

Weber State University
Biennial Report on Assessment of Student Learning

Cover Page

Department/Program: Master of Science of Computer Science
Academic Year of Report: 2018/19 (covering Summer 2017 through Spring 2019)
Date Submitted:
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A. Brief Introductory Statement:

Please review the Introductory Statement and contact information for your department or academic program displayed on the assessment site: <http://www.weber.edu/portfolio/departments.html> - if this information is current, please place an 'X' below. No further information is needed.

Information is current; no changes required.

Update if not current: No introductory statement exists.

Introductory statement:

The WSU Master of Science in Computer Science (MSCS) program provides a timely path for students in Computer Science to pursue a graduate degree in a high-demand and growing discipline. The program blends scientific and engineering principles implemented through actual, practical, and applications-oriented experience as well as the intellectual study of computation. It is designed to provide a sound fundamental understanding of logic and of digital computer organization as well as the interaction between hardware, software, and the interconnection of system components. Ultimately, it is designed to help the bolster the careers of students that are interested in achieving a higher degree of learning and offers professionals in the local work force an opportunity to earn an advanced engineering degree, bolster innovation in the community, and thereby promote economic growth. Finally, for those students who are interested, this program provides the necessary preparation for doctoral programs at other institutions of higher learning.

MSCE example: https://www.weber.edu/portfolio/mce_ms.html

B. Mission Statement

Please review the Mission Statement for your department or academic program displayed on the assessment site: <http://www.weber.edu/portfolio/departments.html> - if the mission statement is current, please place an 'X' below.; If the information is not current, please provide an update:

Information is current; no changes required.

Update if not current:

The mission of the Master of Science Program in Computer Science, in adherence to the core themes of the mission of Weber State University, is to provide students a high-quality graduate-level education in Computer Science. This education, which emphasizes advanced computer science principles coupled with hands-on experience, enables students to make significant contributions to society as professionals. The program stresses design and problem-solving using math, science and advanced computer science principles.

C. Student Learning Outcomes

Please review the [Student Learning Outcomes](#) for your academic program displayed on the assessment site:

<http://www.weber.edu/portfolio/departments.html>. In particular, review in light of recent strategic reporting and indicate any needed updates. If the outcomes are current, mark below.

At the end of their study at WSU, students in this program will:

1. Demonstrate the ability to apply knowledge of math, science and engineering.
2. Demonstrate the ability to design a system, component or process.
3. Demonstrate the ability to identify, formulate and solve computer science problems.
4. Demonstrate the ability to apply master's level knowledge to the specialized area of computer science.

Information is current; no changes required.

Update if not current:

D-1. Curriculum

“A collection of courses is not a program. A curriculum has coherence, depth, and synthesis.”

(Linda Suskie; presentation at NWCCU Assessment Fellowship, June 19, 2019)

Please review the [Curriculum Grid](#) for your department or academic program displayed on the assessment site:

<http://www.weber.edu/portfolio/departments.html>.

Indicate in the curriculum grid where graduating student performance is assessed for each program outcome. In the ‘additional information’ section, please provide information about these assessments (e.g., portfolios, presentations, projects, etc.) This information will be summarized at the college and institutional level for inclusion in our NWCCU reporting on student achievement.

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

Additional Information (details about graduating student assessment):

D-2. High Impact Educational Experiences in the Curriculum

In response to the recent USHE requirement that all students have at least 1 HIEE in the first 30 credit hours and 1 HIEE in the major or minor we are asking programs to map HIEEs to curriculum using a traditional curriculum grid. This helps demonstrate how and where these goals are accomplished.

Courses	Department/Program use of High Impact Educational Experiences							
	HIEE 1: Graduate research	HIEE 2: Mentored Literature review	HIEE 3: Capstone course or experience	HIEE 4: Project- based learning				
CS 6010 (Design Project)	X	X						
CS 6011 (Thesis Research)	X	X						
CS 6450 (Software Evolution and Maintenance)			X					
CS 6820 (Compiler Design)				X				
CS 6610 (Computer Architecture)				X				
CS 6420 (Advanced Algorithms)				X				

HIEEs include capstone courses or experiences, community-engaged learning, evidence-based teaching practices, internships, project-based learning, study abroad/away, supplemental instruction, team-based learning, undergraduate research, pre-professional/career development experiences.

