, and refocus a research topic. Students will explore academic electronic databases and Internet search engines, thus developing skills that allow them to critically evaluate published scholarly work. They will also be introduced to research methods and design and will develop skills in organization, effective editing, reviewing, and proofreading. This course should be taken within the first year of study to establish a program of study and support future work on a thesis or project."

The reason for the additional course is simple: We found that students were not sufficiently prepared to perform actual scientific research. Even though it is ironic that almost all of the students have a Bachelor of *Science*, the students were generally unprepared for reading scientific conference and journal papers, unprepared for doing literature reviews, proposing research questions and hypotheses, and understanding what a master's thesis is generally.

Although assessment is still coming in through the pipeline, it appears to have worked. The following summarizes the success of CS 6000:

- Students have been exposed to how the scientific method works in computer science and are having less difficulty in understanding the process.
- Each thesis advisor has to spend less time teaching what the scientific method is and how to propose new research.
- Students are transitioning to their thesis work more easily (less complaints from students and faculty).

The other major changes that occurred from our assessment (of listening to graduated students and employers, as well as following both national and global trends):

- Allowing students to take a "course-work only option" instead of doing a thesis.
- Dropping the GRE requirement for admission into the program.

The reasoning for both is simple: **Everyone else (i.e., most other graduate programs in computer science) is doing it.**

Although that is an overgeneralization, it sums up our reasoning quite well. The exception for the thesis requirement (as in schools that are keeping the thesis required) is for top-tiered schools (e.g., Harvard, Yale, etc.). However, even that exception has exceptions. For example, Standard is one of the leaders of graduating masses of online students that do not a thesis.

This decision cannot be taken lightly and the advocates among our faculty pointed out that this is an existential program. Why should a student be forced to do a thesis at a non-top-tiered school?

The next existential question that we have to face is to allow students to completely take courses online like Standard University. Currently, we feel that if we were to allow a completely online version of our graduate degree that we would lose our identity. Our graduate faculty enjoy the one-on-one relationships that we share without students. If we were to switch to online then we feel that we would lose that purpose and our desire to have the program.

The reason for dropping the GRE has the same logic as why we made the thesis optional. Dropping the GRE is becoming a universal trend throughout the nation. After hearing much discussion of the subject at Graduate Council, we voted on it and thus decided to drop the GRE.

However, we have maintained the GRE as a requirement for international students.

G.B Evidence of Learning Worksheet: Courses within the Major – Copy as needed (see appendix for alternative format)

Course:

Semester taught:

Sections included:

Level L: Low

Level H: High

Curriculum Map Format

| | Program Learning Outcomes | | | |
|----------------------------------------------------------|---------------------------|--------------------|--------------------|--------------------|
| | Learning Outcome 1 | Learning Outcome 2 | Learning Outcome 3 | Learning Outcome 4 |
| CS 6010 (Design Project) | H | H | H | H |
| CS 6011 (Thesis Research) | H | H | H | H |
| CS 6100 (Distributed Operating Systems) | H | L | H | L |
| CS 6420 (Advanced Algorithms) | H | L | H | H |
| CS 6450 (Software Evolution and Maintenance) | L | H | H | H |
| CS 6500 (Advanced Artificial Intelligence) | H | L | H | H |
| CS 6580 (Adv. Data Science Algorithms and Visualization) | H | L | H | H |
| CS 6600 - Machine Learning | H | H | H | H |
| CS 6610 (Computer Architecture) | H | L | H | H |
| CS 6740 (Computer Systems Security) | L | H | H | H |
| CS 6820 (Compiler Design) | H | H | H | H |

| | | | | |
|-------------------------------------------------|---|---|---|---|
| CS 6830 (Special Topics in Computer Science) | L | L | L | L |
| CS 6840 (Formal System Design) | H | H | H | H |
| CS 6850 (Parallel Programming and Architecture) | H | H | H | L |

G.C 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](https://www.weber.edu/ie/Review%20and%20Assessment/Checklists%20and%20Templates.html); they can replace this page.)

Not applicable. Our graduate students do not take general education courses.

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.

This is not applicable. ABET did not review our graduate program.

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.

Please note that the following is about graduate faculty in our department only.

| Faculty Headcount | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
|---------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|
| With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution) | 10 | 10 | 11 | 13 |
| Full-time Tenured | 4 | 5 | 6 | 6 |
| Full-time Non-Tenured (includes tenure-track) | 6 | 5 | 5 | 7 |
| Part-time and adjunct | 0 | 0 | 0 | 0 |
| | | | | |
| With Master's Degrees | 0 | 0 | 0 | 0 |
| Full-time Tenured | 0 | 0 | 0 | 0 |
| Full-time Non-Tenured | 0 | 0 | 0 | 0 |
| Part-time and adjunct | 0 | 0 | 0 | 0 |
| | | | | |
| With Bachelor's Degrees | 0 | 0 | 0 | 0 |
| Full-time Tenured | 0 | 0 | 0 | 0 |
| Full-time Non-tenured | 0 | 0 | 0 | 0 |
| Part-time and adjunct | 0 | 0 | 0 | 0 |
| | | | | |
| Other | 0 | 0 | 0 | 0 |
| Full-time Tenured | 0 | 0 | 0 | 0 |
| Full-time Non-tenured | 0 | 0 | 0 | 0 |
| Part-time | 0 | 0 | 0 | 0 |
| Total Headcount Faculty | 10 | 10 | 11 | 13 |
| Full-time Tenured | 4 | 5 | 6 | 6 |
| Full-time Non-tenured | 6 | 5 | 5 | 7 |
| Part-time | 0 | 0 | 0 | 0 |

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?

Our biggest improvement has been to start revisiting our originally proposed assessment techniques.

- 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?

At the time of the document being written, the Report Gallery was offline.

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

Please see section E (Assessment Plan).

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>

The Master of Science degree in Computer Science is specifically designed to provide graduates with an in-depth computer science background. It attempts to address the staffing needs of both large and moderate-sized industries in Northern Utah and throughout the state as well as many of the manpower needs of Hill Air Force Base. Several different methods of evaluation will be used to assess the program:

- 1) the first being a survey of the students that are currently in the program. The purpose of this survey is to see if the desired goals and the expectations of the students are being met.

provide both the survey and survey results (aggregated, analyzed)

- 2) The second will consist of surveys of both graduates from the program and the employers of those graduates. The graduates will be evaluated to determine whether the program met the needs of their current employer or other past employers and how the program could be improved. The employers will be asked whether or not the program is meeting their needs for computer scientists.

provide the survey and survey results (aggregated, analyzed)

- 3) The project and thesis courses will also be used as an assessment tool to determine if students have gained the knowledge and skills they were to have acquired in their graduate courses.

What is being assessed? How is it being assessed?

- 4) The results from these three sources of information will be analyzed and used to implement necessary changes every other year in a process of continuous improvement.

What have you learned from these three data points?