Central Washington University

College of the Sciences

Department of Computer Science

December 14, 2009

Prepared by: Jim Schwing

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Department Chair	College Dean

Table of Contents

Tables

I. Introduction to Department/Program(s)

A. Department/unit mission statement

The Computer Science Department's mission is to prepare students for living in and helping build a society increasingly affected by information technology. From basic technological literacy to the development of problem-solving skills, the General Education program will prepare students to understand the ethical and social impact of computing on society and the use of computing technology as they contribute to the modern world. Through experience, knowledge, and skills ranging from basic theory through experimental techniques to engineering methodology, the Computer Science degree programs will prepare students to be productive citizens who contribute in many ways to the information society that forms the backbone of much of the industry and business in the state of Washington. Computer Science faculty and students working in partnership with each other and with interdisciplinary colleagues will help address significant local, regional, and national problems through the use of this flexible, robust discipline.

B. Brief description of department and program contexts including date of last review

The Computer Science Department seeks to educate graduates that will be both productive and creative in modern business and industry environments. Studies range from theory through experimental techniques to engineering methodology. This program exposes students to aspects of each of these disciplines and fosters an appreciation and understanding of each. Research, laboratory, and on-the-job experiences complement student classroom studies.

The field of computer science can trace its foundation to both mathematics and engineering methodology with the emphasis on practical experience. Using this philosophy, the Computer Science Department has designed a unique curricular model that seeks to provide an increased relevance to the real world. The Senior Project - capstone course - expands upon the experimental and design approach by introducing student to the creativity and productivity concerns required for business and industrial development.

The Department of Computer Science offers a degree program leading to a Bachelor of Science in Computer Science. The Department also offers a Computer Science Minor and an Applied Computer Science Minor. All these programs are offered on the Ellensburg campus. The date of the last program review was Spring 2004.

The Department is located in Hebeler Hall, which houses the department's state-of-the-art computing facilities. Computer Science faculty members have compiled an outstanding record as scholars and instructors. Members of the faculty teach all courses. (Specifically, there are no courses being taught by teaching assistants and only tenure-track faculty members teach major courses.) Students are offered access to a wide ranging computer science curriculum. Specialties in areas such as software engineering, web programming, computer systems, scientific computing and artificial intelligence are available.

The Computer Science Department is one of 13 departments in the College of the Sciences. The department is small with five tenure-track faculty members, one computer systems engineer, and one senior secretary. The department hosts the Imaging Research Lab.

Depending upon grant-generated release time, the department hires adjunct faculty to help cover general education and technical writing courses.

C. Describe departmental governance system and provide organizational chart for department.

In general, since the Computer Science Department consists of five full-time faculty members, the department uses a committee-of-the-whole approach to its committees and, being a small department, attempts to seek consensus on most issues. Four committees carry out departmental business. When consensus cannot be achieved, voting is by majority of faculty present (refer to the CS Policy Manual, Appendix A).

Department Operations Committee – All full-time faculty members meet weekly to review the general business of the department. This business includes budget allocations, use of resources, university issues, and departmental, college and university policy.

Personnel Committee – The composition of the committee varies depending on the type of evaluation under consideration. At some point during the year all faculty will participate in at least one evaluation consideration (Performance Adjustment). Precise composition of the committees for Retention, Promotion, Tenure and Post-tenure evaluation is described in the CS Policy Manual, Appendix A and may include external faculty members.

Curriculum Committee - All full-time faculty members meet several times annually to consider topics such as peer evaluation of teaching, in-depth review of courses, new courses, curriculum structure, and program assessment.

Search Committee - All full-time faculty members (augmented as necessary to meet diversity composition goals) meet when faculty positions become available.

The Computer Science Department consists of tenure track faculty, non-tenure track, adjunct, and visiting faculty, and classified and exempt staff. The Department also houses the Imaging Research Lab that employs two research associates. All faculty and departmental staff report to the Department Chair. One staff member in the Imaging Research Lab reports to the Lab Director and the other staff member reports to the Department Chair (due to potential conflict of interest concerns). The personnel that have filled these positions over the last five years follow.

Department Chair
Jim Schwing, Professor, Tenured

Tenure Track Faculty
Razvan Andonie, Professor, Tenured
Grant Eastman, Associate Professor, Tenured, retired June 2008
Ed Gellenbeck, Associate Professor, Tenured
Boris Kovalerchuk, Professor, Tenured
Francois Modave, Associate Professor, Tenure-track, started Sep 2009

Non-tenure Track Faculty
Andreas Stefik, Sep. 2008 – June 2009. Though technically non-tenure track, Andreas was hired with expectations in instruction, scholarship and service equivalent to those of tenure-track faculty member. Given that he was a recently graduated doctoral student, this

was as much for his career as our need to replace Grant Eastman. Thus in many of the tables below, particularly those on faculty productivity, Andreas' contributions will be tallied with the rest of the tenure-track faculty.

Staff

Fred Stanley, Systems Administrator
LaVelle Clerf, Senior Secretary, retired July 2009
Charlene Andrews, Senior Secretary, started Sep. 2009

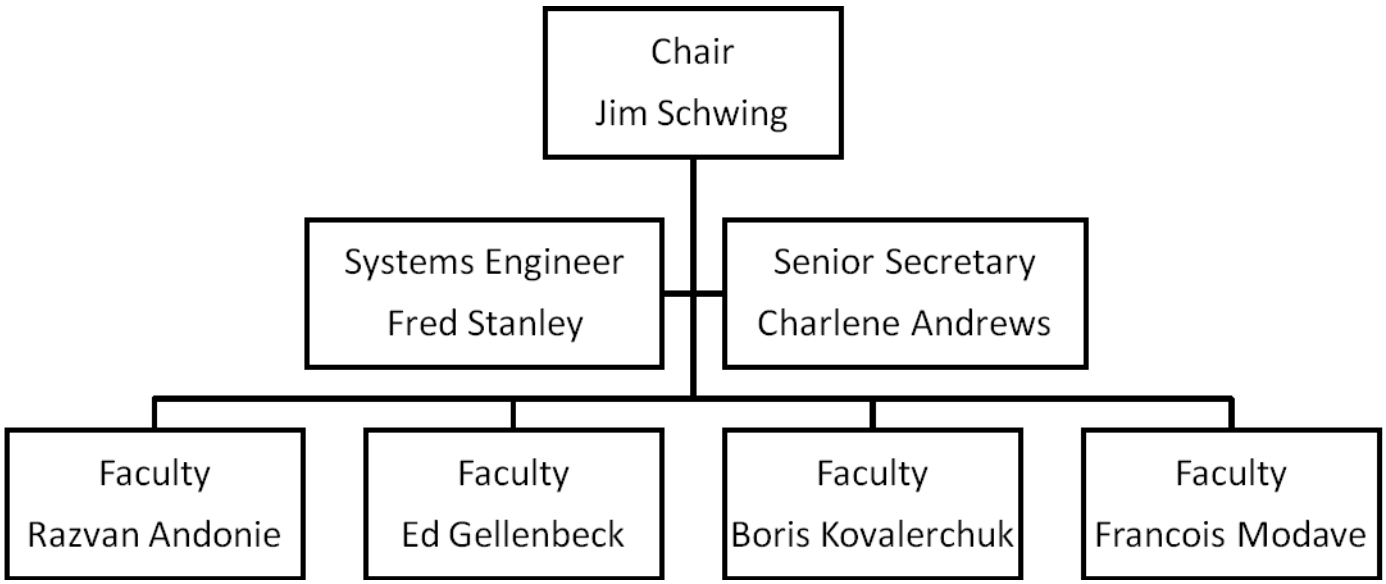


Figure 1: Computer Science Department Organizational Chart

D. Department/Program(s)

1. List department/program goals (be sure to include goals for each degree program).
2. Describe the relationship of each department/program(s) goal to relevant college and University strategic goals. Explain how each relevant strategic goal(s) for the University and college are being met within the department.
3. Identify what data was used to measure (assess) goal attainment
4. Describe the criterion of achievement (standard of mastery) for each goal.
5. Describe the major activities that enabled goal attainment.

Please see Table 1**: Bachelor of Science, Computer Science, Program Goals / Assessment Plan.** below which summarizes our program goals and their assessment.

Table 1: Bachelor of Science, Computer Science, Program Goals / Assessment Plan.

Department/Program Goals	Related College Goals	Related University Goals	Method(s) of Assessment (What is the assessment?)	Who/What Assessed (population, item)	When Assessed (term, dates)	Criterion of Achievement (Expectation of how good things should be?)
1. Promote the role of computer science and computer literacy in undergraduate education at Central Washington University.	Goal I: Provide for an outstanding academic and student experience in the College of the Sciences.	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	Student involvement in general education courses.	Students enrolled in CS 101 & 105. Feedback from Gen. Ed. Committee.	Annual review.	Fully enrolled general education sections. (#FTES high) No concerns expressed by Gen. Ed. Committee.
			Student involvement in service courses.	Students enrolled in CS 105, 110, 111 & 367. Feedback from associated majors.	Annual review.	Reasonably enrolled service course sections. (#FTES stable) No concerns expressed by departments requiring theses classes.
			Senior projects conducted for the university community and regional groups.	Community participation in projects.	Fall annually.	Number of annual requests high. Sufficient projects for our senior project capstone course. No complaints from project clients.
			Interest in major, minor and associated programs.	Students enrolled in CS-related programs.	Annual review.	Range from a constant to an increasing number students enrolled as majors, minors and associated programs (CompE).
			Interest in outreach programs.	Student and faculty participation in GearUp, STEP, Robotics institute	Annual Review	Range from a constant to an increasing number student and faculty participation in these outreach programs.
2. Offer undergraduate programs that train students as computer specialists with a fundamental understanding of technology.	Goal I: Provide for an outstanding academic and student experience in the College of the Sciences.	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	Senior Project Results	Seniors in CS	Annual Review	# of successful projects
			Major Field Test	Seniors in CS	Annual Review	> 50 percentile, combined score
			SOURCE participation	CS-related students	Annual Review	> 20% students in SOURCE
			Awards received	CS-related students	Annual Review	Range from a constant to an increasing number of students receiving awards

3. Maintain an intellectually stimulating learning environment where diverse perspectives are valued and encouraged.	Goal VII: Create and sustain productive, civil, and pleasant learning environments.	Goal VI: Build inclusive and diverse campus communities that promote intellectual inquiry and encourage civility, mutual respect, and cooperation.	Scholarship program participation	Scholarship recipient diversity & achiev.	Annual Review	Continuing ability to offer scholarships to CS majors; range from a constant to an increasing number of underrepresented group recipients; > 25% participate in SOURCE or independent research.
			Mentoring program participation	Program participant diversity & achiev.	Annual Review	Range from a constant to an increasing number of underrepresented group participating; > 25% participate in SOURCE or independent research.
			Service project participation	Student participation	Annual Review	> 5 service related projects
			Non-traditional student outreach	Student diversity	Annual Review	Entry classes and degree tracks that attract non-traditional students.
4. Sustain a productive team of faculty and staff.	Goal IV: Develop a diversified funding base to support curriculum and academic facilities, student and faculty research and scholarships, as well as faculty development, service and applied research in college disciplines.	Goal III: Strengthen and further diversify our funding base and strengthen infrastructure to support academic and student programs.	Faculty productivity	Faculty	Annual Peer Review	All faculty successfully completing their professional goals – scholarship, teaching & service – described and agreed to by peers and the Dean. Review includes contribution to the program and role of faculty member.
			Staff productivity	Staff	Annual Review	All staff successfully completing their PDP.
5. Play a leadership role in scholarship by making basic and relevant scientific contributions to our respective sub-disciplines.	Goal III: Provide for outstanding graduate programs that meet focused regional (cont.)	Goal V: Achieve regional and national prominence for the university.	Scholarship	Faculty scholarship integrated with the undergraduate program.	Annual Review	A departmental average (per faculty) of one conference, journal and book publications A departmental average (per faculty) of one submitted grant A departmental average (per faculty) of six students (cont.)

	needs and achieve academic excellence.					participating in SOURCE, conferences, independent research.
6. Build an interdisciplinary program and an associated Masters Degree program.	Goal III: Provide for outstanding graduate programs that meet focused regional needs and achieve academic excellence.	Goal III: Strengthen and further diversify our funding base and strengthen infrastructure to support academic and student programs.	Program foci Master's degree progress	Faculty planning	Annual review	Successful program review Range from a constant to an increasing number of interdisciplinary projects – both student and faculty. Successfully inaugurated MS program.

E. List results for each department/program goal.

1. Provide results in specific quantitative or qualitative terms for each department/program(s).
2. Compare results to standards of mastery listed above.
3. Provide a concise interpretation of results.

Table 2**: Evaluation of Department/Program Goals** summarizes the criterion for each of the listed Department/Program goals and the results for AY 08-09. The basic data contained in this table is collected in Section 2 below in the discussion of the evaluation of Student Learning Outcomes.