Additional information (HIEE planning, assessment, or other information):

E. Assessment Plan

Please update the Assessment Plan for your department displayed on the assessment site: <http://www.weber.edu/portfolio/departments.html>. Keep in mind that reporting will be done biennially instead of annually; that should be reflected in your assessment plan. Please ensure that Gen Ed courses are assessed/reported at least twice during a standard program review cycle.

A complete plan will include a list of courses from which data will be gathered and the schedule, as well as an overview of the assessment strategy the department is using (for example, portfolios, or a combination of Chi assessment data and student survey information, or industry certification exams, etc.), and plans for continuous improvement.

Assessment plan:

The assessment plan is executed using two types of instruments:

1. Course assessment rubrics.
2. Project thesis/defense assessment.

These assessment instruments are described below.

Course assessment rubrics

The course assessment rubric is a direct assessment instrument that articulates the expectations for student performance. The rubric consists of three elements:

- Dimensions (performance indicators)
- Scale (levels of performance) of 1, 2, 3 or 4
- Descriptors (descriptions of the levels of performance)

Each course in the MSCS curriculum grid has an associated assessment rubric that measures students' performance with respect to the 4 student learning outcomes listed in Section C. Through the continuous use of these rubrics, assessment at both the course and program level is an ongoing process that provides a measurable means of program improvement.

The course assessment rubric works as follows. At the end of each semester, the instructor scores each performance indicator (PI) for the course. A four-point scale is used. The rubrics are designed with a "trigger point." If the score of a PI is 1 (unsatisfactory) or 2 (developing), the instructor

initiates action to make course level changes with respect to the applicable PI for the course. If the score of a PI is 3 (satisfactory) or 4 (exemplary), no action is taken by the instructor. Then, the mean PI score for each course and section* is transferred to a program level “continuous course improvement” record, a document that summarizes the mean PI scores. This spreadsheet utilizes a trigger point of 2.67 and if a mean PI score falls below the trigger point, the faculty at the program level must make significant changes to the course or the program to remedy the problem. Thus, depending on the trigger points activated, both the instructor and program faculty have input to the continuous improvement process.

*CS 6010 and CS 6011 assessment data are recorded in the continuous course improvement record only for the semester in which the student defends.

Project Thesis/Defense Assessment

The thesis or project defense assessment is a direct assessment instrument that is completed by all faculty attending the final design review (defense) of a student’s thesis or project. This instrument assesses the student’s mastery of the program-level learning outcomes listed in Section C.

The thesis or project defense assessment instrument works as follows: Faculty attending a final design review answer four questions corresponding to the four learning outcomes listed in Section C. Responses from these questions fall into a four-point asymmetrical Likert scale:

- 4 = strongly agree
- 3 = agree
- 2 = mixed, and
- 1 = disagree.

The student’s committee chair calculates the mean response for each question. These responses are recorded in the Project Defense Assessment Report, which the chair submits to the program director. The director computes a graduating cohort average for each of the four questions and enters those averages into the continuous improvement record. If the mean value for any question falls below 2.67, the program faculty must initiate action to address the unsatisfactory learning outcome result(s). Conversely, if all mean values are at or above 2.67, no action is initiated by the faculty.

F. Report of assessment results for the most previous academic year:

There are varieties of ways in which departments can choose to show evidence of learning. This is one example. The critical pieces to include are 1) learning outcome being assessed, 2) method(s) of measurement used, 3) threshold for ‘acceptable – that is, the target performance, 4) actual results of the assessment, 5) interpretation/reflection on findings 6) the course of action to be taken based upon the interpretation, and 7) how that action will be evaluated.

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)

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:	Measure 1: A set of 10 multiple choice questions from Exam 1 Measure 2: Student presentations	Measure 1: 85% of students will score 80% or better on 10 questions Measure 2: Using a rubric to assess the presentation, 90% of students will achieve a score of 75% or above.	Measure 1: 93% of students scored 80% or better on 10 questions Measure 2: the threshold was met, but students performed poorly (avg. = 1.8) on one criterion.	Measure 1: Students successfully demonstrated interpretation skills Measure 2: unclear where the issue is	Measure 1: No curricular or pedagogical changes needed at this time Measure 2: provide better explanation of the expectations for this criterion and re-assess.	Analyze the performance on the lower-scoring criterion and determine if clarity of instruction improved student performance.
Learning Outcome 2:	Measure 1: Results of standardized test	Measure 1: 85% of students will score at or above the national average.	Measure 1: 90% of students scored above national average	Measure 1: Students successfully demonstrated competence; lowest average score was in transfer of knowledge, where only 69% of	Measure 1: Faculty agree to include review of transfer in all related courses; this outcome	

