Assessment of Student Learning Plan (ASLP): Computer Science

2013-14 Academic Year

University of Southern Maine

A. College, Department, Date

College ____CSTH_____
Department ____Computer Science_____
Date ___*9/15/2014*_____

B. Contact Person for the Assessment Plan

*Name and title:_Charles Welty, Emeritus Professor*_____

C. Degree Program

*Name of Degree Program:_B.S. , Computer Science*_____

D. Assessment of Student Learning in Your Program

Step 1: Identify Student Learning Outcomes ***(What are students able to do by the end of your program?)***

First we see the higher level outcomes for the Computer Science major

Mission Statement of the Department of Computer Science

- The Bachelor of Science in Computer Science prepares the student for continued study at the graduate level and/or a career in industry and success in their future career pursuits.
- Graduates have the ability to communicate well with others.
- Graduates have the knowledge and skills that enable them to participate in life-long learning and to adapt to an ever-changing technological environment.
- Graduates have the ethical background to deal successfully with the social and technical ethical problems that will inevitably arise in their lives and work.

Program Educational Objectives

List the program educational objectives and state where these can be found by the general public.

Graduates of the USM Computer Science Program have achieved appropriate success in their chosen field in industry and/or academia through their:

- knowledge of computer science
- proven ability to solve complicated technical problems
- proven ability to communicate with their peers, supervisors and subordinates
- continued active participation in life-long learning to adapt to an ever-changing technological environment.
- ethical commitment that allows them to deal successfully with the social and technical ethical problems that have and will continue to arise in their lives and work.

This success is reflected in their job satisfaction, the respect of their peers, their highly responsible and valued work, and their competitive salaries.

a. List 3-5 of the most important student learning outcomes for your program.

(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline
(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
(d) An ability to function effectively on teams to accomplish a common goal
(e) An understanding of professional, ethical, legal, security and social issues and responsibilities
(f) An ability to communicate effectively with a range of audiences

b. Then, identify which student learning outcomes were assessed this past academic year

(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline
(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

Step 2: How and When were the Learning Outcomes assessed?

a. *Briefly describe the assessment tools, measures, or forms of evidence that were utilized to demonstrate students' accomplishment of the learning outcomes selected.*

Examples of direct measures (graded by using a rubric): comprehensive exams, performance tests, papers or essays, case studies, collection of student work/portfolios, presentations or exhibits, individual or group projects, research studies, internships/practicum, etc. Examples of indirect measures: surveys or questionnaires, or documentation of focus groups, interviews, perceptions of advising or departmental services, and tracking performance or grade studies.

Example ***Assessment report: COS 350 – Systems Programming, Spring 2013, Prof. Boothe (This example is all in italics.)***

Assessment Evaluation Matrix:

Course Outcome	***Specific assignment, test problem or other work evaluated, number of points and percentage of grade.***
(Objective C) *Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.*	*C-1 Program 3 – Students write a file submission program that reads, creates, and copies files and directories. 100 points.* *C-2 Program 4 – Students write a text scrolling program that uses timers and signal handlers. 100 points total, Objective C based on 80/100 points.*
(Objective F) *Demonstrate effective communication skills by writing a Unix style man page.*	*F-1 Program 2 - Students write a program to perform compression, and are asked to write a UNIX style man page for it. This manual page is assessed as part the written communication for this course. It is graded on inclusion and coverage of key topics, as well as formatting & organization, spelling, grammar, and punctuation. 100 points total, Objective F based on 20/100 points* *F-2 Program 4 – Students write an interactive text scrolling program and a man page for it. Assessed the same as in F-1.*
(Objective I) *An ability to use current techniques, skills, and tools necessary for computing practice.*	*I-1 Midterm – This is assessed on 5 midterm questions asking about using a variety of Unix commands. 100 points total, Objective I based on 25/100 points.* *I-2 Final – This is assessed on 5 final exam questions asking about using a variety of Unix commands. 100 points total, Objective I based on 15/100 points.*

Assessment Rubric:

Score → ***Objective*** ↓	*Excellent* *5*	*Very Good* *4*	*Good* *3*	*Fair* *2*	*Poor* *1*
(Objective C) Design and implement a Computer Based System ***C-1 Prog 3. Writing a file submission program*** ***C-2 Prog 4. Writing a text scrolling program***	*Perfect – all issues correct* *(losing 0 points)*	*only small flaws or incomplete parts* *(losing <= 10 points)*	*mostly works but some significant issue* *(losing 11 to 20 points)*	*multiple significant flaws* *(losing 21-30 points)*	*many problems or very incomplete solution* *(losing > 30 points)*
(Objective F) Effective written communication ***F-1 Writing a man page for program 2*** ***F-2 Writing a man page for program 4***	*Clearly covers all the important points. Document is well formatted and organized. No grammatical errors.*	*1 or 2 minor mistakes.*	*3 or 4 minor mistakes*	*A readable and usable man page but contains major errors or omissions.*	*Man page was either not turned in, or poorly done.*
(Objective I) Use current techniques, skills, and tools ***I-1 Midterm exam questions on using Unix*** ***I-2 Final exam questions on using Unix***	*Perfect score 25/25 points* *Perfect score 15/15 points*	*20-24* *12-14*	*17-19* *10-11*	*15-16* *8-9*	*< 15* *< 8*

Assessment Data:

	C. Design and Implement Computer Based System…			***F. Effective Communication***			***I. Use current techniques, skills, and tools***		
Student	***C-1***	***C-2***	***Average***	***F-1***	***F-2***	***Average***	***B-1***	***B-2***	***Average***
	5		*5.0*	*3*		*3.0*	*3*	*5*	*4.0*
Names omitted	*5*	*4*	*4.5*	*4*	*4*	*4.0*	*4*	*5*	*4.5*
	5	*5*	*5.0*	*5*	*5*	*5.0*	*4*	*5*	*4.5*
	5	*3*	*4.0*	*5*	*5*	*5.0*	*4*	*5*	*4.5*
	5	*3*	*4.0*	*5*	*5*	*5.0*	*4*	*5*	*4.5*
	5	*2*	*3.5*	*5*	*5*	*5.0*	*5*	*5*	*5.0*
	2	*3*	*2.5*	*5*	*5*	*5.0*	*3*	*4*	*3.5*
	5	*4*	*4.5*	*4*	*5*	*4.5*	*4*		*4.0*
							3		*3.0*
	5	*4*	*4.5*	*5*	*4*	*4.5*	*4*	*4*	*4.0*
	2	*3*	*2.5*	*5*	*5*	*5.0*	*5*	*4*	*4.5*
				4		*4.0*	*4*		*4.0*
	5	*4*	*4.5*	*5*	*5*	*5.0*	*5*	*5*	*5.0*
	5	*5*	*5.0*	*4*	*5*	*4.5*	*3*	*5*	*4.0*
	5	*5*	*5.0*	*5*	*5*	*5.0*	*5*	*4*	*4.5*
	5	*4*	*4.5*	*4*	*4*	*4.0*	*3*	*5*	*4.0*
	5	*5*	*5.0*	*5*	*5*	*5.0*	*5*	*3*	*4.0*
Average Score /									

Averages do not include non-participatory students

Distribution:									
Excellent [5.0]			*33%*			*56%*			*12%*
Very Good (5.0-4.0]			*47%*			*38%*			*76%*
Good (4.0-3.0]			*7%*			*6%*			*12%*
Fair (3.0-2.0]			*13%*			*0%*			*0%*
Poor (2.0-0.0]			*0%*			*0%*			*0%*

Analysis & Conclusions:

My goal for these assessments is for an average score of at least 4.0, corresponding to the "Very Good" level of performance. I expect there will always be some lower performing students that do not reach this level.

Objective C - Design and Implement Computer Based System: *Students like to write programs and overall did very well on this aspect of the course. The average assessment score was 4.27. I am satisfied with student achievement in this area.*
Objective F - Effective Communication: *On two of the assignments students were asked to write a UNIX style man page documenting the program that they had created. In the 2010 assessment a number of students did not take this aspect of the assignment very seriously and produced sloppy work. Based on that assessment, I rewrote the guidelines for the man pages stating more forcefully that I expect proper spelling, punctuation, formatting, and coverage of all key topics. That seems to have worked. All but 1 student did excellent or very good work this semester. The overall average for this assessment improved from 3.96 to 4.59. I am satisfied with student achievement in this area.*
Objective I - Use current techniques, skills, and tools: *We discuss a large number of UNIX commands/tools over the course of this class. I expect the students to start using these tools and gaining familiarity with them. On both exams I have a page of questions asking how students would perform various tasks, and expect them to know what commands/tools to use. In the 2010 assessment approximately 1/4 of the class performed poorly or fairly in this area. Based on that assessment, I created additional small daily assignments which I called experiments. These experiments required the students to write small C programs utilizing the C topic of the day, or more often to use the Unix command of the day to perform some task. The overall average for this assessment improved from 3.56 to 4.21. I am satisfied with student achievement in this area.*

b. Briefly describe when and how you implemented the assessment activity.

Assessment Schedule

Assessment is done every semester on the following schedule (in the following, a year is an academic year, e.g., if the listed year is 2012 it means fall 2012 and spring 2013, listed below as 2012-2013):

3 year schedule. Using Year mod 3, e.g. 2010 mod 3 = 0, 2011 mod 3 = 1, 2012 mod 3 = 2.

Year mod 3 = = 0: All 100 and 200 level courses used for the major. (Academic years 2010-11, 2013-14, 2016-17 ...). Also any courses not assessed in the preceding 3 years.

Year mod 3 = = 1: All COS 300 and 400 level courses offered. (Academic years 2011-12, 2014-15, 2017-18, 2020-21 ...).

Year mod 3 = = 2: All 300 and 400 level courses not assessed last year, when year mod 3 was 1 (Academic years 2012-13, 2015-16, 2018-19, 2021-22...)

Mapping of courses to objectives

Student outcomes table (with faculty course assignments) Course fonts: **Bold – Required Upper Level**, Plain – Required Lower Level *Italics - Elective*									
	Alagic	Bantz	Boothe	Briggs	Congdon	Houser	MacLeod	Rad	Welty
(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline	**360** *4/579*	160 161 *4/595*	**485** 160 285 *455*	160 161 280	160 *472*	*399*	160 161 *452*		160
(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	**360** *4/571* *4/579*	161 160 *4/544*	**485** 160 285	160 161	160		160 161 **420**		160
(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs	*4/571* *4/578*	*4/595*	**350** *455*	*4/569*	*472*	**450** *399* *460*			*368*
(d) An ability to function effectively on teams to accomplish a common goal	**430**	*4/544*		*4/569*	*472*		**420** 476		
(e) An understanding of professional, ethical, legal, security and social issues and responsibilities				**457**				**398**	*368*
(f) An ability to communicate effectively with a range of audiences	**Distributed throughout the program, all courses except COS 420 and COS 479.**								

Step 3: Process of Using the Assessment results to Improve Student Learning

a. *Briefly describe your unit's process of reviewing the program assessment results, and how you expect to improve student learning.*

Four Year Generic Assessment Schedule

(Spring Semester of year n through Fall Semester of year n+ 3, where n is divisible by 4.)