Table 2: Evaluation of Department/Program Goals

Department/Program Goals	Criterion of Achievement (Expectation of how good things should be?)	AY 08-09 Results
1. Promote the role of computer science and computer literacy in undergraduate education at Central Washington University.	Fully enrolled general education sections. (#FTES high) No concerns expressed by Gen. Ed. Committee. Reasonably enrolled service course sections. (#FTES stable) No concerns expressed by departments requiring theses classes. Number of annual requests high. Sufficient projects for our senior project capstone course. No complaints from project clients. Range from a constant to an increasing number students enrolled as majors, minors and associated programs (CompE). Range from a constant to an increasing number student and faculty participation in these outreach programs.	We continue to enroll well over 200 FTES annually in our general education courses which were up slightly from AY07/08 (see Table 7. **Support Courses Offered in Department.**). Enrollment is the services courses remained stable (see Table 7. **Support Courses Offered in Department.**). We had good participation in requests for senior projects. The number of students enrolled as majors and minors remains stable (see Table 4: Programs Offered in Department.). Participation in the CompE program has been virtually zero. Indeed, the program is being considered for removal. Three of four regular faculty and one adjunct participated in these programs last year.
2. Offer undergraduate programs that train students as computer specialists with a fundamental understanding of technology.	# of successful projects	Five of six senior projects met their major requirements (see Table 16: Summary of Project

	> 50 percentile, combined score	Success for Senior Projects, AY 08-09.).
	> 20% students in SOURCE	MFT scores were at the 65 percentile (see Table 15: Five Years of MFT Results.).
	Range from a constant to an increasing number of students receiving awards	Eleven students participated in SOURCE last year (see Table 19**: Summary of Students Participating in Undergraduate Research.**) This is greater than 20% of our majors. Last year we awarded six outstanding graduate and five research accomplishment awards. This is consistent with expectations relative to class size.
3. Maintain an intellectually stimulating learning environment where diverse perspectives are valued and encouraged.	Continuing ability to offer scholarships to CS majors; range from a constant to an increasing number of underrepresented group recipients; > 25% participate in SOURCE or independent research.	The department continued to offer scholarships supported by the NSF and Boeing. 17 students participated in SOURCE and independent research last year this is greater than 25% of our students.
	Range from a constant to an increasing number of underrepresented group participating	Table 5 shows the graduation numbers for underrepresented students. This increased from last year but does not appear stable.
	> 5 service related projects	Five of six Senior Projects and one other project were service oriented.
	Entry classes and degree tracks that attract non-traditional students.	Table 5 indicates that the department has had reasonable though varied success here.
4. Sustain a productive team of faculty and staff.	All faculty successfully completing their professional goals – scholarship, teaching & service – described and agreed to by peers and the Dean. Review includes contribution to the program and role of faculty member.	All faculty continue to meet their professional goals as evaluated by our annual peer review. Two faculty completed a successful post-tenure last year.
	All staff successfully completing	Of the two department staff,

	their PDP.	one is completed and one is in-progress.
5. Play a leadership role in scholarship by making basic and relevant scientific contributions to our respective sub-disciplines.	A departmental average (per faculty) of one conference, journal and book publications.	The faculty averaged 5.25 (category A) conference/journal/book publications last year.
	A departmental average (per faculty) of one submitted grant A departmental average (per faculty) of six students (cont.) participating in SOURCE, conferences, independent research.	The faculty averaged 1.5 grant applications and 1.25 grants awarded last year. Table 19**: Summary of Students Participating in Undergraduate Research.** shows that 21 students participated in SOURCE, conferences and independent research.
6. Build an interdisciplinary program and an associated Masters Degree program.	Successful program review	Currently under Review
	Range from a constant to an increasing number of interdisciplinary projects – both student and faculty.	Students and faculty participated in three interdisciplinary projects last year, the same as AY07-08.
	Successfully inaugurated MS program.	Program under current consideration by University upper administration

It is the evaluation of the faculty that the department is currently meeting all of the department/program goals. There are two areas of concern that will be explored in the next section.

F. Based on the results for each department/program(s) listed above describe:

1. Specific changes to your department as they affect program(s) (e.g., curriculum, teaching methods).
2. Specific changes related to the assessment process.

In what follows, we begin by presenting the curriculum changes the department has identified annually (extracted from our annual assessment reports) along with the actual actions taken and our analysis of those resulting actions. All these changes were developed through the assessment process.

AY 05-06

1. Senior project courses – CS 480 and 481 – a redesign will be undertaken to increase the breadth of available projects, to provide increased emphasis on the testing component, and to include a different collection of documents for the research oriented projects.

   Actions: Dr. Gellenbeck began a redesign of the course last year which included the extreme programming model in addition to the standard waterfall model and also included more emphasis on testing. In addition, the course continued to allow two basic types of projects are attempted by student teams, basic applications and research investigations. This year a separate set of documents were designed for student teams participating in research

investigation projects. In addition since Dr. Gellenbeck offered students two alternate development models for student teams to use in their projects (the standard waterfall model and extreme programming), a third set of documents tailored to the work produced by students using the extreme programming model was developed.

Analysis: Last year project teams participated in all three models mentioned above: standard waterfall, extreme programming, and research investigation. Student project teams make three formal presentations and prepare four to five documents describing their progress. Faculty viewed and discussed project artifacts from all teams. The following conclusions were reached.

- The testing component showed some improvement. Efforts need to be continued here.
- The new document sets provided a better, more typical vehicle for students participating in the different project models.

2. A networking focus area will be developed for our students by combining CS theory courses with IT application courses.

   Actions: Dr. Schwing and Dr. Rawlinson from ITAM have worked to identify appropriate courses in both departments to be taken by students working on a networking/security focus area. Drs. Schwing and Eastman incorporated this information into their quarterly advising.

   Analysis: Several students have chosen this new focus area. They have reported positive responses to this track in advising sessions and are making good progress toward graduation.

3. A new course will be developed in network security to complement courses offered in IT and provide expanded resources and opportunities to our students.

   Actions: Drs. Schwing and Eastman worked with Drs. Braunstein and Rawlinson in ITAM to identify proper course content for security courses to be taught by CS and IT. Using these discussions, Dr. Eastman then implemented a computer security course for the department.

   Analysis: Given the short time frame within which the course was introduced there was a small enrollment the first term. Nonetheless, the course was well received and will continue to be offered.

4. The faculty will investigate building a follow-on course to Math 260 and 330.

   Action: An initial plan to have Drs. Andonie and Kovalerchuk design and co-teach such a course had to be abandoned when other teaching priorities arose.

   Analysis: This continues to be a concern. The department will attempt to address this in the redesign of some of our earlier courses such as CS 112 discussed below.

AY 06-07

1. Senior project courses – CS 480 and 481 – as noted in the AY 05-06 recommendations, we will continue to emphasize testing as an important component of the courses.

   Action: Ed Gellenbeck added testing lectures and interaction with testing franeworks to the CS 480 class this year.

Analysis: This continues to be a concern. The faculty felt in their evaluation of the content component in CS 480 /481 that though improved, the testing methodology used by the students does not demonstrate the mastery required. Thus we have a continuing recommendation in this area (recommendation 1c and curriculum review described in section 4).

2. Redesign CS 101 the computer literacy course to reflect the fact that the Office 2007 suite of applications will be installed on university systems this fall – a major change in the interface and capabilities of the Office programs.

   Action: Jim Schwing and Bob Ota designed a new curriculum for CS 101 and Bob taught the course throughout the year and integrated the new material.

   Analysis: These changes were successfully completed.

3. Redesign CS 112, Foundations of Computer Science, with the major purpose of attracting more majors to the discipline while still covering the basic material. Further as noted in the AY 05-06 report in Recommendation 4, the department will attempt to address some of the mathematical shortcomings in this redesign. Further, if this course is successful in connecting with new majors, it is our intent to use this as the starting point for designing a new computer science track.

   Action: Ed Gellenbeck and Diana Springerlund redesigned the course. Ed Gellenbeck, Diana Springerlund and Jim Schwing taught the redesigned course throughout the year.

   Analysis: Strong interest and positive response in the course along with course evaluations showed that the new course learning outcomes were being met. However based on the result of the student survey, we were not successful in attracting a significant number of new students to the major. Thus we have a continuing recommendation in this area (the second bullet described in section 4).

4. Pay particular attention to the material conveyed in CS 427, Analysis of Algorithms, the major computational theory course taught as part of the curriculum.

   Action: Razvan Andonie choose a new book and redesigned the course for this year. Razvan Andonie also taught the course this year.

   Analysis: Though result on the MFT improved somewhat, this continues to be a concern. Thus we have a continuing recommendation in this area (recommendation 1a described in section 4).

AY 07-08

1.1 Though the Theory category results of the MFT showed some improvement this year, they results are still not to the level of mastery indicated in our plan.
1.2 Performance in the MFT in the area of Theory, while improving, is not to the mastery level. We believe that this is a critical component in critical thinking for a computer scientist. Curricular changes here will correspond to the changes listed in 1.1.

   Action: These changes were implemented for the CS 427 class and our new faculty member will continue to develop changes for CS 427 next year.

Analysis: The MFT result for the Theory component have continued to improve and now exceed out standard for mastery. While this action item is essentially met, we need to continue to review this annually.

2.1 Students noted a concern in the Exit Interviews that they are currently being exposed to just one database management system. The faculty believes that although this single system has all the components of general database systems, exposing students to new database engines is important. With that in mind the database course will incorporate additional database engines next year.

2.2 Concerns were raised in exit interviews about database breadth of experience.

Action: This concern had come up before and this year taught a redesigned the CS 420. In an end-of-the-term survey of the students seemed to appreciate the new class. Next year most of these students will take the MFT. CS 420 should be part of our annual review next fall.

Analysis: The department believes progress has been made on this action item.

3. Students noted a concern in the Exit Interviews that they believe they do not have sufficient background in testing. This is also a concern that arose in the faculty evaluation of CS 480/481 projects. While we will continue to provide more information on testing and testing software in CS 480, the faculty believes that we need to restructure our curriculum so that testing becomes an important component prior to the CS 480 class. The faculty will conduct a full curriculum review will take place next year so that these and other concerns can be addressed.

   Action: Added material on testing was placed in the CS 480/481 material

   Analysis: As noted above, while knowledge of testing software appeared improved based on written exams, the use of testing methods in the projects remained minimal and was evaluated as minimally acceptable in three projects and below expectations in three projects. So theoretical knowledge has improved while is practical application remains limited. This continues as Action Item 3 for next year.

4. The results of the survey of students in CS 112 shows that although the changes in the course were effective and well received by the students, most of the students were already intended computer science majors. One reason for the changes to this class was an attempt to attract more students to the major. We believe that this class needs wider exposure. We intend to propose this class as a general education class in an effort to attract more students.

   Action: Surveys in the class continue to enforce this idea. General Education is currently in a state of flux – changes will be finalized next AY. At that time, the department intends to submit CS 112 as a GE course.

   Analysis: This remains an action item for next year.

5. It is the intent of the faculty to as part of the curriculum review to consider changes to our program that might attract more students to the major. As part of the discussion among the faculty, it was decided that it would be important to make business and industry feedback about our program design a major contribution to this effort. Thus we will be creating an Employer Advisory Board.

Action: We currently have invited three individuals to join our advisory board – representing Micorsoft, Boeing, and PNNL. Two have accepted their invitations – one is still under consideration.

Analysis: The department has made acceptable progress on this action item. It remains active for next year.

6. Full curriculum review.

   Action: This has proven difficult to carry out with one faculty member on sabbatical and another faculty member a temporary one-year replacement (the department only has three other full-time faculty).

   Analysis: Next year a different faculty member will be on sabbatical and we will have a new full-time hire filling the open position. While it is an appropriate time for a full curriculum review to occur, we believe that it will not be possible to attempt this until AY 10-11.

AY 08-09 (current curricular issues)

1. Redesign CS 311/312, 420, and 450 in stages. CS 420 was run with a redesign for AY 08-09 based on last year's assessment. CS 311/312 should be redesigned for AY 09-10 and CS 450 should undergo redesign for AY 10-11.

2. Continue to monitor the revisions in the CS 420 class.

3. During the fall faculty retreat, review other courses where testing (particularly in the programming and data structures sequences) can be made a larger component and more naturally incorporated in projects.

4. As the general education program is currently being redefined, CS 112s submission as a general education course has been delayed until next year.

5. Continue the development of a CS Advisory Board.

3. Provide documentation of continuing program(s) need including reference to the statewide & regional needs assessment

Perhaps the most accurate listing for employment opportunities for our graduates can be found in the analyses done by the Washington State Department of Labor. These analyses still look relatively strong even in the current economic downturn. The analyses include both regional and statewide projections. Table 3 below is extracted from Washington Occupational Employment Projections, June 2009 prepared by Washington Employment Security Department, Labor Market and Economic Analysis Branch. The extract shows projections for the state as a whole and was selected because most of our students do not remain in the region after graduation. The complete document can be found in Appendix K.

In summary, the documents indicates that the Computer Science related occupations, when aggregated, are projected to be the fastest growing of all professions in the state over both the next five years and the five years following that.

Table 3. Long term Employment Needs – Computer Science, State of Washington, June 2009

TITLE	Est. Emp. 2007	Est. Emp. 2012	Est. Emp. 2017	Avg. Annual Growth Rate 2007-2012	Avg. Annual Growth Rate 2012-2017	Avg. Annual Opening Due to Growth 2007-2012	Avg. Annual Opening Due to Growth 2012-2017	Avg. Annual Total Openings 2007-2012	Avg. Annual Total Openings 2012-2017
Computer Specialists	108,595	120,304	136,413	2.1%	2.5%	2,342	3,223	4,476	6,025
Computer and Information Scientists, Research	1,542	1,784	2,080	3.0%	3.1%	48	59	89	113
Computer Programmers	10,918	11,871	13,289	1.7%	2.3%	191	284	406	566
Computer Software Engineers, Applications	25,710	29,557	34,285	2.8%	3.0%	769	946	1,118	1,459
Computer Software Engineers, Systems Software	16,311	18,457	21,370	2.5%	3.0%	429	583	649	903
Computer Support Specialists	12,505	13,143	14,270	1.0%	1.7%	128	225	511	657
Computer Systems Analysts	12,527	13,565	15,007	1.6%	2.0%	208	288	528	688
Database Administrators	2,602	2,742	2,995	1.1%	1.8%	28	51	50	88
Network and Computer Systems Administrators	9,468	10,260	11,543	1.6%	2.4%	158	257	361	525
Network Systems and Data Communications Analysts	8,883	10,321	12,336	3.0%	3.6%	288	403	463	649
Computer Specialists, All Other	8,129	8,604	9,238	1.1%	1.4%	95	127	301	377

II. Description of degree programs and curricula

A. List each degree program (undergraduate and graduate) offered in department by location, regardless of state or self support. Include minor and undergraduate certificate program(s).

