

**Central Washington University
Assessment of Student Learning
Department and Program Report**

Please enter the appropriate information concerning your student learning assessment activities for this year.

Academic Years of Report: AY10-11, AY11-12 College: COTS
Department: Computer Science Program: Bachelor of Science

1. What student learning outcomes were assessed this year, and why?

In answering this question, please identify the specific student learning outcomes you assessed this year, reasons for assessing these outcomes, with the outcomes written in clear, measurable terms, and note how the outcomes are linked to department, college and university mission and goals.

Comment On Which Student Learning Outcomes Were Assessed and Why.

1.1 Overview – Computer Science Reading Assessment.

In addition, the department was asked to carry out the College Reading Assessment. The department chose to administer this assessment in CS 489, Senior Colloquium, a class required of all graduating seniors. In what follows, each section below will begin with a discussion of the results of the College Reading Assessment followed by the regular student learning outcomes assessment. In Appendix A, we provide a copy of the test given to our students.

1.2 Overview – Computer Science Major Program.

The Computer Science Department has established a regular review process for assessment of student learning. For completeness, Table 1 below lists the Student Learning outcomes for the Bachelor of Science in Computer Science. Linking of the Student Learning Outcomes to the Department, College and University goals can be found in our Student Learning Assessment Plan at: <http://www.cwu.edu/computer-science/accred&review.html>. As noted in the Plan, our assessment measures generally are reviewed either annually or on a three year rotating basis. Please note that the department conducted a writing assessment last year so some measures have been delayed for a year.

Table 1. Student Learning Outcomes for the Bachelors of Science in Computer Science.

Student Learning Outcomes
1. Basic Knowledge: Graduates will demonstrate an understanding of each of the subject areas that define the discipline as well as the interrelationships that exist among them.
2. Critical Thinking Skills: Graduates will demonstrate the ability to utilize appropriate theoretical constructs for problem solving: definitions, and axioms, theorems, proofs, and interpretation of results.
3. Research Skills: Graduates will have the ability to apply basic research methods in computer science.
4. Applied Design Skills: Graduates will have the ability to apply appropriate design constructs: requirements analysis and specification, design, implementation, and testing.
5. Ethics and Society: Graduates will demonstrate knowledge of ethical codes and societal issues associated with the computing field.
6. Technical and Theoretical Background: Graduates will demonstrate knowledge of recent technological and theoretical developments, general professional standards, and have an awareness of their own strengths and limitations as well as those of the discipline itself.

7. History of Computing:

Graduates will be aware of the history of computing, including those major developments and trends - economic, scientific, legal, political, and cultural - that have combined to shape the discipline.

8. Graduate Preparation:

Graduates will have the necessary background for entry into graduate study.

9. Communication Skills:

Graduates will have the ability to communicate effectively.

2. How were they assessed?

In answering these questions, please concisely describe the specific methods used in assessing student learning. Please also specify the population assessed, when the assessment took place, and the standard of mastery (criterion) against which you will compare your assessment results. If appropriate, please list survey or questionnaire response rate from total population.

A) What methods were used?**B) Who was assessed?****C) When was it assessed?****2.1 Computer Science Reading Assessment.**

We also conducted our first assessment of the College Reading Assessment as requested. As noted above, the department chose to administer this assessment in CS 489, Senior Colloquium, a class required of all graduating seniors. The assessment was carried out in March and June 2012.

2.2 Computer Science Major Program.

As several of the measures the department uses helps us assess correspond to more than one of the student learning outcomes, we have divide the answers here into two sections. We will begin by listing the methods of assessment and answer parts A), B), and C). After that we will correlate the methods of assessment with the student learning outcomes.

Table 2. Student Learning Outcomes for the Bachelors of Science in Computer Science.