Spring n through Fall n+1 Assessment Cycle (where n is divisible by 4)		
Academic Semester	Item	Action
Spring n (e.g. 2012)	Questionnaire - Alumni	Distribute January
	Questionnaire - Supervisor	Distribute March
	Questionnaire - Graduating senior	Distribute May
Fall n	Submitted Questionnaires	Analysis – Summer, Fall
	Assessment Coordinator's Report to Faculty	Preparation
Spring n + 1	Assessment Coordinator's Report to Faculty	Presented at First faculty meeting – (Jan. or Feb.)
	Faculty Decision and Recommended Actions	Next faculty
	Initial Implementation of Faculty Decisions and Recommended Actions	Immediately after decisions are made.
	Questionnaire - Graduating senior	Distribute May
Fall n + 1	Continuing Implementation of Faculty Decisions and Recommended Actions	Fall 2005 – e.g. Update catalog, etc.
Spring n + 2 through Fall n + 3 Assessment Cycle		
Academic Semester	Item	Action
Spring n + 2	Questionnaire - Graduating senior	Distribute May
Fall n + 2	Submitted Questionnaires	Analysis – Summer, Fall
	Assessment Coordinator's Report to Faculty	Preparation
Spring n + 3	Assessment Coordinator's Report to Faculty	Presented at First faculty meeting – (Jan. or Feb.)
	Faculty Decision and Recommended Actions	Next faculty meeting
	Initial Implementation of Faculty Decisions and Recommended Actions	Immediately after decisions are made.
	Questionnaire - Graduating senior	Distribute May
Fall n + 3	Continuing Implementation of Faculty Decisions and Recommended Actions	Update catalog, etc.

Most improvements in the program have come from individual faculty members changing their courses based on the assessments. These are illustrated in the example (COS 350) in the previous section.

Usually at least a week after the end of each semester we have a faculty meeting whose sole purpose is to discuss what we have assessed or otherwise determined in our individual courses with the aim of disseminating the information to the rest of the faculty. Each faculty member brings their individual assessment report or reports to this meeting. They are then presented and discussed in detail. These are often wide ranging discussions. All faculty are active participants in this.

The stakeholder questionnaire results, especially from program alumni, have shown that students were not adequately prepared for the amount of written and oral presentations needed in the work place. This motivated us to have either written or oral presentations required in nearly all of our courses. We also now require ITP 210 (Technical Writing) in addition to the standard core English classes and Public Speaking (THE 170).

The reduced funding in the university, school and the Computer Science Department has resulted in faculty teaching the labs. This does have the benefit of faculty learning more about student problems and being more involved in resolving (or trying to resolve) them.

We find it very difficult to motivate non-computer science majors in COS 160 (CS1). At the end of each semester we meet and review the assessed courses for that semester. This time we reviewed 100 and 200 level courses. The prime problems found were in COS 160. Computer science students were quite well motivated but students in other majors were found to be lacking in interest and effort. We spent time discussing this and made no decisions other than to reduce the amount of work assigned in the labs.

Over the years we have seen this same problem and have done a better job of assigning more interesting programs and labs. COS 160 is a course that requires much vigilance and thought.

Assessment Coordinator

The assessment coordinator may be a volunteer, appointed by the department chair or voted in by the department. The assessment coordinator does not have reduced departmental committee responsibilities for the term. It is improbable that release time or funds will be available to the coordinator in the future.

The assessment coordinator is responsible for distributing and collecting the questionnaires. He is responsible for analyzing the questionnaires and making initial suggestions on how to approach problems found. He reports to the faculty as described below. The faculty is responsible for making decisions based on the coordinators report and any additional material that the faculty needs.

Assessment Reports

The assessment report is presented at the first faculty meeting of the odd-numbered year. Remedies and actions are discussed and implemented, if possible. Some remedies and actions require further discussion, more research, and/or more deliberately paced actions. These items are handled by a departmental committee headed by the assessment coordinator. The goal is to have addressed and taken action on as many report items as possible before the beginning of the next even-numbered year. Example reports are in Appendix E.

Possible Actions Taken

Primary changes could be to the curriculum and, thus, the catalog. Other changes could be in resources made available to students. For example, we have meetings with the Career Services people to acquaint students with the resources available there. There could be changes to faculty interactions with students such as office hours, web pages, etc.

Certainly the assessment may cause the questionnaires to be changed or new assessment procedures and tools adopted.

The primary constituency of the Computer Science program is each Computer Science student. Meeting student needs implies meeting the needs of other constituencies for their education, work and life.