Bachelor of Science in Computer Science

The Department of Computer Science offers a degree program leading to a Bachelor of Science in Computer Science. In order to expose computer science majors to a broad theoretical base while emphasizing the laboratory experience, all students complete a set of core courses. This core falls into three broad categories: problem solving and software design, computer architecture, and theory and analysis. To add depth and flexibility to their academic programs, students, working with an advisor, define a focus area. Focus areas may be developed in many topics of computer science; examples include artificial intelligence, computer systems, information systems, scientific computing, and software engineering.

Minor Programs in Computer Science

The Department also offers two minor programs: the Computer Science Minor and the Applied Computer Science Minor. The Computer Science Minor program is designed for students who wish to investigate the basic core of the computer science discipline. This minor is appropriate for any student including those in teacher education seeking to enhance their technical computer science background. The Applied Computer Science Minor program is designed for students who wish to integrate a computer science component into their curriculum. This minor is appropriate for any student who wishes to include an enhanced technical computer science background as part of their overall curriculum. Please see Table 4: Programs Offered in Department. below for a summary of these programs. In looking at these numbers, it is clear that the department has slowly felt the effects of a national trend of dwindling enrollment in Computer Science which seemed to reach its nadir last year according to the Taulbee Survey (see Appendix M).

Table 4: Programs Offered in Department.

Degree Program	**Delivery Location(s)**	**# Students in Major**					**# Degrees Awarded**				
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
BS, Computer Science	Ellensburg	96	100	83	80	66	29	27	26	19	18
Minor Programs	**Delivery Location(s)**	**# Students in Minor**					**#Minors Completed**				
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Minor, Computer Science	Ellensburg	12	10	7	6	6	2	4	7	2	5
Minor, Applied Computer Science	Ellensburg	15	20	19	13	12	3	3	3	2	2
Certificate Programs	**Delivery Location(s)**	**# Students in Program**					**# Cert. Completed**				
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
None											

Table 5 represents the number of underrepresented classes of students graduating in each of the last five years as reported to us by Institutional Research. Students of color includes: Asian, Black, Hispanic, Multiethnic, Native American, and Pacific Islander.

Table 5. Graduation of Underrepresented Classes of Students in Computer Science

	04-05	05-06	06-07	07-08	08-09
Students of Color	8	17	0	1	9
Females	4	9	4	2	0

B. Provide a table that lists courses, location, and student number for the following:

1. General Education contributions
   a. courses delivered
   b. location
   c. number of students
2. Professional Educators contributions
   a. courses delivered
   b. location
   c. number of students
3. Service Course delivery
   d. courses delivered
   e. location
   f. number of students

General Education

The department offers courses that satisfy two different aspects of the "basic" requirements in general education. CS 101 – Computer Basics is a computer literacy course that meets the computer literacy requirement. CS 105 – The Logical Basis of Computing is a course that introduces the basics of problem solving and algorithm development. This course meets the reasoning requirement.

Professional Educators

In 1998, the State dropped its computer science endorsement for teachers. At present, there are no computer-related endorsements for teachers.

Service Courses

Several majors either require or recommend computer science courses to their students, these include several of the Engineering Technology programs, Information Technology, Mathematics, Geography, Geology, Physics (pre-engineering), and programs in the College of Business. The courses meeting recommendations and requirements are the introductory problem solving and programming courses in a variety of programming languages. Specifically, CS 110, 111, and 367 typically meet these students' needs.

Please see Table 6 below for the total number of students taught by the Computer Science Department and Table 7 for a listing of support courses offered by the Department.

Table 6. State-funded Course FTE – Academic Years 2005-2009

		2004-05	2005-06	2006-07	2007-08	2008-09
Computer Science	**Total**	136.8	138.7	134.0	120.0	125.3
	Lower Division	86.9	90.2	90.9	78.8	85.8
	Upper Division	49.9	48.5	43.1	41.2	39.5

Table 7. Support Courses Offered in Department.

Contributing area	Delivery Location	# Students (Head Count)				
General Education Courses	Location(s)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
CS 101, Computer Basics	Ellensburg	513	496	545	491	543
CS 105, Logical Basis of Computing	Ellensburg	265	292	281	206	200
Professional Education Courses	Location(s)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
None						
Service Courses	Location(s)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
CS 110, Programming Fundementals I*	Ellensburg	139	156	144	115	139
CS 111, Programming Fundementals II*	Ellensburg	49	55	59	55	51
CS 367, Adv. Visual Basic Programming	Ellensburg	9	13	10	14	12
* some students are majors						

C. Required measures of efficiency for each department for the last five years

1. Number of Instructional staff in department.

Table 8. Number of Institutional Staff in Department.

	# Staff each year				
Degree Program Instructional Staff	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Faculty FTE* Tenure Track	4.67	4.67	4.67	3.67	2.67
Faculty FTE** Non-Tenure Track	1.51	1.42	1.30	2.09	2.96
Grad Assist. FTE***	0	0	0	0	0

*Number of faculty based on FTE teaching load of 36 credit hours.
** Number of faculty based on FTE teaching load of 45 credit hours
*** Number of graduate assistants that have assignments based on 20 hours per week work load.

D. Describe currency of curricula in discipline. How does the curriculum compare to recognized standards promulgated by professionals in the discipline (e.g., state, national, and professional association standards)?

Approximately once a decade, computer professionals from business, industry, and education get together and analyze the needs and trends in computer education through the auspices of the ACM and the IEEE. The most recent curriculum review was published with the title Curriculum 2008. The department instituted a total curriculum restructure in 2002 based on Curriculum 2001. Since then the department has implemented an annual assessment to ensure that the curriculum is kept up-to-date. We will describe that process next. We believe it has resulted in annual

improvement of the curriculum. Details of these changes can be found in the annual assessment reports which can be found in Appendices B – E.

The review is tied to an annual peer review of faculty conducted by the department. As one part of this review, the department requires faculty participation in the annual peer-review of teaching and assessment of student learning outcomes. Here each faculty member will conduct a thorough review of one class (or perhaps a pair of sequenced classes. Each faculty member is asked to prepare a complete portfolio for the class (or classes). Different classes are to be presented each year until the department has reviewed the entire curriculum. The entire curriculum is generally reviewed over a three year period. The purpose of the review is two-fold. The first purpose is to review the current professional instructional development of each faculty member. The second purpose is to provide another tool for our curriculum review. Portfolios include the following information: textbook, syllabus, objectives, notes, slides, other materials including web-based, programming projects, exams, and samples of student work. Additionally, the faculty as a whole reviews the collected assessment data which includes results of the capstone courses, results of the Major Field Test, results of the senior colloquium, senior exit interviews, comments from graduates and participation in undergraduate research.

The program is organized to require each student to take a set of core courses and to work out a focus area with the guidance of an advisor. Table 9. Comparison of CS Core Courses to Core Hours Recommended in ACM/IEEE Curriculum 2008 below summarizes how the core courses in current curriculum organization match recommendations the CS Core Body of Knowledge recommendations found in the ACM/IEEE Curriculum 2008.

Note that the core courses required of all majors in the computer science program covers over 98% of the Core Curriculum identified by Curriculum 2008. Further, when one includes popular elective courses (Networking and Data Communications, Graphics I, Parallel Processing, and Artificial Intelligence) coverage of the CS Body of Knowledge is 100%.

Table 9. Comparison of CS Core Courses to Core Hours Recommended in ACM/IEEE Curriculum 2008

	CS 110 Programming Fundamentals I	CS 111 Programming Fundamentals II	CS 112 Foundations of Computer Science	CS 301 Data Structures	CS 302 Advavnced Data Structures	CS 311 Computer Architecture I	CS 312 Computer Architecture II	CS 325 Technical Writing in CS	CS 361 Principles of prog. Lang. I	CS 362 Principles of prog. Lang. II	CS 420 Database Management Systems	CS 427 Analysis of Aalgorithms	CS 446 User Interface Design	CS 470 Operating Systems	CS 480 Software Engineering	CS 481 Software Engineering Project	CS 489 Senior Colloquium	Math 172 Calculus I	Math 260 Set & Ligic	Math 330 Discrete Mathematics	Total
DS. Discrete Structures (43 core hours)																					53
DS/FunctionsRelationsAndSets (6)	1			2														2	4		9
DS/BasicLogic (10)	2	1																	5	2	10
DS/ProofTechniques (12)																			8	5	13
DS/BasicsOfCounting (5)																				5	5
DS/GraphsAndTrees (4)				2	4															4	10
DS/DiscreteProbability (6)																				6	6
PF. Programming Fundamentals (47 core hours)																					66
PF/FundamentalConstructs (9)	10	5	2			3															20
PF/AlgorithmicProblemSolving (6)	2	1	2	2	2																9
PF/DataStructures (10)	1	1		4	4																10
PF/Recursion (4)		3		1	2																6
PF/EventDrivenProgramming (4)		1		3																	4
PF/ObjectOriented (8)		5		3																	8
PF/FoundationsInformationSecurity (4)	1	1				1								1							4
PF/SecureProgramming (2)					2	1									2						5
AL. Algorithms and Complexity (31 core hours)																					46
AL/BasicAnalysis (4)			1	4								4								3	12
AL/AlgorithmicStrategies (6)				2	2							6									10
AL/FundamentalAlgorithms (12)				2	2							10									14

AL/DistributedAlgorithms (3)												4									4
AL/BasicComputability (6)				2								4									6
AR. Architecture and Organization (36 core hours)																					44
AR/DigitalLogicAndDataRepresentation (7)			2			5															7
AR/ComputerArchitectureAndOrganization (9)			2			2	8														12
AR/InterfacingAndI/OStrategies (3)							4							2							6
AR/MemoryArchitecture (5)							5							2							7
AR/FunctionalOrganization (6)							6														6
AR/Multiprocessing (6)							4							2							6
OS. Operating Systems (18 core hours)																					20
OS/OverviewOfOperatingSystems (2)														2							2
OS/OperatingSystemPrinciples (2)														2							2
OS/Concurrency (6)														6							6
OS/SchedulingandDispatch (3)														4							4
OS/MemoryManagement (3)														4							4
OS/SecurityAndProtection (2)														2							2
NC. Net-Centric Computing (15 core hours)																					14
NC/Introduction(2)			1											2							3
NC/NetworkCommunication (7)														7							7
NC/NetworkSecurity (6)													2	2							4
PL. Programming Languages (21 core hours)																					37
PL/Overview(2)	1								2												3
PL/VirtualMachines(1)	1									2											3
PL/BasicLanguageTranslation(2)	1									2											3
PL/DeclarationsAndTypes(3)	2		2							2											6
PL/AbstractionMechanisms(3)	1	1		2						2											6
PL/ObjectOrientedProgramming(10)	5	5		2						4											16
HC. Human-Computer Interaction (8 core hours)																					20
HC/Foundations (6)	1		1	2									6								10
HC/BuildingGUIInterfaces (2)		3		1									6								10
GV. Graphics and Visual Computing (3 core hours)																					2

GV/FundamentalTechniques (2)		1	1																		2
GV/GraphicSystems (1)																					0
IS. Intelligent Systems (10 core hours)																					16
IS/FundamentalIssues (1)			1	1							2										4
IS/BasicSearchStrategies (5)				2						6											8
IS/KnowledgeBasedReasoning (4)										4											4
IM. Information Management (11 core hours)																					14
IM/InformationModels (4)											4										4
IM/DatabaseSystems (3)											6										6
IM/DataModeling (4)											4										4
SP. Social and Professional Issues (16 core hours)																					18
SP/HistoryOfComputing (1)	1		1																		2
SP/SocialContext (3)			2					1													3
SP/AnalyticalTools (2)																	2				2
SP/ProfessionalEthics (3)																	3				3
SP/Risks (2)																	2				2
SP/IntellectualProperty (3)			2														2				4
SP/PrivacyAndCivilLiberties (2)			1														1				2
SE. Software Engineering (31 core hours)																					51
SE/SoftwareDesign (8)	2	2	2												4						10
SE/UsingAPIs (5)	2	2		1																	5
SE/ToolsAndEnvironments (3)	2														4						6
SE/SoftwareProcesses (2)		2													2						4
SE/RequirementsSpecifications (4)	1	1	1												4						7
SE/SoftwareVerificationValidation (3)		1													3	3					7
SE/SoftwareEvolution (3)															3	3					6
SE/SoftwareProjectManagement (3)															3	3					6
CN. Computational Science (no core hours)																					0
Totals	37	36	24	38	18	12	27	1	2	22	16	28	14	38	25	9	10	2	17	25	

E. Effectiveness of instruction - Describe how the department addresses the scholarship of teaching with specific supporting documentation including each of the following:

1. Departmental teaching effectiveness – report a five-year history of the "teaching effectiveness" department means as reported on SEOIs, indexed to the university mean on a quarter-by-quarter basis.

The department believes that looking at the results of a single question in a summary of student evaluations can be misleading both for individual and in aggregate. As described in 2) below, there are many components necessary for a successful understanding of teaching effectiveness of which the full SEOI is just a part. This section summarizes information for one question from the SEOI. Question 29 (Table 10. Annual SEOI Data for the Instructor Effectiveness Question) looks at the student opinion of instructor effectiveness.

Table 10. Annual SEOI Data for the Instructor Effectiveness Question

	04-05	05-06	06-07	07-08	08-09
Department Fall	4.14	4.26	4.42	4.11	3.98
Winter	4.06	4.11	4.11	4.08	3.81
Spring	4.03	4.12	4.01	4.07	3.95
University Fall	4.30	4.31	4.26	4.30	4.31
Winter	4.33	4.31	4.33	4.33	4.31
Spring	4.35	4.35	4.33	4.35	4.36

2. What evidence other than Student Evaluation of Instruction (SEOI) is gathered and used in the department to evaluate the effectiveness of instruction?

The following statement and list is taken from section 1.8.A of the Computer Science Policy Manual (Appendix A).

