Program Assessment Report

Bachelor of Science in Computer Science
2014-2015

Compiled by

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1. INTRODUCTION

To have computing programs that meet the needs of their many constituencies, continuous program evaluation and improvement is necessary. The Computer Science (CSCI) department at CSU, Chico has developed a program improvement process that is designed to achieve departmental program objectives that are based on the mission statements for the University, College, and Department. The above-mentioned constituencies include the faculty, employers, alumni, and students. Each group provides detailed information at some point in this process. The department's mission has been designed to reflect the mission of the College of Engineering, Computer Science and Construction Management and of the University.

The mission and objectives of the Computer Science department’s Bachelor of Science in Computer Science (CSCI) program is reviewed at least once every six years by representatives of all constituencies. Embedded assessment, senior exit surveys, and industry advisory board semi-annual meetings are primary sources of input. The faculty, as a whole, evaluates the inputs to decide if any changes in the objectives are warranted. If changes are made, the assessment plans are revised to reflect the changes. The CSCI department is responsible for verifying that its graduates satisfy the educational objectives of its programs. The CSCI department’s assessment plans for both of its programs are posted on the department website at http://csci.ecst.csuchico.edu/assessment.

2. Program Educational Objectives

The following sections describe the Mission Statements of:

- the California State University, Chico;
- the College of Engineering, Computer Science and Construction Management; and
- the Computer Science Department and the Department’s program in Computer Science.
These sections also discuss the Program Educational Objectives (PEOs) of the CSCI program and their relationship to the Mission Statements.

2.1. The CSU, Chico

2.1.1. Mission, Vision and Goals Statements

1. **Mission:** California State University, Chico is a comprehensive university principally serving Northern California, our state and nation through excellence in instruction, research, creative activity, and public service. The University is committed to assist students in their search for knowledge and understanding and to prepare them with the attitudes, skills, and habits of lifelong learning in order to assume responsibility in a democratic community and to be useful members of a global society.

*The division of Academic Affairs advances the mission of the University to serve Northern California, the state, the nation and the global community through excellence in learning, scholarship and creativity, and public engagement.*

**Vision:** California State University, Chico sees its distinctive residential context as an opportunity to create an active, diverse, healthy, caring, innovative, and green learning and working environment. We aim to create a vital and collaborative living and learning experience for students, who will appreciate and embrace the local, regional, and global communities of which we are all a part. We have a well-respected and dedicated faculty, a superior staff, and committed leadership together with cutting-edge learning and information resources. All of these assets are placed within a beautiful and engaging physical environment. We are a place devoted to the academy's most fundamental, tenets: reason, respect, civility, and community.

The division of Academic Affairs is a vibrant learning community of engaged students and well-respected, dedicated faculty, staff and administrators that is purposeful, inclusive, collegial, respectful and celebrative. We are known for excellence in learning, especially for our role of facilitating student learning and student success. We acknowledge our public purpose by developing, applying and exchanging knowledge
and expertise for the mutual benefit of our community and our region. We bring about personal, organizational, national and global sustainable development through efforts that are intellectually honest, environmentally friendly, economically sound, politically viable, and socially just. By compelling example and through effective dialogue, we improve the human condition in the twenty-first century.

2.1.2. **University Strategic Goals (USGs)**

1. Enhance student learning—both inside and outside the classroom.
   - Recruit, enroll, retain and graduate a diverse, high-quality student population.
   - Offer excellent and distinctive programs.
   - Deliver active, collaborative and transformative pedagogies.
   - Support student participation in regional, national and international learning opportunities.
   - Ensure access to the most effective information and learning resources.
   - Provide superior student support systems.
   - Demonstrate educational effectiveness.

2. Nurture excellence in faculty and staff.
   - Recruit, develop, and retain a diverse, excellent faculty and staff.
   - Strengthen and integrate teaching, scholarship, student learning and public service.
   - Support professional growth and achievement.
   - Recognize value and celebrate outstanding performance.

3. Educate for a sustainable global society.
   - Deliver curricular and extra-curricular programs for sustainability.
• Promote scholarly and creative activities in sustainability.
• Provide regional leadership for sustainable development practices.
• Assist the University to serve as a model sustainable campus.

4. Serve the North State and beyond.
• Address diverse educational needs.
• Stimulate sustainable economic development.
• Support a rich cultural and artistic environment.
• Collaborate through mutually beneficial public engagement initiatives.

5. Strategically manage resources in support of mission, shared values and vision.
• Marshal resources to achieve mission, vision and goals.
• Align all resources to achieve mission, vision and goals.
• Foster a culture of evidence-based planning and decision making across all units.
• Demonstrate organizational effectiveness.

2.1.3. **University Strategic Priorities (USP)**
1. Believing in the primacy of learning, we will continue to develop high-quality learning environments both inside and outside the classroom.

2. Believing in the importance of faculty and staff, and their role in student success, we will continue to invest in faculty and staff development.

3. Believing in the wise use of new technologies in learning and teaching, we will continue to provide the technology, the related training, and the support needed to create high quality learning environments both inside and outside of the classroom.

4. Believing in the value of service to others, we will continue to serve the educational, cultural, and economic needs of Northern California.

5. Believing that we are accountable to the people of the State of California, we will
3. Program Outcomes

Program outcomes are defined as “statements that describe what students are expected to know and be able to do by the time of graduation that enable them to meet the objectives.”

The Program Outcomes for the Computer Science program are listed below:

Our CSCI graduates must demonstrate:

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.

g. An ability to analyze the local and global impact of computing on individuals, organizations, and society.

h. Recognition of the need for and an ability to engage in continuing professional development.

i. An ability to use current techniques, skills, and tools necessary for computing practice.

j. 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.

k. An ability to apply design and development principles in the construction of software systems of varying complexity.
These outcomes are posted on the department web site, at http://csci.ecst.csuchico.edu/assessment/b.s.-in-computer-science/outcomes. They also appear in a number of departmental documents, including the Program Improvement Plans and the CSCI Program Assessment Reports found on the department web site.