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 ”
	Measure 2: Students are surveyed about their perceived competence of the outcome	Measure 2: On a 5 point Likert scale, 90% of students will indicate 4 or 5	Measure 2: Less than half of students felt competence with this outcome.	questions were answered correctly. Measure 2: Students tested well, but their perceived competence was lower than expected.	will be reassessed during next review Measure 2: Students will be given more opportunity to practice this skill with immediate feedback.	

*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)**

Evidence of Learning: Courses within the Major						
Course:	Semester taught:	Sections included:				
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:		

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”
	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):

c. Evidence of Learning: General Education Courses

(Area-specific EOL grids can be found at http://weber.edu/oie/Complete_Rubrics.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:	

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 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.

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 acting upon.

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.

Graduate Faculty List for 2017-2018: Abdulmalek Al-Gahmi, Robert Ball, Kyle Feuz, Richard Fry, Mark Huson, Brad Peterson, Brian Rague, Hugo Valle, and Yong Zhang

Graduate Faculty List for 2018-2019: Abdulmalek Al-Gahmi, Robert Ball, Arpit Christi, Kyle Feuz, Richard Fry, Mark Huson, Brad Peterson, Brian Rague, Hugo Valle, and Yong Zhang

Faculty Headcount	2017-18	2018-19
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)	8	10
Full-time Tenured	3	4
Full-time Non-Tenured (includes tenure-track)	4	6
Part-time and adjunct	0	0
With Master's Degrees	0	0
Full-time Tenured	0	0
Full-time Non-Tenured	0	0
Part-time and adjunct	0	0
With Bachelor's Degrees	1	0
Full-time Tenured	0	0
Full-time Non-tenured	1	0
Part-time and adjunct	0	0
Other	0	0
Full-time Tenured		
Full-time Non-tenured		
Part-time		
Total Headcount Faculty	8	10
Full-time Tenured	3	4
Full-time Non-tenured	5	6
Part-time	0	0

Appendix C – alternative format for Evidence of Learning Reporting

Course:

Program Outcome 1	
Aligned Course Outcome(s):	
Method(s) of measurement:	
Target Performance:	
Actual Performance:	
Interpretation/Reflection on findings:	
Action Plan/Use of Results:	
Intended evaluation of plan (closing the loop):	

Please respond to the following questions.

- 1) First year student success is critical to WSU's retention and graduation efforts. We are interested in finding out how departments support their first-year students. Do you have mechanisms and processes in place to identify, meet with, and support first-year students? Please provide a brief narrative focusing on your program's support of new students:
 - a. Any first-year students taking courses in your program(s).

At first we did not have anything in place because we were not sure what would be needed. After the first year we realized that students need help in understanding what a "thesis" is and how to succeed. As a result, we created an "information session" that we hold the first week of every semester. We also set up a website with frequently asked questions. We are currently working on handouts that will address commonly concerns and questions. We find that almost all of the students have the same questions.

- b. Students declared in your program(s), whether or not they are taking courses in your program(s)

- 2) A key component of sound assessment practice is the process of 'closing the loop' – that is, following up on changes implemented as a response to your assessment findings, to determine the impact of those changes/innovations. It is also an aspect of assessment on which we need to improve, as suggested in our NWCCU mid-cycle report. Please describe the processes your program has in place to 'close the loop'.

Similar to the above question in 1.a, we want students to succeed. In order to do that we realize that we need to assess how well students are doing. We currently evaluate each course and we will evaluate the success of each student at the end by assessing their thesis work. With the courses, we will look at how a course is performing and refactor assignments, lectures, exams, etc. accordingly when they are underperforming.

With students' thesis, for example, if we find that students universally are lacking in one area then we will change the procedure that we use. For instance, change our proposal process so that it more explicitly states that it must cover topic X. We feel that by explicitly requiring in the future what we find deficit that students and faculty will be more aware of weaknesses and will focus on those areas.

Then, we will be able to determine if that change actually helped the situation by assessing the next round of students. If so, then we will have succeeded with those weaknesses. If not, then we will have to look for other remedies.

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.