Evaluation of teaching effectiveness is inherently a subjective process that cannot be reduced to simple quantitative measures. Nonetheless, such evaluations must be performed. As noted above, what follows is an attempt to list what the department perceives to be important components in the evaluation. It is important that faculty members receive periodic feedback on their teaching performance, and that sufficient information on teaching effectiveness is maintained to allow evaluations to be made fairly.

- Course materials including: syllabi, web pages, examinations, and supplementary materials
- SEOI
- Classroom peer-reviews
- Class preparation
- Evidence of learning assistance provided to students
- Content of courses taught
- Demonstrable efforts to improve teaching skills
- Efforts at developing innovative teaching techniques and methods
- Evidence of currency of knowledge in the subject field
- Ability to teach a reasonable variety of courses appropriate to the faculty member's expertise
- Awards of teaching
- Course / curriculum development
- Instructor or lab manuals and other course support materials
- Supervision of internship and independent study
- Student participation in research
- Student publications and/or participation in conferences
- Goals – current and evaluations of prior
- MFAT results and other assessment outcomes

As noted the department feels annual peer evaluation of teaching is important for the delivery of effective instruction. To this end, the department will set aside the annual departmental development day for evaluation of instruction.

The department has a twofold strategy for considering teaching effectiveness. First, the department looks all of the measures listed above. In addition, the department is prepared to deal effectively with shortcomings that are detected in the review process. In what follows, we present information related to both of these.

The department believes that one of the most effective measures of teaching effectiveness is the observation contained in Table 22**: Analysis of Results and Action Items.** that, in general, all student learning outcomes are being met. As described in Section II.E above, the department also conducts an annual peer review of instruction, which is highly effective in addressing questions of teaching effectiveness. Recall the process for the review asks each faculty member to prepare a teaching portfolio for one of the classes he or she has taught during the year. The choice of course must change annually until all courses in the curriculum have been covered by this in-depth review. The portfolio should include the components described above. Based on the results of most recent peer-review, the faculty have concluded that all current faculty are meeting department goals for teaching effectiveness.

Such an evaluation has not always been the case. It is also important to describe how this process continues when concerns in teaching effectiveness arise. What follows is a description of how such a case was handled. Specifically, an annual peer-review several years ago indicated that one of the tenure-track faculty members was not meeting departmental goals for teaching effectiveness. The department set up a program to help the faculty member improve performance. The department worked with the Dean of the College of Education and Professional Studies (CEPS) to generate a program with specific goals for the faculty member in question. Also in conjunction with the Dean of CEPS, two mentors (one an expert in teaching technology-based subject matter and the other an expert in connecting with students) were chosen to work with the faculty member. It is the belief of the department that this would have formed an effective program for dealing with this concern. In this case, the solution was not fully tested as the faculty member resigned shortly after the program was put together.

3. Effectiveness of instructional methods to produce student learning based upon programmatic goals including innovative and traditional methods – examples include:
    a. Collaborative research between student and faculty
    b. Inquiry-based, open ended learning
    c. Use of field experiences
    d. Classic lectures
    e. Lecture and inquiry based guided discussions
    f. Service learning or civic engagement
    g. Other innovative methods (e.g., online integration)

The department prides itself in using a variety of methods to instruct students. Table 11 below summarizes the methods used in both general education and major classes. Most of courses involve both a lecture and a laboratory component. Enhancing the communication experience continues to be a major effort and as such a number of classes incorporate a writing/presentation component. Other courses use or include a seminar-style component where students read, present, and discuss current research articles. Many of the advanced courses involve individual or group projects include written and oral presentations while many of the junior and senior classes incorporate small-group discussions, debates, and inquiry-based learning exercises. Finally, many group projects include a service or civic engagement component.

Table 11. Instructional Methods Used in CS Classes

	General Education and Major Courses	Lecture	Laboratory	Inquiry-based Disc.	Writing/Oral Presentation	Seminar/Literature Review	Group or Class Projects	Individual Projects	Teaching Experience
101	Computer Basics	x	x						
105	Logical Basis of Computing	x	x				x	x	
110	Programming Fundamentals I	x	x					x	
111	Programming Fundamentals II	x	x					x	
112	Foundations of Computer Science	x		x	x		x		
301	Data Structures	x	x					x	
302	Advanced Data Structures	x	x					x	
311	Computer Architecture I	x	x					x	
312	Computer Architecture II	x					x	x	
325	Technical Writing in CS				x			x	
350	Web Development Technologies I	x	x	x	x	x	x	x	
351	Web Development Technologies II	x	x	x	x	x	x	x	
352	Web Development Technologies III	x	x	x	x	x		x	
361	Principles of Language Design I	x	x	x	x			x	
362	Principles of Language Design II	x	x	x	x		x	x	
392	Lab Experience in Teaching CS I								x
410	Formal language Theory	x	x	x		x		x	
420	Database Management Systems	x	x	x	x			x	
427	Algorithm Analysis	x	x	x				x	
435	Simulation	x	x	x		x		x	
440	Computer Graphics I	x	x	x			x	x	
441	Computer Graphics II	x	x	x		x	x	x	
446	User Interface Design	x	x	x	x			x	
450	Computer Networks & Data Comm.	x	x	x				x	
455	Artificial Intelligence	x	x	x	x	x			
456	Data Mining	x	x	x	x	x	x	x	
457	Computational Intelligence	x	x	x	x	x	x	x	
458	Artificial Intelligence Project				x			x	
460	Optimization	x	x	x				x	
465	Compiler Design	x	x	x			x	x	
470	Operating Systems	x	x	x			x	x	
473	Parallel Computing	x	x	x	x	x	x	x	
480	Software Engineering	x	x	x	x		x	x	
481	Software Engineering Project				x		x		
489	Senior Colloquium				x	x			
490	Cooperative Education / Internship				x			x	
492	Lab Experience in Teaching CS II								x
496	Individual Study				x			x	

F. Degree to which distance education technology is used for instruction.

1. ITV
2. Online

The Computer Science Department does not currently offer ITV and has planned its first online course for Winter 2010.

G. Assessment of programs and student learning

1. List student learner outcomes for each graduate and or undergraduate degree program and note how the outcomes are linked to department, college and university mission and goals.
   a. Describe the specific method used in assessing each student learning outcome. 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, list survey or questionnaire response rate from total population (e.g., alumni, employers served).

Please see Table 12 below which summarizes the current Student Learning Outcomes (SLOs), their measures, and standards of mastery as adopted by the department in 2007. Following that, as the department uses several of the methods of assessment which correspond to more than one of the student learning outcomes, we present two tables that summarize the measures that were taken in AY 08-09 and how they correlate with the SLOs. In Table 13, we list in column 1, the method used, in column 2, who was assessed, and in column 3 – when the assessment occurred. In Table 14, we correlate the Student Learning Outcomes with the methods of assessment used.

Table 12: Student Learning Outcomes for the Bachelor of Science in Computer Science.

Student Learning Outcomes (performance, knowledge, attitudes)	Related Program/ Departmental Goals	Related College Goals	Related University Goals	Method(s) of Assessment (What is the assessment?)*	Who Assessed (Students from what courses – population)**	When Assessed (term, dates) ***	Standard of Mastery/ Criterion of Achievement (How good does performance have to be?)
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.	Goals 1 & 2. Promote the role of computer science and computer literacy in undergraduate education at Central Washington University. Offer undergraduate programs that train students as computer specialists with a fundamental understanding of technology.	Goal I: Provide for an outstanding academic and student experience in the College of the Sciences.	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	MFT taken by graduating seniors Performance in the core courses of the major	Senior CS majors Majors at all levels	Reviewed annually. Reviewed on a three year cycle.	> 50th percentile overall and in content areas of the MFT All graduates have a GPA of better than 2.5 in core courses.
2. Critical Thinking Skills: Graduates will demonstrate the ability to utilize appropriate theoretical constructs for problem solving: definitions, and axioms, theorems, proofs,	Goal 2. Offer undergraduate programs that train students as computer specialists with a fundamental understanding of technology.	Goal I: Provide for an outstanding academic and student experience in the College of the Sciences.	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	MFT taken by graduating seniors Performance in the core courses of the major Performance in CS 427	Senior CS majors Majors at all levels Students in CS 427	Reviewed annually. Reviewed on a three year cycle.	> 50th percentile overall and in content areas of the MFT All graduates have a GPA of better than 2.5 in core courses. Students meet the student learning outcomes of CS 427

and interpretation of results.							
3. Research Skills: Graduates will have the ability to apply basic research methods in computer science.	Goals 3, 5 & 6. Maintain an intellectually stimulating learning environment where diverse perspectives are valued and encouraged. Play a leadership role in scholarship by making basic and relevant scientific contributions to our respective sub-disciplines. Build an interdisciplinary program and an associated Masters Degree program.	Goal VII & III: Create and sustain productive, civil, and pleasant learning environment. Provide for outstanding graduate programs that meet focused regional needs and achieve academic excellence.	Goal VI & V: Build inclusive and diverse campus communities that promote intellectual inquiry and encourage civility, mutual respect, and cooperation. Achieve regional and national prominence for the university.	Performance in CS 489 Student participation in SOURCE Student participation in research projects and groups.	Graduating seniors Students involved with SOURCE Students involved in undergraduate research	Reviewed annually.	All graduates will produce a successful research paper. Range from a constant to an increasing number presenting at SOURCE An annual average of two students (per faculty) involved in undergraduate research. > 3 external research presentations or publications annually with student participation.
4. Applied Design Skills: Graduates will have the ability to apply appropriate design constructs: requirements analysis and specification, design,	Goal 2. Offer undergraduate programs that train students as computer specialists with a fundamental understanding of technology.	Goal I: Provide for an outstanding academic and student experience in the College of the Sciences.	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	Performance in CS 480-481 the senior capstone courses.	Graduating seniors	Reviewed annually.	>75% of project groups produce successful projects. All teams produce minimally successfully documents as measured by the content rubrics.

implementation, and testing.							
5. Ethics and Society: Graduates will demonstrate knowledge of ethical codes and societal issues associated with the computing field.	Goal 1. Promote the role of computer science and computer literacy in undergraduate education at Central Washington University.	Goal I: Provide for an outstanding academic and student experience in the College of the Sciences.	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	Performance in CS 489	Graduating seniors	Reviewed annually.	All graduates successfully produce a research paper studying a societal issue or develop a case study of an ethical situation.
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.	Goals 3 & 5. Maintain an intellectually stimulating learning environment where diverse perspectives are valued and encouraged. Play a leadership role in scholarship by making basic and relevant scientific contributions to our respective sub-disciplines.	Goal VII & III: Create and sustain productive, civil, and pleasant learning environment. Provide for outstanding graduate programs that meet focused regional needs and achieve academic excellence.	Goal VI & V: Build inclusive and diverse campus communities that promote intellectual inquiry and encourage civility, mutual respect, and cooperation. Achieve regional and national prominence for the university.	Performance in CS 311 and 312. Performance in CS 480-481 the senior capstone courses.	Students in CS 311 and 312. Graduating seniors.	Reviewed on a 3 year cycle. Reviewed annually.	Students meet the student learning outcomes of CS 311 and 312. All student groups will meet professional standards in generating course documents.
7. History of Computing: Graduates will be aware of the history of computing, including those	Goal 1. Promote the role of computer science and computer literacy in	Goal I: Provide for an outstanding academic and student experience in	Goal I: Maintain and strengthen an outstanding academic and student life on the	Performance in CS 112	Students in CS 112	Reviewed annually.	Students meet the student learning outcomes of CS 112.

major developments and trends - economic, scientific, legal, political, and cultural - that have combined to shape the discipline.	undergraduate education at Central Washington University.	the College of the Sciences.	Ellensburg campus.				
8. Graduate Preparation: Graduates will have the necessary background for entry into graduate study.	Goal 2, 4 & 6. Offer undergraduate programs that train students as computer specialists with a fundamental understanding of technology. Sustain a productive team of faculty and staff.	Goal I, IV & III: Provide for an outstanding academic and student experience in the College of the Sciences. Develop a diversified funding base to support curriculum and academic facilities, student and faculty research and scholarships, as well as faculty development, service and applied research in college disciplines. Provide for outstanding graduate	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	Performance in CS 427 Student participation in SOURCE Student participation in research projects and groups. Graduate school acceptance.	Students in CS 427. Students involved with SOURCE Students involved in undergraduate research Survey of graduating seniors.	Reviewed on a 3 year cycle. Reviewed annually.	Students meet the student learning outcomes of CS 427. Range from a constant to an increasing number presenting at SOURCE An annual average of two students (per faculty) involved in undergraduate research. > 3 external research presentations or publications annually with student. Range from a constant to an increasing number of students accepted to graduate school.

		programs that meet focused regional needs and achieve academic excellence.					
9. Communication Skills: Graduates will have the ability to communicate effectively.	Goal 2. Offer undergraduate programs that train students as computer specialists with a fundamental understanding of technology.	Goal I: Provide for an outstanding academic and student experience in the College of the Sciences.	Goal I: Maintain and strengthen an outstanding academic and student life on the Ellensburg campus.	Performance in CS 325. Performance in CS 480-481. Performance in CS 489.	Students in CS 325. Graduating seniors	Reviewed on a 3 year cycle. Reviewed annually.	Students meet the student learning outcomes of CS 325. All teams produce minimally successfully documents as measured by the writing rubrics. All students participate in three successful midterm and final presentations. All graduates will produce a successful research paper.

Table 13: How the Student Learning Outcomes Were Assessed.