### 3.1. Relating Program Outcomes to Program Educational Objectives

Our program outcomes identify what our graduates are expected to know or be able to do upon graduation. These outcomes were updated from our previous Program Assessment Plan to reflect ABET changes to Computing Accreditation Criteria. Table 1, below, lists the program objectives and the specific CSCI program outcomes that relate to each program objective.

**Table 1: Program Objectives X Program Outcomes Matrix**

<table>
<thead>
<tr>
<th>Program Objectives</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
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<td>E</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
All of the program objectives are assessed by examining the attainment of outcomes that that are related to them. Many of the outcomes are themselves measured by embedding them into the course, using direct tests for selected outcomes in the assessment of student performance and in the grading processes. These measures are augmented by indirect assessment of outcomes via exit surveys of graduating seniors, the Major Field Test (MFT) in Computer Science and inputs from the Industrial Advisory Board. Performance on the various outcomes reflects upon the related objectives. Problems encountered in the assessment process may cause the objectives, and the outcomes associated with them, to be re-examined.

The direct assessment used in the outcomes related to objectives A, B, D and E (i.e., outcomes a, b, c, e, g, h and i) is generally well integrated into the curriculum of the courses(s) chosen for the assessment of each Program Outcome. Consider, for example, CSCI 301, which is a core course in CSCI curriculum. This course is designed, in part, to address outcomes that relate specifically to objective D, which states that students will “understand the ethical and technical context of their professional obligations and contributions.” The outcomes are reflected in specific questions included in quizzes and tests for that purpose, and in other measures of classroom performance which are carefully chosen with this intent. Students who are successful in these measures are presumed to have achieved the outcomes targeted by the question sets. Similar rationales exist for every course in which embedded assessment of the outcomes that relate to these four objectives is carried out. Indirect assessments of these objectives are done via periodic surveys of graduates.

Objective C is directly assessed via specific outcomes in courses in which teamwork and/or communication is a major component. Assessment can take the form of determining each team-member’s effectiveness via anonymous reports, or by using a rubric to assess the student’s speaking and/or writing skills. Copies of some of these rubrics may be found in the portion of the department web site devoted to assessment.
Objective F is assessed by the simple expedient of querying graduating students about their employment prospects and by tracking the advancement of their careers. Surveying students’ employment prospects also occurs in the capstone course entitled “Directed Programming Experience,” which serves multiple purposes, including the determination of whether students recognize the necessity for a lifetime of learning to stay current in the discipline. The campus Placement Center maintains records of placements. Unfortunately, the accuracy of these records is impacted by the fact that they are based entirely on hiring that happens within the context of the Center’s interview and placement process: most students either fail to provide follow-up information or obtain positions outside of the formal campus interview process and fail to update the Placement Center’s records. Additional input on this topic comes from the same surveys used to indirectly assess Outcomes associated with Objectives A, B, D and E. Finally, many of the individuals who hold current positions on the Industrial Advisory Board are graduates of the program, and their observations reflect their own experience as well as those of a network of classmates.

3.2. Assessment of Program Outcomes

The Computer Science Department's program assessment cycle/process for CSCI, shown in Figure 1, below, is based on Dr. Gloria Roger's Model for Quality Assurance of Student Learning Outcomes:
Multiple sources of data for individual PEOs or POs are combined using weighted average to take into account the number or respondents contributing to each data source.

To transform percentage ratings (between 0 through 100 inclusive) to a 5-point (5: highest, 1: lowest) Likert scale score, the data undergo a simple linear rescaling.

The department has chosen a “threshold” score of 70% (percentage scale), for satisfactory performance, which converts to a score of 3.5 on a five point Likert scale. Scores of 3.5 or above are the target for all PEO and PO assessments.

3.2.1. Embedded Assessment

Table 2, below, details the current alignment between the program core courses and the program student learning outcomes. The specific courses in which embedded measures were used to assess specific outcomes are shown in Table 3.

The 2014-15 embedded assessment data for CSCI reflected the modified schedule of collection, as the staggered, 3-year collection schedule was replaced with an annual cycle in 2010, that allowed all POEs to be assessed on an annual basis. The new annual assessment
cycle allowed the department to keep much closer tabs on all Program Outcomes. The collection schedule is presented in Table 3.
Table 2: Core Course x Program Outcomes Matrix.

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>Student outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area B3 (of General Education) Course</td>
<td>a    b    c    d    e    f    g    h    i    j    k</td>
</tr>
<tr>
<td>Science Course with a Lab (e.g., NSCI 102, CIVL 175, etc.)</td>
<td>I    I    I    I    I    I    I    I    I    I    I</td>
</tr>
<tr>
<td>CSCI 111 Programming and Algorithms I</td>
<td>I    I    I    I    I    I    I    I    I    I    I</td>
</tr>
<tr>
<td>MATH 120 Analytic Geometry and Calculus</td>
<td>I    I    I    I    I    I    I    I    I    I    I</td>
</tr>
<tr>
<td>MATH 121 Analytic Geometry and Calculus</td>
<td>I    I    I    I    I    I    I    I    I    I    I</td>
</tr>
<tr>
<td>CSCI 211 Programming and Algorithms II</td>
<td>P    P    P    P    I    I    P    P    P    P    P</td>
</tr>
<tr>
<td>PHYS 204A Mechanics</td>
<td>P    I    I    I    I    P    I    P    I    P    I</td>
</tr>
<tr>
<td>PHYS 204B Electricity and Magnetism</td>
<td>P    P    I    I    I    P    I    P    I    P    I</td>
</tr>
<tr>
<td>MATH 217, CSCI 217 Discrete Mathematical Structures</td>
<td>P    P    P    I    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>EECE 237 Embedded System Programming (with Assembly Language)</td>
<td>P    P    P    P    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CSCI 301 Computer's Impact on Society</td>
<td>A    A    A    A    A    A    A    A    A    A    A</td>
</tr>
<tr>
<td>CSCI 311 Algorithms and Data Structures</td>
<td>A    A    A    A    A    A    A    A    A    A    A</td>
</tr>
<tr>
<td>EECE 320 Computer Architecture</td>
<td>P    P    P    P    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CINS 370 Introduction to Databases</td>
<td>P    P    P    A    A    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CSCI 430 Software Engineering</td>
<td>P    P    P    P    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CSCI 446 Intro to Comp Networks &amp; Network Management</td>
<td>A    A    P    P    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CINS 448 Survey of Computer Security</td>
<td>A    A    A    P    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CSCI 490 Directed Programming Experience</td>
<td>P    P    A    P    A    A    A    A    A    A    A</td>
</tr>
<tr>
<td>CSCI 515 Compiler Design</td>
<td>P    P    P    P    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CSCI 551 Numerical and Parallel Programming</td>
<td>P    P    P    P    P    P    P    P    P    P    P</td>
</tr>
<tr>
<td>CSCI 580 Artificial Intelligence</td>
<td>P    P    P    P    P    P    P    P    P    P    P</td>
</tr>
</tbody>
</table>

