Assessment Based Changes

While not all program improvements have been associated with a single student outcome, most have. In the outcome column of the following table, the letters given correspond to the following outcomes. The outcomes listed with capital letters correspond to the learning objectives that were in place prior to 2010. The outcomes listed with lower case letters correspond to the student outcomes that are currently in place.

A. Proficient in programming in at least two programming languages
   Mastery level background
B. Principles and practices for problem/solution analysis and design
C. Data structures and algorithms
D. Computer architecture and organization
E. Programming languages
F. Operating systems
G. Theory of computing
H. Software engineering
I. Possess an understanding of the practices and dynamics required to develop software whether it be a single program or a major software product developed in a team environment
J. Proficient in the use of mathematical tools including discrete mathematics, calculus, elementary statistics, and probability
K. Understand the basics of the life sciences, the scientific method, basic chemistry, and molecular biology
L. Understand the basics of information and database systems and their implementation
M. Understand basic business, accounting, and economic practices
N. Understand the basics of team and organizational leadership principles
O. Understand the basics of science, and specifically the scientific method
P. Have an understanding and appreciation for the arts, humanities, and social sciences, and their importance in today's society
Q. Possess sufficient fundamental knowledge of computer science to be a life-long learner
R. Understand the social and ethical issues which face computer scientists, and thus be able to contribute to society in a positive and productive manner
S. Able to communicate information effectively both in writing and orally.

1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
3. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
4. An ability to function effectively on teams to accomplish a common goal.
5. An understanding of professional, ethical, legal, security and social issues and responsibilities.
6. An ability to communicate effectively with a range of audiences.
7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
8. Recognition of the need for and an ability to engage in continuing professional development.
9. An ability to use current techniques, skills, and tools necessary for computing practice.
10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
11. An ability to apply design and development principles in the construction of software systems of varying complexity.

Outcome	How measured	When measured	Needed Improvements Identified	Improvements Implemented
A,B,C,D,E,F,G,H	On-going yearly review of text books by text book committees	Spring of each year	On-going improved teaching material and content	New texts chosen
T	Department head exit survey	Spring 1998-1999	Poor job interview skills

Lack of knowledge of job search process(es) | CS3000 implemented – specific assignments on resume writing and Career Services lectures |
| ALL | Department head exit survey | Spring 1998-2000 | Women in program often feel isolated | ACMW chapter implemented |
| ALL | Department head exit survey | Spring 1998-1999 | Senior year electives not well understood | CS3000 implemented – Faculty lectures given on each of the 5000-level electives available |
| All | Department head exit survey | Spring 1998-1999 | Some students indicate a reluctance to speak out | Anonymous e-mail site set up

Note: Removed in 2003 because some e-mails not appropriate |

P,R,T	Exit surveys and general faculty "impressions"	Spring 1999	Need for more social interactions with majors	1-ACM chapter with faculty adviser formed 2- Computer Science dormitory floor established in Greaves Hall. (2003) 3-Graduating senior banquet held each April 4-Lounge room established on fourth floor of Old Main
A,B,C,D,H,I,T	Industrial Advisory Board input, Alumni survey results	2000	Suggests more experience in developing large software products	1 - Upper division credit requirement implemented to "encourage" taking one 4-credit project class
Retention Goals	Retention rates low	Fall 2000	1 - Must better meet needs of women in program 2 – Better advisement needed	1 - ACMW chapter started 2 – Full time undergraduate adviser hired

B,C,I	1 - ABET review 2 – Faculty committee review for CS1700, 1720, 2200	2000, 2002	Lack of solution design in core curriculum	1-First four weeks of CS1700 give emphasis to problem solving, using a simple pseudo-language. Programming language syntax not discussed during this time 2- UML used and emphasized in CS2370
A,B,C,E	Faculty reviews of CS1700, 1720, 2200	Spring 2001	Steep learning curve results in C/C++, lack of understanding by students of basic CS topics	1 - Worked with student services to establish supplemental instruction for students 2 – Moved some material in CS2200 to CS5050 and made CS5050 required for all options
A,B,C,H,I,J,L	Faculty meeting discussions	Spring 2001	Need for students to have programming contest opportunities to "hone" their skills	ACM and ACMW chapters begin sending teams to ACM programming contest
R	Frequent copying of programs, etc. noted in numerous classes	Spring 2001	Better and more uniform notification of department code of conduct requirements	Cheating policy required on all department syllabi