Method Used	Who was Assessed	When the Assessment Occurred
A. Major Field Test	Senior CS Majors	March, June 2009
B. Senior Capstone Courses, CS 480 / 481	Senior CS Majors	Fall 2008 and Winter 2009 when the courses were offered
C. Senior Colloquium, CS 489	Senior CS Majors	March, June 2009
D. Participation in SOURCE Participation in research projects and groups	Majors at all levels Majors at all levels	May 2009 June 2009
E. Survey of students in Fundamentals of Computer Science, CS 112	Entering majors, minors and some non-majors	Dec 2008, March, June 2009
F. Exit Interviews	Senior CS Majors	March, June 2009
G. Employers and Internship Employers Surveys	Majors at all levels	June 2009
H. Graduate School Acceptance	Senior CS Majors	June 2009
I. Individual Course Outcomes	Majors at all levels	September 2008

Table 14: Correlation of Student learning Outcomes to the Methods of Assessment Used.

Student Learning Outcome	Method Used
1. Basic Knowledge	Major Field Test Exit Interviews Individual Course Outcomes
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 Individual Course Outcomes
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 Individual Course Outcomes
7. History of Computing	Fundamentals of Computer Science, CS 112
8. Graduate Preparation	Participation in SOURCE Participation in research projects and groups Graduate School Acceptance
9. Communication Skills	Senior Capstone Courses, CS 480 / 481 Senior Colloquium, CS 489

2. List the results for each student learning outcome.
   a. Provide results in specific quantitative or qualitative terms for each learning outcome.
   b. Compare results to standards of mastery listed above.
   c. Provide a concise interpretation of results.

3. Based upon the results for each outcome listed above describe:
   a. Specific changes to your program as they affect student learning (e.g., curriculum, teaching methods.
   b. List specific changes related to assessment process if any.

In responding to 2) and 3) above, we present the results contained in sections 3 and 4 of the department's most recent assessment report. As even this portion of the report is quite extensive,

we have placed the complete report for AY 08-09 in Appendix B. The Assessment Reports following our last Program Review AY 04-05 have been attached as follows: Appendix C – Assessment Report AY 07-08, Appendix D – Assessment Report AY 06-07, Appendix E – Assessment Report AY 05-06.

Start of Inserted Sections

3.1 Assessment Results and Actions AY 08-09 – An Overview
We divide this section into two subsections. In Section 3.2, we present the results for each of the methods of assessment used last year. Where appropriate, we summarize these results in Tables 15 – 20. In Section 3.3, Table 21 details how these results compare to the standard of mastery for each of the student learning outcomes as found in our Assessment Plan. Our interpretation of these results can be found with our discussion of how this will affect the program in Table 22.

3.2 Results for each of the Methods Used

A. Major Field Test
Currently, approximately 150 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. Table 15 summarizes MFT results for the last five years.

Table 15: Five Years of MFT Results.

	04-05		05-06		06-07*		07-08*		08-09*	
	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Num. Stu.	22		27		24		17		24	
Overall	145.3	45	153.1	75	148.2	55	149.1	60	154	65
Programming	51.1	48	60.0	82	55.0	35	60.7	55	65	70
Systems	31.3	33	40.2	63	39.9	35	37.0	25	41	35
Theory	37.4	71	44.3	92	33.3	40	34.8	45	41	70
GPA – avg.	3.19		3.66		3.25		3.19		3.32	

* new interpretation of scores used – 4CMF

B. Senior Capstone Courses, CS 480 / 481
This year the department had six senior project teams. Five teams used the traditional waterfall 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. Five teams met the major requirements specified in their original design. One team did not meet all the specified major requirements due to factors beyond their control (sickness of their client did not allow for sufficient contact). Table 16 summarizes these results.

Table 16: Summary of Project Success for Senior Projects, AY 08-09.

Model of Project	Met All Requirements	Met Major Requirements	Major Requirements Lacking
Waterfall	2	2	1
Research		1	

All six documents and three presentations were evaluated relative to both content and style rubrics. The following summarizes the students' performance in these critical communication areas. 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 17 summarizes these results.

Table 17: Summary of Writing and Presentation Evaluations for Senior Projects, AY 08-09.

	Excellent	Exceeds Expectations	Meets Expectations	Fails Some Expectations	Missing Major Requirements
Content	1	3	2		
Style	2	2	2		

Finally while knowledge of testing software appeared improved based on written exams, the use of testing methods in the projects remained at the short end and was evaluated as minimally acceptable in three projects and below expectations in three projects.

C. Senior Colloquium, CS 489

All graduating seniors are required to participate in the Senior Colloquium. This year 24 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. Each of these units are evaluated by both content and style rubrics. Table 18 summarizes these results.

Table 18: Summary of Content and Style Evaluations for Senior Colloquium, Winter & Spring 09.

	Excellent	Exceeds Expectations	Meets Expectations	Fails Some Expectations	Missing Major Requirements
Ethics Unit					
Content	2	8	13	1	
Style	1	11	11	1	
Research Paper					
Content		9	14	1	
Style		14	9	1	
Presentation					
Content		16	7	1	
Style		8	15	1	

D. 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. This year there were 36 students in last two years of study in computer science. Fifteen different students participated in some form of undergraduate research this year. Table 19 summarizes how these students participated in different aspects of undergraduate research. As an aside, the department had one regular faculty member on sabbatical this year; thus, there were four active regular faculty members in the department this year.

Table 19: Summary of Students Participating in Undergraduate Research.

	Number of Students
SOURCE	11
Individual Research	6
Group Research	8
Conference Presentations	4
Publications	3

E. Survey of Students in Fundamentals of Computer Science, CS 112

This survey is a follow-up to the one done last year at the end of a major revamp of this course and its place in the curriculum. We will discuss the changes and our perceptions about them in section 5 below. Here we will [resent 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 Scribbler robots – programming low level interaction with robotic sensors.

Alice: Students enjoyed the introduction to animation. Students valued the introduction to "pairs" programming. Students had an appreciation for the impact of this technique in the development of software.

Careers in computer science: The results here were an improved perception about the opportunities and requirements of a career in computer science. Most of the students reported already leaning towards becoming computer science majors.

Hands-on computers: Students reported a better appreciation for the development of hardware and in how computers are put together. Generally students reported an improved comprehension of data representation, though a minority of students reported still being confused on this topic.

Scribbler robots: Though generally well received a number of students reported frustration with the somewhat uneven performance of the Scribbler sensors.

F. 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 08-09.

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. As an aside, none of the graduating seniors took the revised database class this year. Students would like to see 300 and 400 level core courses offered more that once a year.

Focus area elective courses generally provide sufficient breadth and depth for the interests of the students. Students would like to see more emphasis on parallel and distributed environments – particularly multi-threading due to the proliferation of multi-core processors.

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" came up frequently.

G. 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 survey 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.

H. Graduate School Acceptance
Table 20 summarizes the graduate school success of students graduating in AY 08-09.

Table 20: **Graduate School Success, AY 08-09.**

	Number of Students
Number Applied	4
Number Accepted	3
Number Pending	1
Number Rejected	

I. Individual Course Review
Annually, the Computer Science faculty conduct a thorough review of one class (or perhaps a pair of sequenced classes) for each faculty member. Each faculty member is asked to prepare a complete portfolio for the class (or classes). Different classes are to be presented each year until the department has reviewed the entire curriculum. The purpose is two-fold. The first purpose is to review the current professional instructional development of each faculty member. The second purpose (which has impact here) is to provide a tool for our curriculum review. Portfolios include the following information: textbook, syllabus, objective, notes, slides, other materials including web-based, programming projects, exams, samples of student work and SEOIs.

This year, the faculty met in retreat in September and reviewed the following courses, CS 110/111, 112, 420, 474, 480/481. Of these, all but CS 420 met their learning outcomes. It was felt that 420 – Database Management Systems fell short in several areas with the major one being that it did not demonstrate knowledge of state-of-the-art systems. This was due in large part to stale material in the course.

3.3 How Assessment Results Correlate to the Student Learning Outcomes.
Standards of mastery are described above in the Computer Science Student Learning Outcomes Assessment Plan.

Table 21: **Correlating Results with Standards of Mastery for Student Learning Outcomes.**

Student Learning Outcome	Standard of Mastery	AY 08-09 Results
1. Basic Knowledge	Major Field Test > 50th percentile overall and in content areas	Overall, Programming and Theory > 50th percentile System < 50th percentile but improved from AY 07-08,
	Exit Interviews – student self-reported strengths and weaknesses of the program	Focus area electives, labs, faculty, and staff were all listed as strengths. One concern raised in core courses: database breadth.
	Individual Course Outcomes	110/111 and 112 address basic skills and were evaluated as meeting individual course outcomes.
2. Critical Thinking Skills	Major Field Test > 50th percentile overall and in content areas	Overall, Programming and Theory > 50th percentile System < 50th percentile but improved from AY 07-08,
3. Research Skills	Senior Colloquium, CS 489	23 of 24 students produced

		All graduates will produce a successful research paper	acceptable papers or better, 1 student papers was rated minimally acceptable.
		Participation in SOURCE Participation in research projects and groups > 25% student participation > 2 students per faculty	15 of 36 eligible students participated in some form of undergraduate research 3.75 students per active full-time faculty member
4.	Applied Design Skills	Senior Capstone Courses, CS 480 / 481 > 75% successful projects	5 of 6 teams met the major requirements of their project; yet, testing still lags.
	Applied Design Skills (cont.)	All teams produce minimally acceptable documents based on content	All teams produced acceptable documents based on content.
		Individual Course Outcomes	420, 474 and 480/481 were reviewed in this category. 474 and 480/481 were evaluated as meeting course outcomes. 420 was evaluated as not meeting all course outcomes.
5.	Ethics and Society	Senior Colloquium, CS 489 All students successfully complete the ethics unit.	All students but one student completed successfully 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	Focus area electives, labs, faculty, and staff were all listed as strengths. One concern raised in core courses: database breadth.
		Individual Course Outcomes	420, 474 and 480/481 were reviewed in this category. 474 and 480/481 were evaluated as meeting course outcomes. 420 was evaluated as not meeting all course outcomes.
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 Scribbler robots was effective.
8.	Graduate Preparation	Participation in SOURCE Participation in research projects and groups	15 of 36 eligible students participated in some form of undergraduate research

	> 25% student participation > 2 students per faculty	3.75 students per active full-time faculty member
	Graduate School Acceptance	4 students applied for graduate school. At this time three have been accepted and one has applications pending.
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.	23 of 24 students produced acceptable papers, one student papers was minimally acceptable. 23 of 24 students made an acceptable presentation, one student presentation was minimally acceptable.

4. **What will the department or program do as a result of that information?**
In Table 22 below we analyze the results presented in the section above and where appropriate recommend action items to help address the issues raised.

Table 22: Analysis of Results and Action Items.

Student Learning Outcome	Assessment and Curricular Changes
1. Basic Knowledge	Generally this student learning outcome has been met, there are however two concerns. a) While all categories of the MFT showed improvement this year, it is time to address shortcomings in the Systems area. The systems area breaks down into four sub areas: Architecture (CS 311/312), Operating Systems (CS 470), Networking (CS 450), Database (CS 420). Action items: The faculty felt that we would approach modifying these courses in stages. CS 420 was run with a redesign for AY 08-09 based on last year's assessment. CS 311/312 should be redesigned for AY 09-10 and CS 450 should undergo redesign for AY 10-11. b) Students noted a continuing concern in the Exit Interviews that they are currently being exposed to just one database management system. These graduating seniors were not however in the CS 420 class redesigned for AY 08-09. Feedback from the revised class indicated that students were pleased with the changes. Action item: continue to monitor the revised CS 420 class. c) Students noted a concern in the Exit Interviews that they would like to see 300 and 400 level core courses offered more that once a year. Unfortunately, enrollment in Computer Science

		courses will not support more frequent offering of these courses. No Action item.
2.	Critical Thinking Skills	Generally this student learning outcome has been met, there is however one concern. Performance in the MFT in the area of System, while improving, is not to the mastery level. We believe that this is a critical component in critical thinking for a computer scientist. Curricular changes here will correspond to the changes listed in 1a) above.
3.	Research Skills	Based on the results of the current assessment the faculty believe that this outcome has been met. No curricular changes are planed here.
4.	Applied Design Skills	Based on the results of the current assessment the faculty believe that this outcome has been generally met. However as noted in the description of testing in the senior project sequence, this aspect does not receive the necessary development when it comes to actual application. Action item: in the fall faculty retreat, review other courses where testing can be made a larger component and more naturally incorporated in projects.
5.	Ethics and Society	Based on the results of the current assessment the faculty believe that this outcome has been met. No curricular changes are planed here.
6.	Technical and Theoretical Background	Generally this student learning outcome has been met, there is however one concern. Concerns were raised in exit interviews about database breadth of experience. Curricular changes here correspond to the changes listed in 1a) and 1b) above.
7.	History of Computing	Based on the results of the current assessment the faculty believe that this outcome has been met. No curricular changes are planed here.
8.	Graduate Preparation	Based on the results of the current assessment the faculty believe that this outcome has been met. No curricular changes are planed here.
9.	Communication Skills	Based on the results of the current assessment the faculty believe that this outcome has been met. No curricular changes are planed here.

In summary we have five action items.

1) Redesign CS 311/312, 420, and 450 in stages. CS 420 was run with a redesign for AY 08-09 based on last year's assessment. CS 311/312 should be redesigned for AY 09-10 and CS 450 should undergo redesign for AY 10-11.
2) Continue to monitor the revisions in the CS 420 class.
3) During the fall faculty retreat, review other courses where testing (particularly in the programming and data structures sequences) can be made a larger component and more naturally incorporated in projects.
4) As the general education program is currently being redefined, CS 112s submission as a general education course has been delayed until next year.
5) Continue the development of a CS Advisory Board.

End of Inserted Sections

In July after the completion of our assessment for AY 08-09, we received the results of our most recent student survey. As one of the questions has an important impact on the evaluation of our student learning outcomes, we will present the results below. Table 23 summarizes how working graduates from the last five years believe their degree prepared them in key competencies (our

student learning outcomes). The entire survey can be found in Appendix J. The faculty believe that these results continue to support the idea that the program is meeting the SLOs.