A = assessed, P = practiced, I = introduced
Table 3: Embedded Assessment Cycle for CSCI Classes in 2014-15

<table>
<thead>
<tr>
<th>Course</th>
<th>Core Courses</th>
<th>Fall/Spring</th>
<th>Fall/Spring</th>
<th>Fall/Spring</th>
<th>Fall/Spring</th>
<th>Spring</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 301</td>
<td>An ability to apply knowledge of computing and mathematics appropriate to the discipline.</td>
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<tr>
<td>CSCI 311</td>
<td>An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.</td>
<td>spring</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CSCI 340</td>
<td>An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.</td>
<td>fall/spr.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CSCI 370</td>
<td>An ability to function effectively on teams to accomplish a common goal.</td>
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<tr>
<td>CSCI 431</td>
<td>An understanding of professional, ethical, legal, security and social issues and responsibilities.</td>
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<tr>
<td>CSCI 446</td>
<td>An ability to communicate effectively with a range of audiences.</td>
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<td></td>
</tr>
<tr>
<td>CINS 465</td>
<td>An ability to analyze the local and global impact of computing on individuals, organizations, and society.</td>
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</tr>
<tr>
<td>CSCI 490</td>
<td>Recognition of the need for and an ability to engage in continuing professional development.</td>
<td></td>
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<tr>
<td></td>
<td>An ability to use current techniques, skills, and tools necessary for computing practice.</td>
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<tr>
<td></td>
<td>An ability to apply design and development principles in the construction of software systems of varying complexity.</td>
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<td></td>
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</tr>
</tbody>
</table>

Table 4 below, summarizes the assessment data available since 2009. Annual data collection began in 2009-2010, when embedded data for all outcomes was first collected.
Each score represents the composite of the embedded scores collected in the selected courses (see Table 3, above) and scaled to fit the standard five-point (5: high, 1: low) Likert scale adopted by the department. The Department collects assessment workbooks from all faculty participating in assessment each semester and combines these into a ‘Master Worksheet’ that display all of the data collected and averages the outcome scores when more than one course was used for assessment. An example of a ‘Master Worksheet’ is shown in Appendix C.

Table 4: Trends in Embedded Assessment Data for CSCI Program.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Apply computing/math</td>
<td>3.60</td>
<td>3.47</td>
<td>4.63</td>
<td>4.23</td>
<td>4.08</td>
</tr>
<tr>
<td>b</td>
<td>ID computing reqts.</td>
<td>4.51</td>
<td>4.43</td>
<td>3.81</td>
<td>4.18</td>
<td>4.14</td>
</tr>
<tr>
<td>c</td>
<td>Design/eval system</td>
<td>4.20</td>
<td>4.29</td>
<td>3.93</td>
<td>3.19</td>
<td>3.89</td>
</tr>
<tr>
<td>d</td>
<td>Work on teams</td>
<td>4.58</td>
<td>5.00</td>
<td>4.34</td>
<td>4.51</td>
<td>4.69</td>
</tr>
<tr>
<td>e</td>
<td>Prof./ethical responsib.</td>
<td>4.74</td>
<td>4.00</td>
<td>5.00</td>
<td>4.58</td>
<td>4.42</td>
</tr>
<tr>
<td>f</td>
<td>Communicate</td>
<td>3.63</td>
<td>4.71</td>
<td>5.00</td>
<td>4.49</td>
<td>4.42</td>
</tr>
<tr>
<td>g</td>
<td>Global/social impact</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>4.49</td>
<td>4.69</td>
</tr>
<tr>
<td>h</td>
<td>Prof. development</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>3.00</td>
<td>4.46</td>
</tr>
<tr>
<td>i</td>
<td>Current tools</td>
<td>3.63</td>
<td>4.44</td>
<td>4.17</td>
<td>3.06</td>
<td>4.69</td>
</tr>
<tr>
<td>j</td>
<td>Apply theory</td>
<td>4.14</td>
<td>4.22</td>
<td>4.08</td>
<td>2.50</td>
<td>4.46</td>
</tr>
<tr>
<td>k</td>
<td>Construct systems</td>
<td>3.85</td>
<td>5.00</td>
<td>4.06</td>
<td>4.14</td>
<td>4.52</td>
</tr>
</tbody>
</table>

(Note: red text in a cell marks scores falling below department criterion of 3.5)
The values shown on Table 4 are plotted in Figure 2, below.

![Annual Embedded Assessment Scores for Outcomes](image)