Method Used	Who was Assessed	When the Assessment Occurred
Major Field Test	Senior CS Majors	March, June 2011 & March, June 2012
Senior Capstone Courses, CS 480 / 481	Senior CS Majors	Fall and Winter term in both 2011 and 2012 when the courses were offered
Senior Colloquium, CS 489	Senior CS Majors	March, June 2011 & March, June 2012
Participation in SOURCE	Majors at all levels	June 2011 and 2012
Participation in research projects and groups	Majors at all levels	June 2011 and 2012
Survey of students in Fundamentals of Computer Science, CS 112	Entering majors, minors and some non-majors	June 2011 and 2012
Exit Interviews	Senior CS Majors	March, June 2011 & March, June 2012
Employers and Internship Employers Surveys	Majors at all levels	June 2011 and 2012
Graduate School Acceptance	Senior CS Majors	June 2011 and 2012

Table 3. Student Learning Outcomes for the Bachelors of Science in Computer Science.

Student Learning Outcome	Method Used
1. Basic Knowledge	Major Field Test Exit Interviews
2. Critical Thinking Skills	Major Field Test
3. Research Skills	Senior Colloquium, CS 489 Participation in SOURCE Participation in research projects and groups
4. Applied Design Skills	Senior Capstone Courses, CS 480 / 481
5. Ethics and Society	Senior Colloquium, CS 489
6. Technical and Theoretical Background	Senior Capstone Courses, CS 480 / 481 Employers and Internship Employers Exit Interviews
7. History of Computing	Fundamentals of Computer Science, CS 112 Participation in SOURCE
8. Graduate Preparation	Participation in research projects and groups Graduate School Acceptance
9. Communication Skills	Senior Capstone Courses, CS 480 / 481 Senior Colloquium, CS 489

3. What was learned?

In answering this question, please report results in specific qualitative or quantitative terms, with the results linked to the outcomes you assessed, and compared to the standard of mastery (criterion) you noted above. Please also include a concise interpretation or analysis of the results.

3.1 Computer Science Reading Assessment.

Let us begin with the results of the College Reading Assessment.

Table 4. Results of College Reading Assessment.

Rubric Element	Pass	No Pass
Reading Rate	Good (> 300 wpm) 13/25 = 52%	Average (> 190 wpm & <300) 8/25 = 32%
	Overall Pass 21/25 = 84%	4/25 = 16%
Summary: Details	22/25 = 88%	3/25 = 12%
Summary: Discipline Specific Vocabulary	20/25 = 80%	5/25 = 20%
Summary: Author's Intent	22/25 = 88%	3/25 = 12%

Table 5. Correlating Results with Standards of Mastery for the College Reading Assessment.

Rubric Element	Standard	Results
Reading Rate	Pass Rate >= 75%	Class average 84%
Summary: Details	Pass Rate >= 75%	Class average 88%
Summary: Discipline Specific Vocabulary	Pass Rate >= 75%	Class average 80%
Summary: Author's Intent	Pass Rate >= 75%	Class average 88%

3.2 Computer Science Major Program.

As in the prior section, we will first give the results of each student learning outcome measurement and follow this with how these results compare to the standard of mastery for each of the student learning outcomes as found in our Assessment Plan.

Assessment Measures

Major Field Test

Currently, approximately 110 computer science departments across the country use this test as part of their assessment process. The faculty have reviewed the list of institutions participating in the computer science MFT and feel it provides a fair cross section of computer science programs, many from what are considered peer-institutions. The MFT in Computer Science was changed two years ago so results are no longer comparable to prior years, so only the last two years' results are presented.

Table 6. MFT Results Over Last Two Years.

	10 - 11		11 - 12		Total	
	Score	Percentile	Score	Percentile	Score	Percentile
Num. Stu.	27		28		55	
Overall	151.1	53	149.3	43	150.2	49
Programming	55.5	63	54.2	56	54.8	61
Systems	40.4	49	37.2	31	38.8	44
Theory	40.7	49	40.3	49	40.4	49
GPA – avg.	3.33		3.18			

Senior Capstone Courses, CS 480 / 481

The last two years the department had 12 senior project teams. Six teams used the traditional waterfall model of software development, five teams used the extreme programming model of software development, and one team used a research project model of development. In each model students were required to develop six documents and make three presentations. Eleven teams either met all requirements or the major requirements specified in their original design. One team did not meet the specified major requirements.