1. Students
   We meet the need of students in their years of study by providing relevant, well-taught courses. The goal of providing these courses is aided by student evaluations of courses each semester, discussion with faculty and survey feedback from these students at the time of graduation and, later, as alumni. On-going course and program assessment is also a major component in ensuring that student needs are met. Other constituencies also affect the courses provided, see the following sections.
2. Alumni
   We are fortunate that many of our alumni stay in the area and keep in touch with the department. Even those at some distance (e.g. Hawaii, Japan, Seattle, etc.) are in contact with us through LinkedIn and other sites. We are interested in how they are doing from both their perspective and that of their employers, see below. We survey recent alumni every four years. These are alumni who graduated three to five years previously. Several alumni have contacted the department to find current students and graduates to work at their places of employment. That our alumni wish to work with our students speaks well of the department.
3. Employers
   A prime constituency is the employers of our students. Our students are very career-oriented. Meeting the need of employers, while keeping the intellectual integrity of the

department intact, is an important task. We survey immediate supervisors of our alumni every four years. The results of these surveys show our alumni to be valued employees and the companies tend to want more of our graduates. Our main formal contact with employers is our Computer Science Industrial Advisory Board, see below.

4. Computer Science Industrial Advisory Board

The Computer Science Industrial Advisory Board has been very helpful in proposing new courses and directions for the department. It meets two to three times a year with occasional subgroups meeting more frequently. We have been very impressed with the broad view taken by the Board members. They know that our students have learned enough different systems in their studies and have the background to learn new systems that they do not require specific systems to be taught. When the Dean added the policy that many third year courses and all fourth year courses be offered only every other year, the Board considered the options and, in consultation with the faculty, helped us come up with a restricted elective policy that implemented the Dean's policy. For example, students could either take Operating Systems or Database Systems to fulfill a requirement. Many faculty thought the Board would be in favor of only the database course because of its nearly ubiquitous applications. The Board and the faculty are the only groups that are not surveyed. The Board is almost completely responsible for our new courses in Software Project Management and encouraged our new courses in Computer Security.

Over the past few years, the Board has been more involved in non-curricular activities due to the changes in Computer Science employment. Maine has an aging information technology work force. The Board took the initial initiative to address the need for a more widely focused internship program. Fortunately another industrial group started an IT web site giving information about IT and internships and jobs. Another concern of the Board not directly affecting the Computer Science program was the interest in starting a separate, ABET-accreditable B.S. in Information Technology. This proposal now has a separate life of its own. Both of these initiatives were started due to the State of Maine wanting to double the number of IT graduates in the next 4 years. We did not think anyone else was really looking at these needs but, perhaps somewhat through our efforts, they are now being addressed by others. The Board is now going back to more advising on the Computer Science program itself.

The prime result of the efforts to increase IT graduates is Project>Login . This site educates our students and the general public about IT professions, educational opportunities as well as job and internships.

Improvements

Most improvements in the program have come from individual faculty members changing their courses based on the assessments. These are illustrated in the example (COS 350) in the previous section.

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The stakeholder questionnaire results, especially from program alumni, have shown that students were not adequately prepared for the amount of written and oral presentations needed in the work place. This motivated us to have either written or oral presentations required in nearly all of our courses. We also now require ITP 210 (Technical Writing) in addition to the standard core English classes and Public Speaking (THE 170).

The reduced funding in the university, school and the Computer Science Department has resulted in faculty teaching the labs. This does have the benefit of faculty learning more about student problems and being more involved in resolving (or trying to resolve) them.

A specific improvement has been to add a lab to COS 1561, the second required course in the major. Student responses on the general USM student evaluations, faculty observation and faculty/student discussions during advising showed that the transition from COS 160 (the entry level course taken by many majors) to COS 161 (taken only by students majoring or minoring in Computer Science) was too great. Students needed more time and instructor aid to successfully complete COS 161. We added a 1 credit lab to the course for this purpose. Subsequent assessment has shown it to be a worthwhile curricular change.

Start planning for next academic year: Assessment is an ongoing process.

The plans for the next 3 -4 years are specified in the above. The 3 year direct assessment schedule and the 4 year questionnaire schedule are given above.