**Figure 3: Trends in Scores for Annual Embedded Measures for CSCI Program Outcomes.**

3.2.2. **Discussion of Embedded Assessment Results**

Figure 2 and the table it is based upon provide data that offer some insight as to the trends currently occurring within the CSCI program. The discussion is organized by Program Outcome and shown, in sequence, in Table 8.
Table 5: Analysis of Program Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Score 2013-14</th>
<th>Score 2014-15</th>
<th>Analysis of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) An ability to apply knowledge of computing and mathematics appropriate to the discipline.</td>
<td>4.08</td>
<td>4.57</td>
<td>This is showing a nice increase from historical data. No concerns here.</td>
</tr>
<tr>
<td>b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.</td>
<td>4.14</td>
<td>4.43</td>
<td>This value was high last year and has increased nicely and shows no cause for concern.</td>
</tr>
<tr>
<td>c) An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.</td>
<td>3.89</td>
<td>3.75</td>
<td>This outcome shows a slight dip but is above the minimum criterion of 3.5. Not a cause for concern at this time, but will continue to watch.</td>
</tr>
<tr>
<td>d) An ability to function effectively on teams to accomplish a common goal.</td>
<td>4.69</td>
<td>4.20</td>
<td>There is no cause for concern here.</td>
</tr>
<tr>
<td>e) An understanding of professional, ethical, legal, security, and social issues and responsibilities.</td>
<td>4.42</td>
<td>4.42</td>
<td>This value is steady and shows no cause for concern.</td>
</tr>
<tr>
<td>f) An ability to communicate effectively with a range of audiences.</td>
<td>4.42</td>
<td>4.46</td>
<td>This value is fairly steady and shows no cause for concern.</td>
</tr>
<tr>
<td>g) An ability to analyze the local and global impact of computing on individuals, organizations and society.</td>
<td>4.69</td>
<td>4.48</td>
<td>This score has dipped just slightly but is still quite high. No concerns here.</td>
</tr>
<tr>
<td>h) Recognition of the need for, and an ability to engage in, continuing professional development.</td>
<td>4.46</td>
<td>4.48</td>
<td>This outcome shows a very slight improvement and is still well above the minimum criterion of 3.5.</td>
</tr>
<tr>
<td>i) An ability to use current techniques, skills, and tools necessary for computing practice.</td>
<td>4.69</td>
<td>4.00</td>
<td>Although this score has dipped, it is well above the minimum criterion of 3.5</td>
</tr>
<tr>
<td>j) 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.</td>
<td>4.46</td>
<td>3.25</td>
<td>This score has dropped significantly and is a definite cause for concern since it has dipped below the minimum criterion of 3.5. The 2 courses in which this outcome was measured are CINS 465, Web Programming, and CSCI 340, Operating Systems. Both instructors have corrective measures they intend to implement in fall 2015. We will continue to watch this outcome carefully.</td>
</tr>
<tr>
<td>k) An ability to apply design and development principles in the construction of software systems of varying complexity.</td>
<td>4.52</td>
<td>3.78</td>
<td>This score has dropped significantly. It is still above the minimum criterion of 3.5. 2 courses were used to assess this outcome and the CSCI 431 course in Usability (Software Engr.) was the course that caused the metric to dip. The instructor has an improvement plan that will be implemented in spring 2016, the next time this course is to be offered. Note: this course is no longer required in either CINS or CSCI in the new 2015-16 catalog.</td>
</tr>
</tbody>
</table>

3.2.3. Faculty Reflections on Embedded Assessment Data

When faculty members fill out their embedded assessment report forms (Excel spreadsheets), they are asked to reflect upon the assessment results. When the measurement score for an outcome in one of their courses comes in below 70% (or 3.5 on a Likert scale) the faculty member comes up with a plan for improving the outcome in the subsequent
semester. For each of the outcomes, a) through k), below are the faculty comments on their metric and results, the effectiveness of the assessment instrument and their planned actions to improve attainment of the outcome, if necessary. Improvement plans are in bold, italic and underlined for emphasis.

**Outcome a)**: Dr. Challinger used the comprehensive final exam as a metric for this outcome in the core class CSCI 311. Students must earn 70% or better on the comprehensive final exam to achieve this outcome. There were 35 CSCI majors that enrolled and completed the course (the students who had an unauthorized withdrawal have been eliminated from consideration). The percentage of students passing this metric increased from 75% to 91% this semester, likely due to additional exercises on the more theoretical components of the course that were given in the classroom based on the last assessment. These in-class exercise helped more students grasp this material.

**Outcome b)**: Professor Zeichick used in class labs in CINS 448 to test the student's ability to solve a challenge using computer security tools (Kali Linux tool suite). 29 out of 35 were able to complete the labs successfully. The measure is very effective. The use of this suite of security tools has improved the achievement of this outcome.

**Outcome c)**: Dr. Dixon had the following commentary on his assessment results in CSCI 340. Here, students must demonstrate their understanding of threads and synchronization tools covered in this course and prevent any potential race conditions that could occur. Student must earn 70% or better on the DNS Resolver Assignment. There were 28 CSCI majors that enrolled and completed the course (the students who had an unauthorized withdrawal have been eliminated from consideration). The fact only ~75% of students passed this metric was due to 2 of the students not doing the assignment. The remaining students who failed to pass this metric got stuck handling their locks correctly and as such had their code fail to work resulting in only partial credit for creating threads correctly.
I feel that this assignment makes this an effective assessment tool for this outcome as it
gives students hands on usage of threads, locks, and shared data and they have to design
and implement this assignment from blank source files vs having skeleton code. I think
the assessment is fine. I will continue to try to improve the percentage of students passing
this metric through the use of more coding examples in class and better explanation of the
assignment during labs.

**Outcome d):** Professor Im used a total of 28 small lab assignments many of which require
group work to assess this outcomes. The assignments heavily depend upon other members
to work in collaboration to achieve their goal. The metric used is the grades for the labs.
The students must achieve an average of 75% or higher to pass this metric. The number
of students who passed this metric closely matches the number who received a C- or better
in the course. These results indicate the measure turns out to be very accurate.

Professor Raigoza sought to have students achieve outcome d) by expecting group
members to lead or participate in a demanding project with regular assessments. The
project simulated a real-life industry assignment including professionalism and an
opportunity for creativity. Some project groups tended not to evenly distribute the work
load. Hence, submitted work required a description of each member's contribution and
also, regular meetings with the project group and the instructor were conducted.
Additional meetings with the instructor were conducted with groups who needed more
guidance. 43 out of 50 or 86% of the Computer Science majors succeeded in their group
work. The metric was effective. The groups accomplished their work and enjoyed their
contribution.

**Outcome e):** Professor Hubbard used selected well-written essays which demonstrate
understanding of professional, ethical, legal, security and social issues and responsibilities.
Measure very effective. The number of student's passing this metric went up slightly from
88% to 90%, but the enrollment in these classes nearly doubled. The results show no need
to modify this assessment or metric.
**Outcome f):** Professor Hubbard used selected well-written essays which demonstrate understanding of professional, ethical, legal, security and social issues and responsibilities. Measure very effective. The number of student's passing this metric went up slightly from 88% to 90%, but the enrollment in these classes nearly doubled. The results show no need to modify this assessment or metric.