Table 7. Capstone Project – Meets Listed Requirements.

Model of Project	Met All Requirements	Met Major Requirements	Major Requirements Lacking
Waterfall	1	4	1
Extreme Programming	2	3	
Research		1	

All documents and presentations were evaluated relative to both content and style rubrics. In the content evaluation, one team was evaluated as excellent, three teams were evaluated as exceeding expectations and one team was evaluated as meeting expectations. In the style evaluations, two teams were evaluated as exceeding expectations and three teams were evaluated as meeting expectations.

Table 8. Capstone Project – Document Evaluations.

	Excellent	Exceeds Expectations	Meets Expectations	Fails Some Expectations	Missing Major Requirements
Content	2	8	2		
Style	2	7	3		

Senior Colloquium, CS 489

All graduating seniors are required to participate in the Senior Colloquium. Over the last two years 54 students took this class. In addition to taking the Major Field Test, students complete an ethics unit, write a research paper and make a presentation on that research paper.

Table 9. Senior Colloquium – Document and Presentation Evaluation.

	Excellent	Exceeds Expectations	Meets Expectations	Fails Some Expectations	Missing Major Requirements
Ethics Unit	16	29	6	3	
Research Paper	17	31	4	2	
Presentation	19	27	5	3	

Participation in SOURCE and in research projects and groups

The faculty believes that it is the students in their last two years of study in computer science who generally have the background to be eligible to participate in SOURCE or research projects. Over the last two years there were 54 students in last two years of study in computer science. Twenty-one students participated in some form of undergraduate research this year.

Table 10. Research and Independent Study Evaluation.

	Number of Students, AY10-11	Number of Students, AY11-12
SOURCE	5	8
Individual Research	3	2
Group Research	6	4
Conference Presentations	2	2
Publications	1	0

Survey of Students in Fundamentals of Computer Science, CS 112

This course underwent a significant change this year as a result of one of last year's recommendations. We will discuss the changes and our perceptions about them in section 5 below. Here we will present the result of our survey of students taking CS 112 this year. The class had four basic sections: Alice – a programming language used to introduce animation, careers in computer science, hands-on computers – a look at basic data representation and the development of computer hardware, and Lego MindStorm robots – programming low level interaction with robotic sensors. Survey of these students indicates generally positive responses to the aspects of this class with no negative responses.

Exit Interviews

All graduating seniors participate in an exit interview. Topics covered include the efficacy of the core curriculum, the impact, breadth, and depth of the focus area electives, the perceived state-of-the-art of our labs (including research and instructional labs – both hardware and software), the faculty, the staff and any other concerns. The following represents the highlights of senior exit interviews conducted in AY 10-11 and AY 11-12.

Core courses are effective and generally meet the perceived needs of the students. Students would like to see more emphasis on multiple database engines in the database class. Students would like to see a greater emphasis on classical C and Unix environments.

Focus area elective courses are intended to provide sufficient breadth and depth for the interests of the students. There was a large concern expressed consistently by the seniors interviewed about the scarcity and diversity of electives offered.

Labs continue to house state of the art equipment and software. Students are aware that the department with the help of the university replaces one lab each year allowing students to have access to the latest in computing technology.

Faculty were perceived as knowledgeable and helpful.

Staff were perceived as friendly and helpful. The descriptor “awesome” continues to come up frequently.

Employers and Internship Employers

Internship employers are surveyed at the end of any term that they employ a computer science intern. Employers of computer science graduates are surveyed more informally. The results of this feedback has been uniformly positive. Students are considered prepared for the work place with an understanding of basic professional interactions.

Graduate School Acceptance

Table 11. Student Acceptance in Graduate School.

	Number of Students
Number Applied	5
Number Accepted	5
Number Pending	
Number Rejected	

Assessment of Student Learning Outcomes

Standards of mastery are described in the Computer Science Student Learning Outcomes Assessment Plan.