B,C,G	CS2200 committee analysis of student performance vs objectives	Spring 2001	1- Objectives not adequately met 2- Some material in CS2200 not critical to subject	Some material moved from CS2200 to CS5050 to give more time and emphasis to core algorithms and data structures material.
Q	University Goals and Objectives	Spring 2002	Life-long learner as a University-wide Objective	Added life-long learner as department objective Self-evaluation question put on exit survey
A,B,C,D,H	CS3000 advanced standing exams	2002-2003 exam scores	Advanced standing exam scores relatively low – especially analysis of algorithms	1 - Increased from 2 to 4 the number of lectures on the placement exam subjects 2 – To encourage studying for exams, implemented a $20 fee for retakes 3 – CS1720 and CS2200 give more emphasis to algorithm analysis

R,T	1 - CS3000 discussions 2- Department exit interviews 3 - Graduating senior exit surveys showed poor interest in Philosophy (ethics) class 3 – Grades in Engl 1010 and 2010 high but resume/cover letter writing poor (CS3000)	2002-2003	Need for another writing opportunity with emphasis on ethics	Added ethics lectures (4) and ethics paper to CS3000 class The quality of writing on this paper is considered and must be adequate to pass CS3000
K, L, M, N	1 - Department exit interviews 2 – Review of Job openings data 3 – transfer out survey information 4 – College of Science Bioinformatics Committee	2002-2003	Interest in other options, especially 1 –Bioinformatics 2 – Inf Tech (less math)	Bioinformatics and IT options approved
A,B,C,D,F	On-going yearly review of laboratory facilities	Spring 2003	Need for improved teaching room and laboratory for Linux instruction	1 - New lab developed for SER 005 – 38 systems, with teaching console 2 – Dual boot (XP/Linux) lab of PC's for CS3100 class (Main 428 – 12 systems)
A,J	1- Department Head exit interviews 2 – Meeting with Math/Stat faculty	Spring 2003	1- Desire for additional program. Language (C#) 2- Want coop counted in curriculum	Increased upper division requirement from 16 to 19 credits, but allowed one <5000-level CS course and up to two appropriate mathematics classes

J	Faculty (department meetings) review of CS3310 curriculum	Spring 2003	Insufficient coverage of topics	Math/Stat adds requested material and increases Math3310 from 2 to 3 credits
D	Advanced standing test results	Spring 2003	Difference between digital and other option performance	Emphasis on test (organization) aligned with CS2550 and ECE 2250
R	Frequent copying of programs, etc. noted in multi-section lower division classes	Spring 2004	Need a more effective means to evaluate and compare code	Use of MOSS software for CS1700, 1720, and 2200 classes
M	Industrial Advisory Board input	2004	Additional business skills would be helpful	Additional business courses added
A,B,C,D,H,I,T	Industrial Advisory Board input, Alumni survey results	2004 Reviewed at department 2004,2005 retreats	Suggests more experience in developing large software products	1 – CS5070 Capstone class made a requirement For Fall 2006
Retention	Exit interview responses from women graduates indicate need for more women-to-women interactions	Spring 2003	Better meet needs of women majors	Request made for funding for USU WISE chapter Budget cut eliminated program)
H,I	Industrial advisory board	Spring 2006	Need for more real-world projects	Meetings held with local industry for CS5070 project suggestions
A	Industry advisory board	2000, 2004, 2006	C++ most important language	C++ remains as initial teaching language

K	College of Science Bioinformatics meeting	Spring 2006	Need for a general bioinformatics class for multiple majors	CS5890 – Topics in Bioinformatics added for summer 2006- taught by CS, Biol, Stat, CIB personnel
All	Department meeting discussions ABET Fall 2005 meeting	Spring 2006	Need for course level objective assessment	Faculty course self-evaluation form designed and used
Retention	Majors data from Planning and Analysis	Fall 2004-Fall 2006	Need for more women and minorities in the major	"loaned" surplus computers to local charter school with faculty supervision Fall 2007
Retention	Drop-out rate in program	Fall 2004-2006	Need for a more "student friendly" learning environment in early programming classes	Implemented pairs programming paradigm for introductory classes Fall 2007
D	Assessment of CS2550 and CS2810 classes	Fall 2006 Spring 2007	Need for more background in architecture and less organization	Redesign of Architecture sequence – Fall 2008 – CS2810, 3810
H, I	Department meeting and Faculty course assessments	Fall 2006, Spring 2007	Additional background on system requirements, and projects	Expansion of CS2450 class from one to two semesters with added material Fall 2008
A,E,F,L	Industry advisory input, new faculty input	Fall 2006-2007	Opportunity for additional instruction in computer security	CS5460 – new elective class in computer security Fall 2007

A,B,C	Course self-evaluations filled out by faculty Adviser input on reasons for leaving CS as a major Student performance (assessment) on homework assignments in CS1400, 1410, and 2420	Fall 2006-2008	More opportunities for collaboration and tutoring in early classes	Opened tutoring lab in SER 005 lab room Increased number of tutor hours in Main 425 tutor room Implemented and allowed pairs programming in introductory classes
A,B,C,D,E,F,G,H,I	Alumni surveys, Industry advisory board, course self-evaluations	Fall 2007	Students need a capstone experience to show the ability to use the skills they have obtained in the program	Added CS5070 COmputer Science Capstone class (1 credit) to required curriculum
T	Evaluation of w ritings produced by students in CS3000 class	Fall 2007-Fall 2008	Writing skills not adequate	Added English 2010 and the CIL tests as prerequisites for CS3000
T	Evaluation of w ritings produced by students in CS3000 class	Fall 2007-Fall 2008	Grammar skills not adequate for effective written communications	Added grammar test to CS3000 class - Spring 2009 must pass at 75%
NA	Exit interviews with graduating seniors and adviser input from majors advising	Fall 2006-Fall 2008	Need for more opportunities for women to interact with other women in the major	Assigned Vicki Allan and Renee Brycs (2008) as ACMW advisers and gave additional funding for social and educational activities

| D | Alumni surveys, industry advisery board input, technical literature | Fall 2008 | No longer a need for an entire semester of Boolean logic/Algebra | Eliminated CS2550 (Logic Design)

Put 4 weeks of Logic in CS2810

Added CS3810 with emphasis on networking and advanced multi-core architectures |
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| H,I | Industry advisory board input

self-evaluations of courses by faculty | Fall 2006-Spring 2008 | Students were not getting sufficient time to do a quality project and its associated documentation | Changed fro one semester of software engineering (CS2450) to a two semester sequence CS2450, CS3450 |
| A,B,C,D,E,F,G,H,I | Faculty team evaluations of student projects in CS5070 | Fall 2008-Spring 2009 | Insufficient time and course credit to build projects of magnitude desired | Made CS5070 (1 credit) a course in which only analysis, design, and testing plan are produced

Made CS5071 (3 credits) a course in which product is implemented and tested, and documentation is produced. |
| b, c, i, k | Senior Exit Survey
IAB Survey
Alumni Survey | 2008, 2009, 2010 | Early-program mobile apps class needed | Added CS3200 Mobile Apps (iOS and Droid) |
| b, c, i, k | Senior Exit Survey
IAB Survey
Alumni Survey | 2008, 2009, 2010 | Early-program web application class | Added – CS2610: Developing Web Applications |
| b, c, i, k | Senior Exit Survey
IAB Survey
Alumni Survey | 2008, 2009, 2010 | Early-program GUI/Java class | Added – CS2410: Introduction to GUI's – Java class |

b	Senior Exit Survey IAB Survey Alumni Survey	2010, 2011	Insufficient room in program to maintain two-semester architecture sequence	CS2810/3810 restructured to one-semester CS3810
c, d, e, f	Faculty Survey	2010, 2011	Insufficient room in program to maintain two-semester software engineering sequence	CS24450/3450 restructured to one-semester CS3450 – CS3450 applied for communication-intensive designation
c, d, h, k	Faculty Survey	2011	Capstone courses need to be more closely aligned with senior material	CS5070 merged into 4-credit senior design classes.

SO(b), SO(d)	Exit interviews with graduating seniors, Industrial advisory board, faculty discussion	Fall 2011	Students not getting enough structure in capstone experience	Removal of capstone course. Capstone experience folded into senior electives.
SO(b)	Exit interviews with graduating seniors and adviser input from majors advising	Fall 2011	Circuits sequence inappropriate for digital systems	ECE requirements changed to ECE2700,2250,3710,5780
Continuous Improvement Process	Review of continuous improvement processes	Fall2012	No PEOs No Course Direct Measures	Adopted PEOs for each of 5 emphases Adopted new CDM structure
SO(a), SO(f), SO(j)	Exit interviews with graduating seniors and adviser input from majors advising	Fall2013	No students taking bioinformatics option, confusing requirements in all options	Adopted new, more streamlined requirements definition, removal of several deprecated graduation paths
Continuous Improvement Process	Review of continuous improvement processes	Fall 2015	SO assessments too aggregate	CDMs should use a single question directed specifically at one SO
Senior Exit Interviews	Review of Program with Students	Fall 2015	Students seem oblivious to computer ethics	Ethics segment added to CS3450
SO(c)	CDM data assessment	Fall 2015	Students unprepared for many CS3 subjects	CS1, CS2, CS3 to be coordinated across all sections
SO(c), SO(j)	Sophomore Seminar Exam	Spring 2016	Wish to improve attainment in exam	Preprofessional curriculum standardized, control over subjects covered placed in UCC