**Outcome g):** In his CSCI 490, senior project class, Dr. Henry uses the following metric: Students must complete the senior project and give the presentation during their scheduled time and receive adequate or better on the audience review forms. Students and faculty attend the presentation. The ability to present a semester long project is a good indication of a student’s ability to communicate technical information. 14 out of 16 or 87.5% were successful. The measure is effective and does not need to be modified.

**Outcome h):** Professor Hubbard used selected well-written essays which demonstrate understanding of professional, ethical, legal, security and social issues and responsibilities. Measure very effective. The number of student's passing this metric went up slightly from 88% to 90%, but the enrollment in these classes nearly doubled. The results show no need to modify this assessment or metric.

**Outcome i):** Dr. Henry had the following commentary on CINS 465 - Students were required to complete six assignments of varying difficulty. Completing all of these assignments is a strong indication that students are able to apply current techniques, skills, and tools necessary for computing practice. 80.35% of the students succeeded. The measure is very effective and no changes are needed at this time.

Dr. Dixon used the following metric in CSCI 340 to measure attainment of objective i): Students must complete several large programming projects, applying the Operating System topics covered in this course. Student must earn 70% or better on the combined score of all programming assignments. There were 28 CSCI majors that enrolled and
completed the course (the students who had an unauthorized withdrawal have been eliminated from consideration). The percentage of students passing all of the programming is ~68%, I think these assignments are a good application of the core OS concepts in a hands on application and their success on these directly measure how much they are learning. This success rate on this outcome did come in below the department’s desired level of 70% and needs to be addressed in the Annual Program Improvement Plan. Dr. Dixon plans to continue to use this metric, but plans to add additional in-class exercise to further improve student’s understanding of current OS concepts.

Outcome j): Dr. Henry had the following commentary on CINS 465 – The metric used for this outcome was complexity and completeness of the final open-ended programming project. Students pass this metric if their final project was non-trivial. The percentage of students that passed this metric was only 67.34%. Some students have a difficult time with open ended projects. More students might have passed this standard if I had given more guidance on the final project. Some students may have failed this metric because the expected level of complexity was not clear. While the metric does not need to change, as part of the Annual Program Improvement Plan, Dr. Henry plan to provide a much more comprehensive, detailed description of requirements for the final project, explicitly defining what is required to do well on the project.

Dr. Dixon used a specific assignment in his CSCI 340 class as a metric for achievement of outcome j): Students must demonstrate understanding of the fundamentals of OS solutions in their application, complexity and trade-offs. Students must earn 70% or better on the Paging Strategies Program. This assignment is a good assessment of using a variety of paging algorithms discussed in lecture in a hands on application where students can see the trade-offs of the different algorithm choices in the results of the simulations. Since the number of students who passed this metric was only 61% and this is significantly less than the desired 70% and this outcome needs to be addressed in the Annual Program Improvement Plan for next year. Dr. Dixon plans on working through more
examples of the paging strategies during lecture in his fall 2015 offering of this course in order to improve the results of this outcome.

Outcome k): Dr. Buffardi had the following commentary on CSCI 431 - Of the 9 students who failed to earn at least 70% on all of their deliverables, only one student failed to earn at least 70% on more than one. This one student did not participate at all for much of the semester. Overall, most students demonstrated the ability to gather, apply, and evaluate design and development principles. The assessment is effective, although it is based upon a team project so there is room for improving insights into how each individual member of the team demonstrated the outcome independently (as well as within a group). The deliverables should remain the same, however, students should identify their specific contributions within the team to verify that they have demonstrated the outcome in each of the team's deliverables.

As is generally the case, the faculty concerns expressed dealt more with the detailed mechanics by which the various student learning outcomes are achieved within the course and how the outcomes might be improved. It would be very helpful if the results of the “Major Field Test” included subtest scores that could be mapped to individual outcomes. This would provide an anchor point to validate the balance of results that apply to outcomes.

It is also anticipated that decreasing our class sizes, a plan we are implementing beginning fall 2015 will assist in better Student Learning Outcomes overall. Decreasing class sizes has been made possible largely to the additional hires the department has received and will continue to receive. These additional hires stem from the administration’s recognition that our program is growing significantly, both in the undergraduate and MS programs. It is also acknowledged that the growth of enrollment in the Mechatronics Engineering and Computer Engineering programs also increases demands on the Computer Science department, since their majors take our programming courses. The department has hired five new tenure-track faculty in the past four years and has been approved for at least one more tenure-track hire during 2015-16.
The department has made some curriculum changes in its undergraduate degrees and these changes are anticipated to improve the Student Learning Outcomes. We have added elective courses in Bioinformatics, Advanced Algorithm Analysis and two courses in software engineering: Usability and Software Testing. These courses were created on the initiative of the new junior faculty, taking into account their in-depth expertise. The advanced algorithms course is anticipated to improve scores on outcomes a, b, c, i, j and k. The Department has also added a required lower-level web programming course, CINS 110, as a prerequisite to CINS 465, effective with the 2015-16 catalog. The instructor for CINS 465 has observed that the backgrounds of the current students in CINS 465 are extremely disparate, making it difficult to effectively teach the course. Our Industry Advisory Board has also emphasized the critical importance of a solid skill set in web programming during the Interactive Workshop held in fall 2014. The results of this Workshop are in Appendix A. The problems that have been seen with CINS 465, and the low assessment value for outcome J), recorded in Table 8, will hopefully be addressed by students having a stronger background in web programming due to having the prerequisite course, CINS 110. The changes that the instructor plans on making to CINS 465 by providing a much more thorough design component to the course, together with the enhanced background the students will have after having the prerequisite, should help to boost the scores for outcome j). This outcome will be monitored closely next year.