Table 23. Student Survey - How well did Computer Sciences prepare you for each of these competencies?

	Not at all prepared	Not prepared	Somewhat prepared	Prepared	Very prepared	Rating Average	Response Count
A. Critical Thinking Skills.	0.0% (0)	0.0% (0)	9.1% (3)	**60.6% (20)**	30.3% (10)	4.21	33
B. Communications.	0.0% (0)	0.0% (0)	27.3% (9)	**63.6% (21)**	9.1% (3)	3.82	33
C. Quantitative reasoning.	0.0% (0)	3.0% (1)	27.3% (9)	**51.5% (17)**	18.2% (6)	3.85	33
D. Information literacy.	0.0% (0)	6.1% (2)	18.2% (6)	**54.5% (18)**	21.2% (7)	3.91	33
E. Basic Knowledge.	0.0% (0)	0.0% (0)	9.1% (3)	**66.7% (22)**	24.2% (8)	4.15	33
F. Research Skills.	0.0% (0)	6.1% (2)	**33.3% (11)**	30.3% (10)	30.3% (10)	3.85	33
G. Applied Design Skills.	3.0% (1)	6.1% (2)	27.3% (9)	**45.5% (15)**	18.2% (6)	3.70	33
H. Ethics and Society.	0.0% (0)	3.0% (1)	33.3% (11)	**48.5% (16)**	15.2% (5)	3.76	33
I. Technical and Theoretical Background.	3.0% (1)	3.0% (1)	36.4% (12)	**39.4% (13)**	18.2% (6)	3.67	33
J. History of Computing.	0.0% (0)	0.0% (0)	21.2% (7)	**57.6% (19)**	21.2% (7)	4.00	33

III. Faculty

A. Faculty profile – Using attached chart show faculty participation for mentoring student research, professional service activities, scholarly activities including grant writing and teaching?

Over the past five years the Computer Science faculty have demonstrated an amazing level of productivity. Consider a couple of highlights. In scholarship, the faculty has an average of 15.2 Category A publications. That's an average of over three publications per faculty member annually - in a university setting that requires a 36 WLU teaching load per faculty or three classes per term unless time is bought out. This scholarship work was not done at the expense of students. Rather the faculty involved students in their work as 49 students participated in SOURCE and 84 students participated in independent study and research over the five years. These numbers occurred in a strictly undergraduate program. Please see **Table 24** below for a summary of faculty activity.

B. Copies of all faculty vitae.

Copies of faculty vitae can be found in Appendix F.

C. Faculty awards for distinction: instruction, scholarship, and service

No awards have been received over the last five years.

D. Include in appendices performance standards by department, college and university.

The university performance standards can be found in Appendix G, the college standards can be found in Appendix H and the department standards can be found in Appendix I.

Table 24: Tenured and Tenure-track Faculty Profile.

	2004-2005		2005-2006		2006-2007		2007-2008		2008-2009				
	# faculty TT - T	% of faculty	# faculty TT - T	% of faculty	# faculty TT - T	% of faculty	# faculty TT - T	% of faculty	# faculty TT - T	% of faculty	**5-yr total**	Annual avg	% of faculty
*** Scholarship Measures:** ***(Use categories applicable to your departmental & college criteria)***													
Peer reviewed Cat. A, national/international conference proceedings, Books	9	60%	16	80%	14	80%	19	60%	18	100%	76	15.2	76%
Abstracts, regional conference proceedings Cat. B									1	20%	1	0.2	4%
conference presentation, Cat B.	11	60%	13	80%	13	80%	17	60%	15	100%	69	13.8	76%
Other													
*** Grants:** ***(Use categories applicable to your departmental & college criteria)***													
External													
Funded / Unfunded	4 / 2	60%	6 / 3	80%	5 / 4	60%	4 / 3	40%	5 / 3	60%	24 / 15	4.8 / 3.0	60%
Internal													
Funded / Unfunded	3 / 0	40%	3 / 0	40%	3 / 1	40%	3 / 0	20 %	2 / 1	40 %	14 / 2	2.8 / 0.4	36%
*** Service measures:** ***(Use categories applicable to your departmental & college criteria)***													
CWU Committees	23	100%	22	100%	23	100%	23	100%	25	100%	116	23.2	100%
State Committees							1	20%			1	0.2	4%
Leadership & Service - Professional Organizations	8	60%	15	80%	14	80%	13	60%	17	60%	67	13.4	68%
Reviewing Papers, number	37	80%	30	60%	73	80%	31	60%	124	100%	295	59.0	76%
Community Service	4	40%	4	40%	4	40%	4	40%	4	40%	20	4.0	40%
Other													
*** Faculty Mentored Research:** ***(Use categories applicable to your departmental & college criteria)***													
Undergrad projects / SOURCE	9	60%	8	80%	9	100%	6	60%	11	80%	43	8.6	76%
Undergraduate Research – Supervising projects Students	24	100%	20	80%	11	100%	11	80%	18	80%	84	16.8	88%
Senior Project Participation Students	24	100%	28	100%	23	100%	21	100%	19	100%	115	23.0	100%
Other													

IV. Students – For five years

A. Student accomplishments (include SOURCE, career placement information, etc.). List students working in field; students placed in master's or doctoral programs.

Given its size, the department has had significant success in having students participate in undergraduate independent study and research. Table 25 below summarizes how our students participated in SOURCE, other research projects and independent study courses over the last two years.

After graduation, the main objective of our students is to seek employment in the field of computer science. A relatively small number of our students seek to go to graduate school. Table 26 below summarizes the success of our students in seeking graduate programs.

This summer the university conducted a survey of our graduates from the last five years. Knowing the typical response rate of these surveys, a participation rate of over 28% was considered a success. The survey noted that almost 82% of the graduates are employed in a computer science related field and that almost 85% of them are employed in the state of Washington. The complete survey can be found in Appendix J.

We finish this question with two tables from the same survey. The first, Table 27, shows the average income of our recent graduates is in the $60,000 - $80,000 range. The second, Table 28, shows that overall our students were highly satisfied with their computer science education. Finally the third, Table 29, shows that the education they received at CWU is meeting the university's mission and its general education goals.

Table 25. Summary of students Participating in Undergraduate Research.

	Number, AY 07-08	Number, AY 08-09
SOURCE	6	11
Individual Research	4	6
Group Research	10	8
Conference Presentations	5	4
Publications	3	3

Table 26. Graduate School Success, AY 08-09

	Number AY 07-08	Number AY 08-09
Number Applied	2	4
Number Accepted	1	3
Number Pending	1	1
Number Rejected		

Table 27. Annual Income of Surveyed Students

	Response Percent
Less than $20,000	0.0%
$20,001 to $40,000	12.5%
$40,001 to $60,000	25.0%
$60,001 to $80,000	**40.6%**
$80,001 to $100,000	15.6%
$100,001 to $120,000	6.3%
$120,001 to $140,000	0.0%
Over $140,000	0.0%

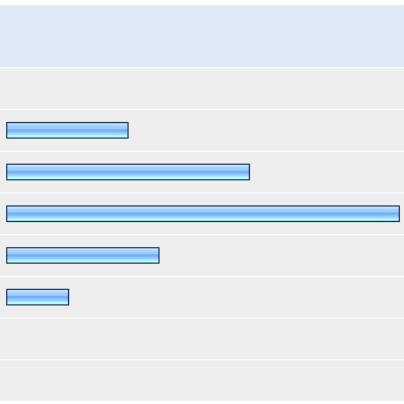


Table 28. Opinion of Computer Science Education at CWU of Surveyed Students

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Does Not Apply	Rating Average
A. I am very satisfied with my education from the Computer Sciences.	0.0% (0)	3.0% (1)	3.0% (1)	39.4% (13)	**54.5% (18)**	0.0% (0)	4.45
B. My Computer Sciences education helped me to get my current job.	0.0% (0)	3.0% (1)	12.1% (4)	21.2% (7)	**60.6% (20)**	3.0% (1)	4.48
C. My Computer Sciences education helps me to perform my current job duties.	0.0% (0)	0.0% (0)	6.1% (2)	30.3% (10)	**63.6% (21)**	0.0% (0)	4.58
D. My Computer Sciences education provided adequate preparation for graduate school	0.0% (0)	3.0% (1)	12.1% (4)	9.1% (3)	6.1% (2)	**69.7% (23)**	5.27
E. My Computer Sciences education provided adequate preparation for Professional schools.	0.0% (0)	3.0% (1)	15.2% (5)	9.1% (3)	3.0% (1)	**69.7% (23)**	5.21

Table 29. Opinion of Surveyed Students: How Their Education Helped Meet CWU's Mission and General Education Goals

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Rating Average
A. become a responsible citizen	0.0% (0)	3.0% (1)	42.4% (14)	**45.5% (15)**	9.1% (3)	3.61
B. become a responsible steward of the earth	0.0% (0)	6.1% (2)	**63.6% (21)**	30.3% (10)	0.0% (0)	3.24
C. become a productive and enlightened (informed, good learner, insightful) individual	0.0% (0)	0.0% (0)	15.2% (5)	**60.6% (20)**	24.2% (8)	4.09
D. value different perspectives	0.0% (0)	0.0% (0)	27.3% (9)	**60.6% (20)**	12.1% (4)	3.85
E. appreciate the breadth and depth of scientific and human knowledge	0.0% (0)	3.0% (1)	9.1% (3)	**60.6% (20)**	27.3% (9)	4.12
F. increase your sense of the interconnectedness of knowledge	0.0% (0)	0.0% (0)	12.1% (4)	**66.7% (22)**	21.2% (7)	4.09
G. integrate knowledge from diverse fields to solve problems	0.0% (0)	0.0% (0)	21.2% (7)	**54.5% (18)**	24.2% (8)	4.03
H. increase your awareness of the many ways that knowledge evolves	0.0% (0)	0.0% (0)	30.3% (10)	**60.6% (20)**	9.1% (3)	3.79
I. ask incisive and insightful questions	0.0% (0)	6.3% (2)	12.5% (4)	**59.4% (19)**	21.9% (7)	3.97

B. Provide one masters project (if applicable); two will be randomly selected during site visit. Available in either the library or through the departmental office.

While the department does not have a Master's program, we feel the documents developed by students for our senior capstone course fill a similar role. Copies of the senior project documents will be available in the department office.

C. Describe departmental policies, services, initiatives, and documented results for successful student advising.

The department believes that advising is a major component of the success of the program. To that end, pre-major students (indeed all students) are required to be advised every term. As part of this advising process, pre-major students develop a graduation plan and have progress toward meeting the entry requirements reviewed each term. Students who are not making significant progress can then be advised in a proactive manner. In any case, during the term in which they plan complete entry requirements, students must submit a formal application to the department office. This application is reviewed at the end of the term after grades are posted. Students that fail to meet the entry requirements, are dropped from more advanced courses, and asked to meet with the department chair to review their

situation and discuss future plans (which may include redoing an entry course if appropriate).

Once students are accepted to the major, they interact with one of the full-time faculty members. Faculty are assigned to advise students in focus areas that correspond with their professional expertise. Table 30 shows the current assignment of faculty as advisors. Students are required to meet with their advisors at least once per term to review their progress and plan courses for their focus areas.

Table 30. Advising Assignments

Focus Area	Advisor
Pre-major Students Entering Freshmen	Jim Schwing
Transfer Students	Boris Kovalerchuk
Artificial Intelligence	Razvan Andonie Boris Kovalerchuk
Computer Systems	Francois Modave
Information Systems	Jim Schwing
Scientific Computing	Razvan Andonie Francois Modave
Software Design / Engineering	Ed Gellenbeck
Web Programming	Ed Gellenbeck

D. Describe other student services offered through the department including any professional societies or faculty-led clubs or organizations and their activities.

The department does sponsor a student chapter of the ACM (one of two societies for computer professionals). The activities of the club include presentations from Career Services, presentations from former graduates, technical presentations, special interest groups, contest participation and supervision, and service to the department. Perhaps the most outstanding activity of the club is the service it provides by offering tutoring to students in the entry level programming classes.

There are also several minor services the department can offer students. First the building is housed in a former demonstration grade school. Students are able to request access to lockers. Next, the department participates in Microsoft's academic licensing program which allows students free access to all of Microsoft's programming development software and related products. Finally, the department has access to two conference rooms providing ample space and time for students and faculty to schedule meetings for their research projects.

V. Facilities & Equipment by location

A. Describe facilities available to department and their adequacy (program delivery location, size, functionality, adjacencies, lighting, ventilation, finishes, plumbing, electrical outlets, etc.). Describe anticipated needs in the next three to five years.

The department is housed in Hebeler Hall. Space is categorized as follows:

- Main office and workroom/mailroom
- Conference room
- Shared meeting room with the Dean's Office of the College of Arts and Humanities
- Seven offices for five full time faculty, one systems engineer, three adjunct faculty
- Three teaching labs (30, 20, 20 workstations respectively) – open labs when classes are not in session
- Work/study computing lab (10 workstations and large tables and white boards)
- Undergraduate experimental lab – used for alternative operating systems, networking, data mining, and individual research projects
- Undergraduate experimental lab – used for parallel programming projects, robot assembly and storage, and for servers for senior projects
- System room with servers for student and faculty accounts, and activities such as system maintenance
- Accessibility Research Lab
- Image Processing Research Lab
- Bio-inspired Computing Lab
- Lectures are primarily held in Hebeler. This includes a large lecture (125 seats), two midsize rooms (35 – 50 seats) and one small room (25 seats).

For the most part, the rooms have adequate lighting and electric. There is however one main problem. Air conditioning is much less than adequate in faculty offices, the main office, the conference room, the undergraduate lab for parallel and robot projects, and the work/study computing lab. Temperature studies have demonstrated that from the end of May through the beginning of September these rooms are frequently unusable. This is a continuing problem identified more than a decade ago and **listed as a primary problem by the reviewer on our last program review**. With the help of the then Dean, three years ago, the department received a verbal **assurance** from Facilities that funds would be in place and that at least faculty offices would be air conditioned by the following year. Unfortunately, despite repeated requests, we have yet to see any progress on this issue.

In the next three to five years, we expect to be involved in more interdisciplinary research at the faculty/masters' level. Collaborative research space needs to be developed as these needs grow.

B. Describe equipment available to department include program delivery location and its adequacy (office furniture, instructional fixtures, lab equipment, storage cabinets, specialty items, etc.) Describe anticipated needs in the next three to five years.

Furnishing and general equipment in the main office, faculty offices and lab spaces are for the most part adequate for the need. Computing equipment is the key to our program. Below we describe the status and concerns for this equipment.

- Continue to maintain instructional labs with state-of-the-art equipment. The department continues to work with ITS, particularly the director and supervisor of labs, to ensure that lab equipment is rolled over in a timely fashion (the current cycle is three to four years).

- Continue to maintain computing equipment in faculty and staff offices – this includes laptops for the faculty. We must ensure that this equipment is replaced in a timely fashion.
- Continue to maintain computing equipment in research labs for faculty research and undergraduate research projects. The equipment in one of these labs is beginning to show its age.
- Despite recent changes in air exchange systems, summer working conditions in the parts of Hebeler housing computer science faculty remains intolerably hot. The department will continue to work with the Dean to find options for alleviating this condition.

C. Describe technology available to department include program delivery location and its adequacy (computers, telecommunications, network systems, multi-media, distance education, security systems, etc.). Describe anticipated needs in the next three to five years.

The lecture rooms describe in part A of this section were upgraded with multi-media presentation equipment since the last review as was one of our instructional labs. The classrooms now are adequately equipped and provide a variety of sizes for scheduling from large lecture to seminar.

- Our current media facilities in two of our three instructional labs continue to be constraining. These labs do not have built-in projection and computer stations. Set-up and take-down time for portable equipment at the start and end of class reduces discussion and presentation time. A fully functional lecture/lab setting in both of these labs would have a significant impact on quality, quantity and efficiency.

VI. Library and Technological Resources by location

A. Describe general and specific requirements for library resources by program and location that assist in meeting educational and research objectives. Indicate ways in which the present library resources satisfy and do not satisfy these needs. Describe anticipated needs as to the next 5 year period.

As with most technical disciplines, communications, both written and oral, continues to be one of the most difficult areas for our students. With this in mind, the department has developed four required courses that contain a major writing/presentation component. CS 325, Technical Writing in Computer Science uses a writing professional to present the aspects of technical writing tailored to the computer science discipline. The senior project capstone courses, CS 480 & 481, require that each team generate professional documents such as software requirements, design, test plan and user manual. Project teams also make formal, required progress reports. CS 489, the Senior Colloquium, requires students to write and present a research paper. In addition, at least nine of the junior/senior level classes require research papers and/or research presentations. In most circumstances, faculty require some of the references to come from non-internet sources. Generally speaking the library holdings are adequate for these needs. Library journal holdings can be found in Appendix L.

It is interesting, but not surprising, that most of the new research in computer science is kept in digital libraries. As can be seen by the list of holdings, access to these journals is electronic. Of most interest to the students and faculty are the digital libraries kept by the ACM and the IEEE Computer Society. The department provides faculty subscriptions give access to those electronic journals not held by the library that they need for research. Thus the major need is for student access to the digital libraries. While an institutional subscription for complete access to all these holdings would be expensive, it might be appropriate to find an appropriate subset. We believe that this would cover the departmental needs for the next five years.

B. Describe the information technologies faculty regularly and actively utilize in the classroom. Describe anticipated needs as to the next five year period.

C. Describe technology available to department and its adequacy. Describe anticipated needs as to the next five year period.

As the principle interaction and equipment involved/used in computer science research, offices, classes and labs is technology. The answers to sections VI.B. and VI.C. are covered above in sections V.B. and V.C.

VII. Analysis of the Review Period

A. What has gone well in the department and each degree program(s)?

1. Explain accomplishments of the past five years.
2. How have accomplishments been supported though external and internal resources?

To address the second point first, the department has been successful obtaining external resources while at the same time we have had the support of the university in many of our endeavors. The accomplishments of the last five years include.

Students

- In a time of national downturn in computer science programs, the department has met or exceeded these trends. (A discussion of this point follows our list of accomplishments.)
- All nine Student Learning Objectives have been uniformly been met over each of the last five years.
- Measured for the first time last year, all six departmental/programmatic goals are being met.
- The department has established a strong undergraduate program.
- The department has two successful general education courses.
- The department had a successful redesign of the CS 112 Foundations of Computer Science course.
- The department has been able to continue to support students with NSF-CSEMS scholarships and Boeing scholarships. This is supported by faculty written grants.
- The department continues a strong, proactive advising program. Pre-majors' progress is actively reviewed quarterly. Majors are matched with an advisor based on student focus area and faculty expertise. Students meet regularly with this advisor to ensure degree progress is being made.

Faculty

- For a small department, we have been able to identify resources to have three successful sabbaticals over the last five years (a major point from the prior program review).
- The faculty continue to have an extremely strong scholarship record for a “teaching” university.
- Faculty service to the college and university is strong.
- Faculty professional service as measured by reviewing and conference and workshop organization is strong.
- The department continues a successful process that allows faculty to identify the role within the department which best utilizes their interests and talents.
- The faculty are compatible and work well together for and with the students. This characteristic is extremely important in a small department.
- The department had a successful one year non-tenure track replacement, Andreas Stefik, for the retirement of Grant Eastman. The followed this with a successful hire into the tenure track line – Francois Modave.

Staff

- The recently retired office staff, senior secretary LaVelle Clerf, was friendly and helpful. Faculty and students respected and appreciated her knowledge and assistance. As point of first contact for many new students and parents, LaVelle presented the perfect contact. She will be missed.
- The department had a successful replacement, Charlene Andrews, for the retirement of our secretary senior, LaVelle Clerf.
- The systems engineer, Fred Stanley, keeps our ever-expanding laboratory facilities in good working order. As personal comment from the chair and as I have said on numerous occasions before, I have seen many other departmental setups, but I have never seen one run so smoothly with so little external help.

Equipment and Facilities

- One of the three general instructional labs has had instructional media added to it. This was carried out with university resources.
- New equipment and software has been added to the instructional labs on a regular basis. This was carried out with university and departmental resources
- A new research lab for accessibility research was built. This was carried out with faculty grant resources.
- Improved funding strategies for office computers and other labs. Specifically, this has been supported through an ITS program called Win-Win where half of the expense for equipment comes from ITS and half from the department.

What follows next is some documentation for the first point listed under students. The Taulbee Survey is an annually compiled (by the Computing Research Association) national study that looks at trends in computer science and computer engineering (CS & CE) education. The statistics have not been strong for the discipline as a whole.

Table 4, Table 5, and Table 6 above demonstrate that the department has basically followed the national trends for enrollment, graduation and diversity. The following information can be found in the most recently completed Taulbee Survey for AY 07-08. A copy of the complete survey can be found in Appendix M.

From the Taulbee Survey, 2007-2008 (http:/www.cra.org)

Summary points made about undergraduate education

- Total enrollment per department by majors and pre-majors in U.S. computer science programs is up 6.2 percent over last year. If only majors are considered, the increase is 8.1 percent. This is the first increase in total enrollment in computer science programs in six years.
- The average number of new undergraduate students per department in U.S. computer science programs is up 1.7 percent over last year. If only majors are considered, the increase is 9.5 percent.
- Bachelor's degree production in computer science was down 10 percent this year, compared to a nearly 20 percent decline last year.
- Diversity in computer science undergraduate programs remains poor. The fraction of Bachelor's degrees awarded to women held steady at 11.8 percent this year. As was the case last year, nearly two-thirds of those receiving bachelor's degrees were White, non-Hispanics.

Figure 1. BS Production (CS & CE)

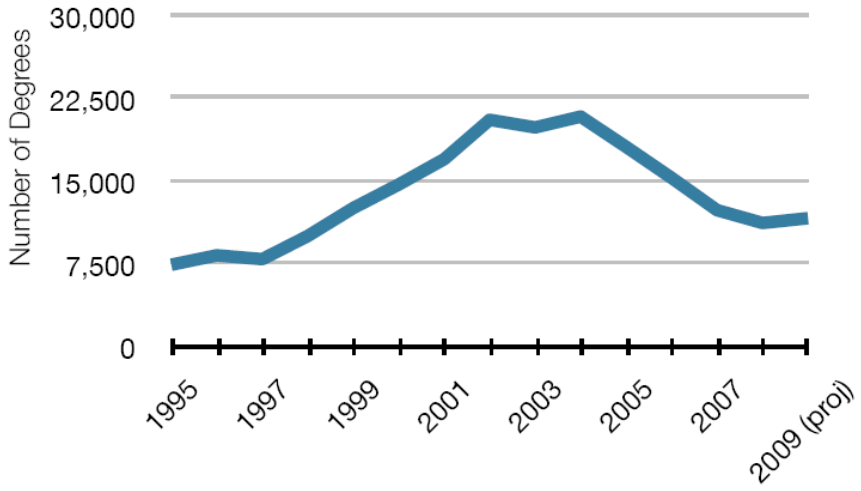
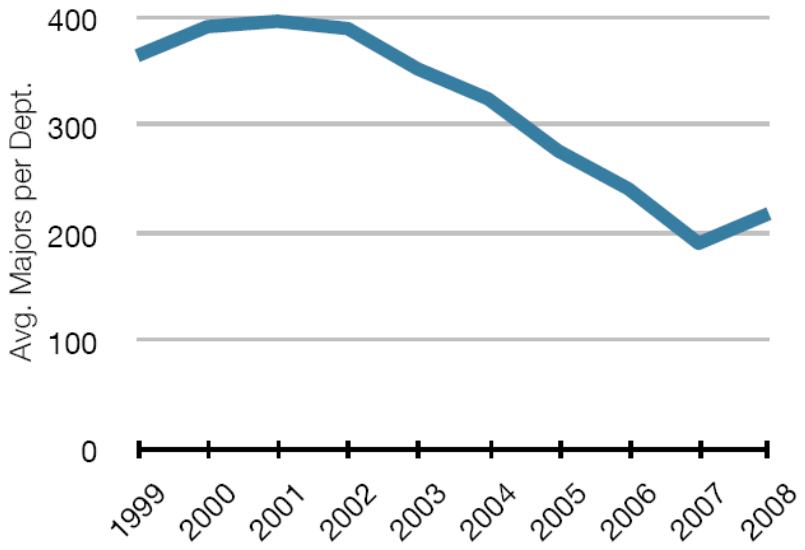


Figure 2. BS Total Enrollment - Avg. Majors per US CS Dept.



B. What challenges exist for the department and for each degree program?

1. Explain major challenges of the past five years.
2. List likely causes of each challenge as supported by documented evidence.

This section will look at the perceived challenges and concerns of the department and the program. Not surprisingly most of these challenges relate to the current budget crisis.

Students and Curriculum

- As a cost cutting measure, the department has agreed to offer two electives per term instead of three. Thus most of our electives will now be offered on an alternating year basis rather than annually. We have worked hard with advisees to let them know of the changes and to reschedule them so they can get the courses they want. At this point, it looks like we can continue to meet the students' needs and keep the quality of the program. The concern is that we have reached a limit on this policy and any further changes would affect the program.
- As with our prior review, we feel that due to the ever-changing nature of computer science, the greatest challenge is to maintain a solid core set of courses and to augment these courses with a strong set of supplemental courses to meet the diverse desires and needs of our students. The department will continue the annual review process. The department will also commence a complete review of our curriculum this spring. The department will also continue to commit development resources to keep faculty active in issues related to curriculum development, particularly in national and regional conferences and special interest groups.

Faculty

- The budget situation will likely mean the loss of adjunct instructors as we teach fewer larger sections particularly in general education and at the introductory major level. This would be a significant loss for the department. The department has developed an excellent collection of adjunct instructors who make vital contributions to the department. They have been essential to allowing a small department such as Computer Science to plan for sabbaticals for the tenured faculty. They have also made important curricular recommendations. The two with sufficient course assignments (greater than half-time) to qualify for consideration were promoted to Senior Lecturer.

Staff

- We have described the extensive (for our size) collection of instructional and research labs; yet the department still has a single systems engineer to keep these systems running. The department would like to look for resources to share (with other departments in COTS) the hiring of an additional engineer. At one point, the previous Dean had agreed with this recommendation, but that idea has not retained currency. We believe that this is an area that with might find grant money to help address the situation.

Facilities

- We need to continue to maintain instructional labs with state-of-the-art computing equipment. The department continues to work with ITS in conjunction with our lab fee funds to ensure that lab equipment is rolled over in a timely fashion (the current cycle is three to four years). We have some concerns that the budget crisis may affect his policy.
- Equipment in faculty and staff offices also needs to be replaced on a cyclic basis. Funds for this typically come from our all-too-stressed goods and services budget. In recent years, ITS has helped departments with the Win-Win program where they share half the cost for purchasing such equipment. This program has recently been put on hold due to the budget crisis.
- Upgrading equipment in the department's research labs is a growing need. As with the previous point, the loss of the Win-Win program will affect our ability to address these needs. We will of course attempt to help address these needs with grant writing.
- We need to have instructional media equipment installed in the two remaining instructional labs. The concern is that the budget crisis will affect the university's ability to help provide these resources.
- Despite recent changes in air exchange (not air conditioning) systems, summer working conditions in the parts of Hebeler housing computer science faculty remains intolerably hot. Since the university failed to follow through on previous assurances of providing air conditioning, we have concerns that with the current condition of the budget that this project will continue on hold or indeed be totally forgotten.

C. What past recommendations from the previous program review have been implemented?

1. How has each recommendation been implemented and how have the department and degree programs been impacted?
2. Which recommendations were not implemented and why?