Table 12. Correlating Results with Standards of Mastery for the Computer Science Major.

Student Learning Outcome	Standard of Mastery	Results
1. Basic Knowledge	Major Field Test > 50 th percentile overall and in content areas	Only the Programming assessment indicator was above 50%. but the others are only slightly below where an increase of just one in the raw score would bring each of these to the 50% level.
	Exit Interviews – student self-reported strengths and weaknesses of the program	Core courses, labs, faculty, and staff were all listed as strengths. The major concern listed was the lack of electives and along with the breadth of topics they cover.
2. Critical Thinking Skills	Major Field Test > 50 th percentile overall and in content areas	Only the Programming assessment indicator was above 50%. but the others are only slightly below where an increase of just one in the raw score would bring each of these to the 50% level.
3. Research Skills	Senior Colloquium, CS 489 All graduates will produce a successful research paper	52 of 54 students produced acceptable papers, 2 student papers failed to meet expectations.
	Participation in SOURCE Participation in research projects and groups > 25% student participation > 2 students per faculty	21 of 54 eligible students participated in some form of undergraduate research 4.25 students per active full-time faculty member. While meeting the standard, we noted that this is down in percentage from prior years and the faculty believe this is related to the decrease in the availability of upper-level elective courses.

4. Applied Design Skills	Senior Capstone Courses, CS 480 / 481 > 75% successful projects	10 of 12 teams met the major requirements of their project.
	All teams produce minimally acceptable documents based on content	All teams produced acceptable documents based on content.
5. Ethics and Society	Senior Colloquium, CS 489 All students successfully complete the ethics unit.	51 of 54 students successfully completed the ethics unit.
6. Technical and Theoretical Background	Senior Capstone Courses, CS 480 / 481 All teams produce professionally acceptable documents based on style.	All teams produced acceptable documents based on style.
	Employers and Internship Employers Surveys – no negative responses from surveys	Students perceived as prepared and professional.
	Exit Interviews – student self-reported strengths and weaknesses of the program	Core courses, labs, faculty, and staff were all listed as strengths.
7. History of Computing	Fundamentals of Computer Science, CS 112 – student self-reported strengths and weaknesses of the class	The history component woven into Alice, Hands-on computing and the Lego MindStrom robots was effective.
8. Graduate Preparation	Participation in SOURCE Participation in research projects and groups > 25% student participation > 2 students per faculty	21 of 54 eligible students participated in some form of undergraduate research 4.25 students per active full-time faculty member.
		While meeting the standard, we noted that this is down in percentage from prior years and the faculty believe this is related to the decrease in the availability of upper-level elective courses.
	Graduate School Acceptance	5 students applied for and were accepted to graduate school.

9. Communication Skills	Senior Capstone Courses, CS 480 / 481 All teams produce professionally acceptable documents based on style. All teams make three professionally acceptable presentations.	All teams produced acceptable documents based on style. All teams made acceptable presentations based on style.
	Senior Colloquium, CS 489 All graduates will write an acceptable research paper and make an acceptable presentation.	52 of 54 students produced acceptable papers, 2 student papers failed to meet expectations. 51 of 54 students made an acceptable presentation, 3 student presentations failed to meet expectations.

4. What will the department or program do as a result of that information?

In answering this question, please note specific changes to your program as they affect student learning, and as they are related to results from the assessment process. If no changes are planned, please describe why no changes are needed. In addition, how will the department report the results and changes to internal and external constituents (e.g., advisory groups, newsletters, forums, etc.).

4.1 Analysis – Computer Science Reading Assessment.

The minimum standards for the College Reading Assessment were clearly exceeded. The faculty believes there are no action items in this area at this time.