3.3. Indirect Assessment of the Program Outcomes

3.3.1. Senior Exit Survey
The senior exit survey conducted by the college gives an indirect measure of how well graduating students feel they have met the program outcomes. Data from 2012-2013 that were specific to CSCI graduates focused on questions 31 to 44:

“As a graduate, do you believe that you now know how to:”

31. Apply knowledge to solve problems
32. Design and conduct experiments
33. Analyze and interpret experimental data
34. Design component or system to meet needs
35. Function on multidisciplinary team
36. Identify, formulate, solve technical problems
37. Communicate technical matters in writing
38. Communicate technical matters orally
39. Understand professional, ethical responsibilities
40. Understand contemporary issues facing society
41. Use modern tools and technology
42. Appreciate impact of your solutions on society and environment
43. Have an appreciation for the importance of continued learning.

Fourteen (14) CSCI students took the questionnaire in 2014-15. The results are summarized in Table 6, below. For the senior surveys, responses are identified as follows: strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and strongly disagree = 1.
Table 6: Responses over the past 5 years of CSCI Graduates to Senior Exit Surveys
(Strongly agree is 5, agree is 4, neutral is 3, disagree is 2, and strongly disagree is 1)

<table>
<thead>
<tr>
<th>Student Learning Outcome</th>
<th>Measure</th>
<th>Sp ’15 Average (Sample size)</th>
<th>Sp ’14 Average (Sample size)</th>
<th>Sp ’13 Average (Sample size)</th>
<th>Sp ’12 Average (Sample size)</th>
<th>Sp ’11 Average (Sample size)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline</td>
<td>Question 31</td>
<td>3.64 (14)</td>
<td>4.37 (14)</td>
<td>3.84 (19)</td>
<td>4.059 (17)</td>
<td>4.39 (18)</td>
</tr>
<tr>
<td>(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution</td>
<td>Question 33 (analyze data)</td>
<td>3.86 (14)</td>
<td>4.07 (14)</td>
<td>3.95 (19)</td>
<td>3.706 (17)</td>
<td>3.44 (18)</td>
</tr>
<tr>
<td></td>
<td>Question 36 (solve problems)</td>
<td>3.64 (14)</td>
<td>4.64 (14)</td>
<td>4.05 (19)</td>
<td>4.17 (17)</td>
<td>4.92 (18)</td>
</tr>
<tr>
<td>(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs</td>
<td>Question 34</td>
<td>4.29 (14)</td>
<td>4.43 (14)</td>
<td>3.95 (19)</td>
<td>3.88 (17)</td>
<td>4.22 (18)</td>
</tr>
<tr>
<td>(d) An ability to function effectively on teams to accomplish a common goal</td>
<td>Question 35</td>
<td>3.5 (14)</td>
<td>4.23 (14)</td>
<td>3.53 (19)</td>
<td>3.82 (17)</td>
<td>4.28 (18)</td>
</tr>
<tr>
<td>(e) An understanding of professional, ethical, legal, security and social issues and responsibilities</td>
<td>Question 39</td>
<td>4.07 (14)</td>
<td>4.36 (14)</td>
<td>3.89 (19)</td>
<td>3.88 (17)</td>
<td>3.82 (17)</td>
</tr>
<tr>
<td>(f) An ability to communicate effectively with a range of audiences</td>
<td>Question 37 (written communications)</td>
<td>4.07 (14)</td>
<td>4.21 (14)</td>
<td>3.79 (19)</td>
<td>3.5 (17)</td>
<td>3.94 (18)</td>
</tr>
<tr>
<td></td>
<td>Question 38 (oral communications)</td>
<td>4.07 (14)</td>
<td>4.21 (14)</td>
<td>3.95 (19)</td>
<td>3.88 (17)</td>
<td>3.78 (18)</td>
</tr>
<tr>
<td>(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society</td>
<td>Question 42</td>
<td>3.79 (14)</td>
<td>4.14 (14)</td>
<td>3.32 (19)</td>
<td>3.94 (17)</td>
<td>3.89 (18)</td>
</tr>
<tr>
<td>(h) Recognition of the need for and an ability to engage in continuing professional development</td>
<td>Question 43</td>
<td>3.86 (14)</td>
<td>4.86 (14)</td>
<td>4.11 (19)</td>
<td>4.41 (17)</td>
<td>4.50 (18)</td>
</tr>
<tr>
<td>(i) An ability to use current techniques, skills, and tools necessary for computing practice.</td>
<td>Question 41</td>
<td>4.31 (14)</td>
<td>4.57 (14)</td>
<td>3.79 (19)</td>
<td>4.0 (17)</td>
<td>4.22 (18)</td>
</tr>
<tr>
<td>(j) 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.</td>
<td>Question 36</td>
<td>3.64 (14)</td>
<td>4.64 (14)</td>
<td>4.05 (19)</td>
<td>4.17 (17)</td>
<td>4.92 (18)</td>
</tr>
<tr>
<td>(k) An ability to apply design and development principles in the construction of software systems of varying complexity.</td>
<td>Question 36</td>
<td>3.64 (14)</td>
<td>4.64 (14)</td>
<td>4.05 (19)</td>
<td>4.17 (17)</td>
<td>4.92 (18)</td>
</tr>
</tbody>
</table>
For the 2014-15 Academic year, attitudinal scores for all outcomes remained above the department standard of 3.5, although some scores did trend downward from last year. The graduating class of 2013-14 was indeed, an extremely positive group. There has not been a score that is below the standard since the 2012-13 Academic year.

3.3.2. Major Field Test (MFT)

The department is using Educational Testing Service’s (ETS) Major Field Test (MFT) in Computer Science for indirect assessment of the B.S. in Computer Science degree program. The CSCI department administers the MFT to graduating seniors registered in CSCI 490, Directed Programming Experience (the CSCI senior capstone course, which is currently being retitled “CSCI Capstone”). CSCI 490 is offered every semester.

The MFT is a standardized test that provides assessment information, based on national, comparative data, in the form of scores and Assessment Indicators. The test indirectly measures student learning outcomes a), b), i) and j). Unfortunately, detailed indicators that can be mapped to specific outcomes are no longer provided by ETS, and the only data available for this report are the total scores of the 32 students who took the test in 2014-15.
The scores are averaged over the academic year. Below is the graph of the low, median and high scores for the last 5 years with the data table below. Note: The top possible score is 200 on the exam.

![Figure 3 - Scores on the Major Field Test](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Low</th>
<th>Median</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-11</td>
<td>181</td>
<td>162.00</td>
<td>186</td>
</tr>
<tr>
<td>2011-12</td>
<td>174</td>
<td>150.57</td>
<td>138</td>
</tr>
<tr>
<td>2012-13</td>
<td>131</td>
<td>159.89</td>
<td>142</td>
</tr>
<tr>
<td>2013-14</td>
<td>142</td>
<td>154.00</td>
<td>136</td>
</tr>
<tr>
<td>2014-15</td>
<td>136</td>
<td>156.81</td>
<td>134</td>
</tr>
</tbody>
</table>

Table 7 Five Year Results Major Field Test (MFT) in Computer Science

The Computer Science faculty have set the metric for successful performance on the MFT at having 50% of the students achieve the median score or higher on the MFT. The most recent (2014) comparative data guide for the MFT shows that the high score of 184 is in the 97th percentile, the median score of 157 is in the 66th percentile and the low score of 134 is in the 16th percentile. Thus, the high score was quite respectable and the median score is better than more than half of the students completing the exam. Of the 33 seniors who took the MFT in 2014-15, 22 or 67% earned scores above the national median of 149. The national median was calculated over the years 2011-2014, based on a total of 5528 students from 79 different US universities. The median score for Chico State Computer
Science BS seniors in 2014-15 was better than that of 3503 of the total 5228 students who have taken the MFT between the years 2011 to 2014 inclusive. That is, 22 of 33 Chico State seniors did better than 3503 of the 5228 students that took the test in that 3 year span. While the Department has the goal of 70% or more of our seniors scoring above the national median, we still feel that this is a very respectable result for our seniors.

3.3.3. Industry Advisory Board Workshop Feedback

The Computer Science Department regularly meets twice a year with our Industry Advisory Board and has planned workshops as part of these meetings to solicit feedback on the objectives and outcomes for Computer Science graduates. The most recent workshop in fall 2014 provided numerous suggestions for enhancing the skills sets of our students and these suggestions align nicely with planned curriculum changes, discussed below. The results of this Interactive Workshop can be found in Appendix A.
4. Continuous Assessment: Conclusions and Concerns

As noted above, some changes in the curriculum are anticipated to improve the outcome scores for outcomes that came in below standard in the 2014-15 assessment cycle. The introduction of a new, prerequisite course for CINS 465 should assist in improving outcomes in that course. The instructor is also planning on focusing much more attention during the course on design principles. The new Advanced Analysis of Algorithms course should also assist students improving outcomes a, b, c, i, j and k. The CSCI 340 class is getting an overhaul by Dr. Dixon and he anticipates that his changes, focusing on more in-class examples of topics covered, will serve to improve the outcomes in that course.

4.1. Program Educational Objectives

During the fall 2014 Industry Advisory Board, two Interactive Workshops were conducted. One addressed the skills that the Board feel are needed by current graduates, the other focused on reviewing and making suggestions to the program educational objectives. The results of the workshop that focused on objectives are given in Appendix B.

4.2. Program Outcomes

The embedded assessment data suggest that there are some potential problems in two outcomes. The curriculum changes and instructor’s improvement plans should serve to address these problems, and the outcomes will be monitored carefully next year. The Senior Exit Survey indicates that students perceive they are obtaining valuable skills from the CSCI program. A third source of data, the MFT, has remained fairly steady-state and indicates satisfactory achievement of outcomes.

4.2.1. Embedded Assessment

Outcomes i and j were the only two outcomes that showed some concern. Outcome i measurements were taken in three courses over 2014-15. Only one of these courses, CSCI 340, had a measurement below the standard and that measurement came in at 68% (3.4 on
Likert scale), which is only marginally below the standard. It should be noted, however, that average of the three courses scores used to measure outcome i came in at 80% (4.0 on Likert scale), which is well above the standard. Dr. Dixon has a plan for improving this outcome in CSCI 340 and his assessment scores will be monitored closely next year to ascertain whether or not improvement has occurred.

The only outcome that shows an overall cause for concern is outcome j) since the average score of the two courses that measured outcome j came in at 65% (3.25 on Likert scale). However, CSCI 340’s measure for outcome j) came in at 81% (4.05 on Likert scale) which is well above the standard. Improvement in this outcome should come about in subsequent years due the new requirement, beginning with the 2015-16 catalog, that students must take a prerequisite course prior to taking CINS 465. Additionally, Dr. Henry plans on providing much more instruction on good design principles in the fall 2015 offering of CINS 465. This outcome will be monitored closely in anticipation of improvement next year.

4.2.2. Senior Survey
Not a single score showed a cause for concern, although scores did dip in general somewhat from the previous year. These attitudinal scores will be monitored carefully from year to year. It is anticipated that the growth of the faculty size and the infusion of enthusiastic junior faculty in the ranks as well as the planned decreases in class sizes, will serve to enhance students attitudes and the results on the senior survey.

4.2.3. The Major Field Test
The scores on the MFT have remained fairly steady-state and show no cause for concern.
5. Appendix A: Continuous Improvement Method: Fall 2014 Interactive Workshop with Computer Science Industry Advisory Board – Results

Feedback from fall 2014 Industry Advisory Board workshop on needed skills of our Graduates:

Background: The Computer Science Department held its regular bi-semester meeting in the fall of 2014 in on the Chico campus. This meeting was well-attended with over 20 members present. Computer Science tenure-track faculty member Todd Gibson conducted an interactive workshop in which groups 5 groups of 4 or 5 members walked around the room with their groups and gave their thoughts on the five key questions below. The workshop was quite dynamic, all members truly enjoyed it and many stated: “This is why we wanted to be on your board, to be able to give you this feedback.”

What skills have recent graduates acquired that are of little use? Or, what misconceptions do recent graduates have when they walk into their first job?

Misconceptions:
+ Expectation to make "big impact" day 1. (you need to be prepared to learn, and work your way up)
+ Some work will always be mundane -- deal with it!
+ You might have to work with other people’s code.
+ Process/paperwork exists and may slow you down.
+ Lack of understanding of the big picture and the life cycle (operations) of a system as application
+ Acquired & of little use: traditional Software Development Approaches
+ Misconception that their learning has just ended...it has just started -- they need to understand there is a lot to learn
+ Misconception that employers don't care how often grads change jobs.
+ The "halo effect" matters

What skills do you expect a Master's graduate to have that an undergraduate typically doesn't have?

+ Be able to work independently and start contributing without much new training
+ Have real world experience, e.g., summer internship
+ Self-starter - Understand root cause (analysis) and carry projects through completion (end-to-end).
+ out-of-the-box creativity, i.e., transformation vs incremental
+ Software development best practices and design patterns/architectural approaches.
+ Specialization in a certain field
+ Collaboration skills
+ Advanced understanding in architecture
+ Algorithms/analysis
+ There is Science in C.S. - not just programming

What skills (independent of tool/environment) do you want your recently graduated hires to have that they currently lack?

+ Needs, Approach, Benefits, Competition (NABC) type skills
- 1 minute elevator pitch
- Presentation of ideas to influence decision makers
- Ability to "boil up" the details to a big picture view
+ Familiarity with popular toolsets/environments (git, AWS, Google analytics)
+ Ability to assess "build vs buy"
+ Flexibility/adaptability. This requires fundamental problem solving skills and solid CSCI fundamentals
+ SQA or more generally, Quality
+ Development life cycle: requirements, design, build, test, ... 
+ Team software development - source control
+ learn how to fail fast
+ SCRUM, Agile methodology
+ Crisp & clear communications
  - Write a one-pager
  - deliver an elevator pitch
+ Think outside the box.
+ Hacker mentality
+ Change control, compliance
+ Project Management, interpersonal skills (esp. between [engineers?]), understanding business needs), project scoping
+ Storyboarding - take ideas and build into (ideas?)

Of the (tool/environment independent) skills that college graduates do have to varying degrees, which are most-important?

+ Technical competence
+ Problem solving
+ work in a group - listen & communicate
+ Initiative
+ Must have base level of several important skills
  - Collaboration
  - Technical competence
  - Analytical thinking
  - Inquisitiveness
+ Problem solving
+ Debugging complex environments
+ versatility/adaptability
+ Willingness to understand big picture of company's objectives, not just write code
+ Technical depth
+ Be good students, i.e., understand & execute on what senior staff are telling them
+ client-side development
+ Grok (reverse engineer) other people's code.
+ do not over-iterate on code - knowing the balance of when code is good enough.
+ JavaScript, SQL, HTML/CSS - If they know this we can use them day 1

5) If you could add any course(s) to the curriculum (may be tool/environment specific), what would you add?

+ UX - User Experience ("Don't make me think")
+ Mobile Development (Responsive design, iOS, Android, HTML 5)
+ Interpersonal skills - How to remain human and interact with your organization
+ Project Management
+ Java
+ Analytics
+ Testing - Development lifecycle
+ Agile Methodologies
+ Cyber security/CS
+ Systems at scale
+ Parallel programming/distributed computing
+ Cloud computing - How to build an app in the cloud, e.g., AWS, Open Stack
+ Client-side development, e.g., JavaScript, not just C or C++ Programming
6. Appendix B: Results of Industry Advisory Board Interactive Workshop on Program Educational Objectives

The current statement for the CSCI Programs Educational Objectives immediately follows:

“The Department of Computer Science at CSU Chico is dedicated to graduating people who:
A. are able to apply the principles of computer science, mathematics, and scientific investigation to solve real world problems appropriate to the discipline;
B. are able to apply current industry accepted computing practices and new and emerging technologies to analyze, design, implement, and verify high quality computer-based solutions to real world problems;
C. exhibit teamwork and effective communication skills;
D. understand the ethical and technical context of their professional obligations and contributions;
E. are able to positively and appropriately apply knowledge of societal impacts of computing technologies in the course of career related activities; and
F. are successfully employed or accepted into a graduate program, and demonstrate a pursuit of lifelong learning.”

As an exercise in constituency feedback, we put the above statement of CSCI Program Educational Objectives up on the Web as a shared document and asked our Industry Advisory Board members to collectively contribute any edits to these that they thought would create a more effective and accurate statement. Below is the result of that exercise:

“The Department of Computer Science at CSU Chico is dedicated to graduating people who:
A. are able to apply analytical thinking together with the principles of computer science, mathematics, and scientific investigation to solve real world problems appropriate to the discipline;
B. develop and implement high-quality, innovative solutions to real world problems.
C. exhibit teamwork and effective communication skills;
D. understand the ethical and technical context of their professional obligations and contributions;
E. are able to positively and appropriately apply ethics in computing and ensure security and integrity of systems and data; and
F. are successfully employed or accepted into a graduate program, and demonstrate a pursuit of lifelong learning.”

Note: The language that was altered/removed in the original statement of objectives, at the top, is underlined and in yellow. The text phrases in the second version that are modifications of the original version are also underlined and in green.
7. Appendix C: Excel Spreadsheet of Combined Embedded Assessment 2014-15
<table>
<thead>
<tr>
<th>Course</th>
<th>Grade</th>
<th>Type</th>
<th>Department</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 201</td>
<td>A</td>
<td>L</td>
<td>Computer Science</td>
<td>Fundamentals of Computer Science</td>
</tr>
<tr>
<td>CSE 202</td>
<td>B</td>
<td>L</td>
<td>Computer Science</td>
<td>Data Structures</td>
</tr>
<tr>
<td>CSE 203</td>
<td>C</td>
<td>L</td>
<td>Computer Science</td>
<td>Algorithms</td>
</tr>
<tr>
<td>Math 201</td>
<td>A</td>
<td>L</td>
<td>Mathematics</td>
<td>Calculus I</td>
</tr>
<tr>
<td>Math 202</td>
<td>B</td>
<td>L</td>
<td>Mathematics</td>
<td>Calculus II</td>
</tr>
</tbody>
</table>

**Notes:**
- All courses are graded on a letter scale from A to F.
- L indicates lecture courses.
- Type L indicates lecture.

**Department:** Computer Science

**Program:** B.S. in Computer Science