Reponses to “Four Immediate Needs”

1. Air-conditioning in Hebeler Hall Faculty Offices

In a meeting with the Chair of Computer Science, the then Dean College of the Sciences and the then AVP for Facilities Planning, the AVP assured us that funding for the air conditioning project would be approved by the legislature for this biennium. Since that funding would be available in July 2007 at the earliest, the estimate was that the air conditioning project could be completed by the summer of 2008. Unfortunately, despite repeated questions to both Facilities and the Dean’s Office the air conditioning project has never occurred with no explanation to the department as to the reason.

2. Multimedia presentation equipment for labs and classrooms

As of October 2006, all classrooms that Computer Science uses for instruction have had multimedia presentation equipment installed since the program review. This includes HB 106, 112, 116, and 121.

At the same meeting mentioned in the prior point, the AVP indicated that he would work with Facilities Planning and Instructional media to bring multimedia presentation equipment into the instructional computing lab HB 203. While this has not happened one of the other teaching labs HB 204C did have instructional media equipment installed.

3. Space

a. Faculty/Student Research Labs

Over the last five years, the Department completed moving and revamping three student faculty research labs and one student project lab. The CWU Imaging lab was moved to a larger space in HB 208. This lab is used to support the research done by Dr. Kovalerchuk and his students. A new distributing computing research lab was developed in the space vacated by the Imaging Lab, HB 205. This lab is used to support the research done by Drs. Andonie and Schwing and their students. A research lab dedicated to Accessibility computing was built in HB 204A. This lab is used to support the research of Dr. Gellenbeck and his students. Computing equipment was upgraded for each of these labs. Finally, the Linux and Networking Lab in HB 207 had its equipment upgraded. Several groups of students conduct projects in this lab.

On an additional note, the Computer Science Department Systems Engineer, Fred on several occasions, Fred has put together systems for project teams that required special server access. These teams will be housed in variously in HB 204A, HB 205 and HB 214A.

b. Students

With the consolidation of Academic Services in Hertz Hall, the Writing Center moved out of the former Library space in Hebeler. This space was then reassigned to Computer Science. With the help of Doug Ryder and Carmen Rahm, the department has built an excellent project and study area for Computer Science students. Approximately half the room is dedicated to space for computer workstations with the other half of the room holding work tables and whiteboards. This has proved to be a popular venue for students to work on projects and form study groups.

c. Adjunct Office Space

At this point the department has two adjunct faculty sharing one office. We do not agree with the reviewer that changing this room assignment is an immediate need.

4. Master's Degree in CS

Work on the Master's program was postponed on several occasions due to concerns about undergraduate enrollment numbers and the need to spend departmental efforts recruiting. These problems have now clearly been identified as a national trend. The department has identified a niche and a need for an interdisciplinary program in scientific computing. A proposal has been developed and is currently under review by the upper administration and has received positive feedback. Further, this proposal has received enthusiastic support from departments in the College of Sciences. A copy of the proposal can be found in Appendix N.

Responses to "Other Department Needs and Suggestions"

1. New faculty need more support for grant writing.

The department has a policy of assigning a mentor to new faculty. One of many purposes for this mentor is to help the new faculty with grant writing. Consider the example of the most recent hire. Razvan Andonie was assigned Boris Kovalerchuk as a mentor. Among other things, Boris has been outstandingly successful in securing external funding. In addition, Drs. Andonie and Kovalerchuk work in related fields. This has proved to be a compatible assignment. Though no grants have been awarded to this point, Dr. Andonie has submitted several strong proposals.

2. Lab equipment replacement planning.

The Department has been successful working with ITS on keeping equipment up-to-date in the computing labs. Through funding from the Department and ITS, new equipment has been placed into instructional labs HB 203, 204C, 209 and 218 on a rotating basis each year.

It is important to note here that ITS has been successful in designing and implementing a policy to assure that all computing lab equipment rolls over in a less than four year timeframe. Further, ITS has been an advocate for adding and improving other IT infrastructure such as the installation of wireless on campus.

3. *Adjuncts need one-year contracts.*

This policy is no longer under the sole control of the department and the university. With the advent of a faculty union and a collective bargaining agreement such policies are now negotiated between the administration and the union. At this point, CS adjuncts are still on a term by term contract.

Somewhat related to this and helping to address the careers of adjuncts, the university and union negotiated a process for promoting successful, long serving adjuncts. Both of the department's continuing adjuncts who met the criteria for consideration received promotion to Senior Lecturer.

4. *PC upgrade for the Computer Science Department secretary.*

The computing equipment for the Computer Science secretary has been upgraded.

5. *Plan for release-time that corresponding to overloads generated by capstone and independent study courses.*

This policy is no longer under the sole control of the department and the university. With the advent of a faculty union and a collective bargaining agreement since the program review, such policies are now negotiated between the administration and the union. Currently, the department chair now works with faculty members to plan an annual workload assignment that meets the instructional needs of the department. Credit for capstone courses and independent study are folded into these workload plans helping to account for this instruction along other aspects of faculty members' professional activities. As an aside, this process is considered by most to be less than perfect and continues to be modified at the bargaining table.

6. *Use junior and senior female CS majors as role models to promote retention of women in CS*

The chair has been asking senior female computer science majors to mentor newly declared female majors although there has not been any noticeable changes in female computer science students. Our current analysis is that it is not retention so much as recruiting to the discipline that is the problem.

7. *A major facelift for rooms and furniture in Hebeler Hall*

While not a major facelift, the department main office did receive new carpeting and paint.

8. *Problems with scheduling CS courses (conflicts)*

The chair as schedule designer is cognoscente of this problem. Every effort is made to avoid such conflicts. On the other hand, given the number of courses that need to be scheduled and the number of periods available for scheduling, it is impossible to avoid all conflicts. When such conflicts do arise, the chair works with any students affected to revamp their academic plans to avoid lengthening time to graduation. During the tenure of the current chair (eleven years) no student graduations have been extended by such a conflict.

9. Problems with scheduling Math courses (conflicts)

As with point 8 above, the chair consults with the Mathematics department prior to the generation of each term's schedule. Every effort is made to avoid scheduling conflicts. Nonetheless, such conflicts cannot be totally avoided. The comments of the previous answer relative to working with student graduation plans apply here as well.

10. Students are unaware of available resources

The reviewers note relative to adding information on the Department's Academic Alliance Agreement with Microsoft has been added to the department web page. Also, the chair holds a welcome for all Computer Science students in September each year. The Academic Alliance, Scholarship and other similar programs are described there.

11. Brookline and university housing have poor internet service

Housing has and continues to improve IT facilities for students.

12. Inform students how SEOIs are used

As noted in point 10 above, the chair holds a welcome for all Computer Science students in September each year. The importance and use of the SEOI is described there. Though quite a bit later, the students are reminded of the use of SEOIs in the Department at their exit interviews.

13. Students would like to see stronger ties to industry

The department, through meetings of the student chapter of the ACM and through continuing ties to Microsoft, has annually brought in several industry representatives to describe job and internship opportunities.

D. Make a comparison between the last program review and where the department is now.

1. How have the advances been supported (e.g., internal and external resources)?
2. Are there still outstanding, unmet needs/challenges from the last program review? What has the department done to meet these challenges?

For the most part changes have been incremental and planned through our annual assessment of curriculum and peer-review of faculty. This process and its successful results have been described in detail in the previous sections. Also as noted above, when necessary, resources used to effect the changes have come from both internal and external categories.

In summary, due to the enactment of this process and the efforts of the faculty and staff, we believe that the information detailed in this report describes an undergraduate program that continues to be solid in all measureable categories. We believe that the new review shows

that the department as a whole continues forward based on the efforts of a highly productive faculty. We believe that we now have a strong proposal for proceeding with a master's degree program. Finally, we believe that this review shows that we can keep these programs on-track and continue their growth using techniques and strategies we have employed over the last five years.

The major challenge to our future, indeed the university's future, is clearly the budget crisis affecting all aspects of the economy and in Washington most especially higher education. It is absolutely clear that state resources will continue to diminish. This implies that the need for increased external resources will correspondingly grow if results similar to those described above are to continue. Without a doubt working to identify such resources will be as much a priority for the department as it is for the university.

VIII. Future directions

A. Describe the department's aspirations for the next three to five years.

We could spend a significant amount of time detailing the fact that we feel it is important to aspire to continue the success we have had with the undergraduate program and the successful productivity that the faculty has demonstrated. However we feel it is more appropriate here to look at six new issues that we would like to achieve over the next three to five years.

- Strengthen Undergraduate Degree Focus Areas
  Review the major's focus areas with the aim of strengthening the sequence of courses required in the area of specialization. In particular, strengthen the software design and engineering focus area by requiring students in this focus area to complete two additional courses in software engineering. This may involve adding additional courses to the curriculum.

- Develop a Masters' Degree Program in Computational Sciences
  Central Washington University now has the ability to go ahead and develop the first state-wide graduate program in computational sciences, which will be a modular program, designed to prepare future professionals in computing-related disciplines. It will allow for a tightening of the collaborative educational and research efforts across the College of the Sciences, which in turn will place us in a better position to attract more external funding, enhance our expertise, and increase our research productivity, while adhering to the vision and mission of Central Washington University.

  Our proposal presents the departments involved, along with their research expertise and capabilities, a thorough justification for the need of a new graduate program within the College, a description of the program and the timelines, and finally, a presentation of the support needed from within the University, and of the support that this program will likely generate, in terms of external funding. This proposal can be found in Appendix N.

- Institute an Advisory Board
  In looking at the action items derived from our most recent annual program assessment, we note that the undergraduate program would benefit from the development of an advisory board. It is clear that the benefits would go far beyond the undergraduate

program. Such a Board would be able to make strong contributions to the direction of the proposed masters' program and to the interdisciplinary flavor of the research being conducted by the faculty.

- Strengthen Ties with Alumni
  This is one area where the department could stand to improve. The benefits are obvious. Steps to do this would include: starting a departmental newsletter, maintaining a Facebook page, use LindedIn, expand alumni attendance at the final presentation of senior projects.

- Institute a Regular Seminar Series
  In order to strengthen its research, encourage multidisciplinary collaboration, increase students' involvement in research, and disseminate results, the Computer Science Department is creating a seminar series, which will be held fortnightly.

  Once a month, Faculty members of the COTS, as well as students, will meet for an informal research meeting. Participants will be able to present either current research, general ideas research directions in their initial phase, or problems they would like to tackle. The aim of this meeting is to foster a computing-centric research culture in the College Of The Sciences, as well as disseminate ideas and results.

  The other monthly meeting will be a more traditional presentation where students and Faculty alike, will present published research, or results to be presented to a conference, thus using the seminar to rehearse the presentation. Whenever possible, the seminar will also encourage outside speakers to present.

- Revamp the current workload split – teaching : scholarship : service
  The main thrust of this point is to allow the growth of an already strong faculty in the direction of national recognition. The current split for department faculty is about 80:13:7. This ratio that is typical for the university with teaching focus. However, the research productivity of the department over the last 10-15 years has changed dramatically. It is at the level of a university with a research focus. Consider just few examples, for the last decade the department with only 5 full time faculty has produced two books published by Springer, over 100 papers in leading conferences and journals, including papers with undergraduate students. The faculty chaired 3 international Computational Intelligence Conferences (2006, 2007, 2009). In addition, grant activities also have been at the level of the research universities. For instance, in 2002 out of 8 research projects funded by NGA in the whole country (mostly from research universities) two winning proposals were from CWU CS dept out of about 70 proposals.

  Next consider the similarity in comparing the publication productivity of CWU and WSU computer science faculty. CWU faculty are highly competitive in terms of the number and the quality of publications. This happens while WSU computer science has a doctoral program to support its research and yet CWU computer science has only bachelors program.

  Based on this, we believe that we have demonstrated that the productivity is sustainable. We also believe that revamping the workload split would help to lend visibility to the program. Thus it is an aspiration of the department to move over the next three to five year to a workload split of 60:30:10 that more nearly reflects this type of research productivity. It is expected that the resources for this move would need to be found both:

1) with self-generated by grants, the proposed masters' program and 2) with local CWU funding.

B. In this context, describe ways the department or unit plans to increase quality, quantity, productivity, and efficiency as a whole and for each program. Provide evidence that supports the promise for outstanding performance.

Given that the faculty believes that the program has generally been successful and that the faculty have been highly productive, we believe that continued success will rely first on our current methods. This includes conducting an annual assessment process that leads to continued incremental improvement in the program. This includes an annual faculty evaluation with a focus on self-evaluation, setting goals, and peer review. We believe that the evidence of outstanding performance stands with the results that have been currently achieved.

We also believe that the time is right for a big step forward in the visibility of the computer science program. The faculty have already demonstrated the ability to successfully collaborate with our colleagues. Three of the aspirations above would work directly to build departmental and university recognition: the proposed masters' degree, the revitalized seminar series, and the development of an advisory board. Finally, the last aspiration would ensure that the faculty have the time to implement all phases of this new direction.

C. What specific resources would the department need to pursue these future directions?

As noted above, it is not surprising most of the resource needed relate to the current budget crisis. In summary they would be (not necessarily in ranked order):

- Resources to restore three electives per term to the undergraduate curriculum.
- Resources to restore adjunct instructors, particularly the two with sufficient course assignments (greater than half-time) who qualified for consideration were promoted to Senior Lecturer.
- Resources to revamp the workload split of the faculty.
- Resources to share (with other departments in COTS) the hiring of an additional engineer.
- Resources to maintain instructional labs with state-of-the-art computing equipment.
- Resources to replace and maintain the equipment in faculty and staff offices.
- Resources to upgrade equipment in the department's research labs.
- Resources to add instructional media equipment installed in the two remaining instructional labs.
- Resources to complete air conditioning the faculty and staff .

D. What do you want us to know that is not included in this self-study.

We believe that the preceding discussion has captured an accurate picture of the program and the department.

IX. Suggestions for the program review process or contents of the self-study?