4.2 Analysis and Action Items – Computer Science Major Program.

Table 13. Analysis of the Student Learning Outcome Results

Student Learning Outcome	Assessment and Curricular Changes
1. Basic Knowledge	Generally this student learning outcome has been met, there are however one concern. The major concern listed was the lack of electives and along with the breadth of topics they cover. There is no question that this is a function of the funding cutbacks and the reduction from 24 courses covered by adjuncts to 4 courses covered by adjuncts. This loss was covered by reducing the number of classes offered, by reducing the frequency with which some upper-level electives are offered, by increasing the size of major classes, and finally by having some faculty volunteer to teach uncompensated sections of classes that grew too large and needed to be split.
2. Critical Thinking Skills	Generally this student learning outcome has been met, there is however some concern. Performance in the MFT has been modest and variable at best. These results need to be monitored closely.
3. Research Skills	While meeting our minimum standard, the faculty believe that the decrease in the percentage of students participating in research related activities needs to be monitored. As noted above the faculty believe this is related to the decrease in the availability of upper-level elective courses. Quite frankly it

	appears that the trend is continuing in AY 12-13.
4. Applied Design Skills	Based on the results of the current assessment the faculty believe that this concern has been met. No curricular changes are planned here.
5. Ethics and Society	Based on the results of the current assessment the faculty believe that this concern has been met. No curricular changes are planned here.
6. Technical and Theoretical Background	Based on the results of the current assessment the faculty believe that this concern has been met. No curricular changes are planned here.
7. History of Computing	Based on the results of the current assessment the faculty believe that this concern has been met. No curricular changes are planned here.
8. Graduate Preparation	The faculty echoes the concern noted in no.s 1 and 3 above. A decrease in the number and breadth of upper-level electives offered means that students no longer have the flexibility of focus areas to choose from that they once did.
9. Communication Skills	Based on the results of the current assessment the faculty believe that this concern has been met. No curricular changes are planned here.

Based on the above analysis, the faculty have identified one concern and one action item.

1. The marginal MFT results provide the concern. Winter results will be monitored by the faculty with review of any curricular changes required if these marginal results show any deterioration.
2. It is clear that the reduction of adjunct faculty teaching in the Computer Science program and the corresponding impact on the number and breadth of electives offered has raised concern affecting several assessment categories. While not impacting the minimum standards of the department, it is noted as a deficiency by both the faculty and the students.

Action: Use the strategic planning process to identify this problem to the upper administration and request expansion of adjunct hiring authority, if not to previous levels at least to level where many of the electives can be restored to being offered annually and core major classes where enrollment exceeds 30 can be split without depending on faculty to volunteer uncompensated overload to cover this shortfall.

Potential Impediment: The issue has been identified in the department's current Strategic Planning documents but budgets continue to be such that providing increased access to adjuncts is not possible.

5. What did the department or program do in response to last year's assessment information?

In answering this question, please describe any changes that have been made to improve student learning based on previous assessment results. Please also discuss any changes you have made to your assessment plan or assessment methods.

5.1 Overview.

As requested, last year the Computer Science assessment report focused on the College Writing Assessment. In our case this resulted in two level of assessment – one at the general education level and one for our seniors in our capstone courses. The subsections that follow will consider the action items for general education first, followed by those for upper-level majors.

5.2 General Education.

Action Items.

1. Add emphasis to those aspects of the Master Document construction that call for critical thinking and generation of supporting evidence.
2. Reemphasize the importance of accurate citations.

Bob Ota and Jim Schwing are teaching the section of this class and have implemented both of the action items.

5.3 Capstone Courses.

There was no real action item here related to the Writing Assessment; however, on reviewing our results last spring, the faculty felt that we were not getting the sufficiently granular information. This is because the documents evaluated were those produced for the capstone courses. These are team documents and as such do not represent the contributions of a single individual. Thus it was felt that we could be masking over potential writing problems with some students' writing. With this in mind, it was decided that it would be more proper to assess the results of the research paper written for CS 489, Senior Colloquium, the next time the Writing Assessment is carried out as these are carried out by individual students.

New Action Item: To be implemented the next time Writing Assessment is carried out.

1. Use CS 489 research papers as the evaluation tool.

6. Questions or suggestions concerning Assessment of Student Learning at Central Washington University: