# Faculty Response to the Computer Science Program Review

The mission of the Weber State University Department of Computer Science, as articulated in its formal mission statement, is "To become and be recognized as the outstanding undergraduate program in applied Computer Science in the Western United States.  Specifically, to be recognized by employers as the best program to produce graduates who are quickly productive and produce software and computer systems of the highest quality."  To complete its self-imposed mission, the faculty of the Dept. of Computer Science values and pursues excellence in teaching and student mentoring as its primary objective.

The *Program Review Evaluation Team Report,* submitted by Dr. Nicole Anderson, Dr. Kirk Love, Dr. Brett Ellis, and Prof. Jo Ellen Jonsson, is expressed in a teaching-centered framework.  Therefore, the faculty response to that report also adopts a teaching-centered framework.  This response focuses on (a) maintaining and extending successful instructional strategies; (b) identifying deficiencies within the department and outlining a plan for their improvement; (c) addressing deficiencies that are beyond departmental control and making recommendations for institutional improvement; and (d) reporting the current state of the ABET accreditation preparation and ongoing tasks.

## Successful Instructional Strategies

The review team observes that the CS Department "has created a strong and innovative curriculum" and lists several departmental practices that, they believe, contribute to the overall curriculum's effectiveness:

- The curriculum is well aligned with emerging computing technologies.
- The core classes provide an appropriate balance of theoretical and practical concepts.
- The core classes also represent the fundamental concepts typically taught at other institutions and generally expected of computer science graduates.
- The curriculum includes significant hands-on work.  There are several facets to this practice:
    - There are computers in most classrooms, which support practical as well as theoretical instruction.  The practice of joining theory with practical application using current industrial tools is one reason why WSU CS graduates are productive the first day on the job and why they are sought after in industry.
    - Most courses include a significant programming, design, documentation or management component; some courses include some linear combination of these components.  Some courses, especially lower division, emphasize individual skills while other courses, especially upper division, include team assignments.  The overall result is graduates that are prepared to work in teams by making strong individual contributions.
- The curriculum provides opportunities for service learning:  The software engineering sequence designs, implements, and installs software in developing countries.  Other courses also create software products for local charitable organizations, other university departments, and state institutions, which helps the department to maintain strong ties with the community.
- The department maintains strong ties with industry through an industrial advisory committee.  The committee consists of members recruited from Wasatch Front computing industries that hire many of the department's graduates.  The department meets with the committee during the Fall and Spring semesters, where the committee reviews the current curriculum and

recommends changes as needed.  The recommendations of the industrial advisory committee are crucial to keeping the curriculum aligned with the current needs of industry and therefore preparing graduates for and enabling them to obtain exceptional employment locally and nationally.

- All courses necessary to earn the Associate of Applied Science degree are currently available online.  Many of the courses necessary to earn the Bachelor of Science degree are also available online, with more Bachelors' courses continuously becoming available.

The review team also notes that "individual course design and delivery mechanisms [are] effective."  The department has adopted a shared ownership model of course design and development.  Each course has a principal architect who is supported by a committee consisting of instructors who teach the course or who teach subsequent courses.  This model ensures consistent content coverage, a broad treatment of content, and a smooth prerequisite flow through the course sequences.

The reviewers interviewed several students who report that the faculty is friendly, available to assist them, and know them by name, all of which contributes to a "comfortable atmosphere that students enjoy."  The faculty believes that this "comfortable atmosphere" is a product of the individual attention given to each student.  The individual attention given to each student is a result of the department's practice of not using teaching assistants to teach courses and of keeping the size of each class relatively small.

Finally, the reviewers note that faculty members are involved throughout the university, often assuming leadership roles, which results in "visibility and respect for the department" throughout the university as well as the teaching and research community.  They also note that the faculty members are given opportunities for growth and development, and that they take advantage of those opportunities.

Having identified these successful practices, it is in the best interest of the department, the university, and certainly the students to continue, refine, extend, and preserve these practices.

## Departmental Deficiencies and Corrective Plans

The review team reports numerous deficiencies currently existing within the Computer Science department.  Although the reviewers did not classify the deficiencies in any way, the faculty members believe that it is important to categorize the deficiencies as either being directly within the department's purview or being beyond the department's direct control.  While the faculty response attempts to so categorize the noted deficiencies, the author acknowledges that some deficiencies overlap both categories and also overlap with concerns related to ABET certification.

The number of students taking computer science courses continues to fluctuate.  Enrollment in CS courses is often a function of the current economy.  However, enrollment is also driven by demand, and the demand for computer science (and related programs) graduates is continuously increasing, both locally and nationally as new industry continues to develop within the state, existing industries relocate to Utah, and technology companies outside Utah recruit our CS graduates.  This implies that, fluctuations aside, the CS department can anticipate sustained growth during the next decade.  Dealing with that growth places heavy demands on the department and is the root cause of many of the highlighted deficiencies.  Specifically, the faculty should:

- Engage in more scholarship.

- Increase course assessment, including implementing the Major Field Test (MFT) in computer science.
- Spend more time in course and curriculum development.
- Implement additional faculty assessment beyond CIEQ instrument, including peer reviews, outcome evaluations for individual courses, and self assessment.
- Consider limiting the number of students admitted to the program or admitted for upper division coursework.
- Consider collaborations with other universities or open course options.
- Increase the number of faculty, with a preference towards those with credentials that support ABET accreditation.

The department is currently implementing or has plans to implement some of the reviewer's recommendations. Specifically, the department, as a part of its ABET accreditation preparations, is in the process of defining curriculum- and course-level outcomes, defining appropriate assessment instruments and rubrics, scheduling individual course assessments, and collecting individual course data. A proposal to incorporate the MFT as an assessment instrument will be presented and discussed at the department's annual beginning of the year meeting. (Students will incur a $25 for each test and the department will incur a reporting fee of at least $300 to $600 per year, depending on the desired reporting options.)

The department currently devotes a considerable amount of the beginning of the year meeting to curriculum development. The curriculum is also reviewed during faculty meetings, especially those immediately preceding or following industrial advisory meetings. As a part of the ABET accreditation preparation, the content for the individual core courses is being formalized and standardized.

Also as a part of the ABET accreditation preparation, mechanisms for individual course outcomes are being defined. However, there are no plans currently in place to include peer reviews or self assessments. The department will review these at a later date.

A proposal for implementing an entrance exam to the bachelor's program is currently under review by the faculty. However, this exam is not intended to limit the number of students in the bachelor's-level coerces but is intended to ensure that students are adequately prepared for these courses, which should reduce the burden on the instructors and should enhance the student's learning experience.

The department is not currently considering collaborations with other universities. However, it is actively pursuing collaborations with other computer-related departments on campus to reduce or eliminate redundant courses and thereby improve resource utilization at the university level.

Significant faculty changes have occurred between the time of the initial review and the submission of this response. One faculty member has resigned, one has retired, and three new faculty members have been hired (two tenure track and one fulltime instructor) for a net increase of one faculty position. The two new tenure track faculty hold earned PhD's in Computer Science and Electrical Engineering, which will enhance the department's ABET accreditation application.

## Extra-Departmental Deficiencies

The reviewers describe the current faculty load as "overburdened" and "unsustainable." In their opinion, "Faculty loads are being pushed beyond reasonable boundaries for prolonged periods of time . . . . [and] it is clear this level of productivity is taking its toll on faculty." The net increase in the number of fulltime faculty described previously ameliorates but does not eliminate this problem. The department is still understaffed by at least one and perhaps two faculty members. And while the number of new faculty members hired is beyond direct departmental control, it is within the department's control to ensure that new faculty members have the appropriate credentials. However, this consideration is exacerbated by a second problem underscored in the review.

The reviewers maintain that CS department "salaries are low relative to similar Universities as well as relative to profession[al]s in the field." This inequality has a negative impact on current faculty members and makes hiring new faculty members holding the appropriate credentials difficult. Historically, WSU employees enjoyed a substantial benefits package, perhaps better than other institutions within the state. However, as a result of the current financial climate, benefits were standardized across the state without a concomitant adjustment in Weber salaries, which results in a negative disparity. Correcting this disparity is beyond the ability of the department, and may be beyond the ability of the college or the university, but it must nevertheless be corrected. The increase in the number of faculty members helps to reduce the overall burden placed on each faculty member but does nothing to help those faculty members who must rely on teaching overload course to meet their financial obligations.

Finally, the reviewers note that students are experiencing difficulty completing the required math courses at WSU. This problem impedes students' timely progress and delays graduation. Students report that they complete the mathematics requirements at other institutions. This is an ongoing situation that should be addressed at the college or university level.

## ABET

As noted above, the CS department is currently preparing for an ABET accreditation visit at the beginning of Fall Semester, 2013. The reviewers specify five distinct challenges that the department faces in achieving accreditation:
1. The current faculty teaching load is too high.
2. The number of adjuncts (specifically the ratio of adjuncts to fulltime faculty) is too high.
3. The number of faculty members holding earned PhD's in computer science or related fields is too low.
4. Technology resources are too limited.
5. The department conducts insufficient assessment.

Challenges 1-3 are addressed by previous discussions of faculty hiring. A solution to challenge 5 is currently in progress as described above. The department attempts to alleviate challenge 4 by utilizing emergent technologies such as the nComputing devices adopted several years ago. These devices replace as many as 30 individual computers with workstations consisting of a monitor, mouse, keyboard, and a network-enabled interface driven by a single server. This architecture lowers overall equipment costs and reduces the maintenance burden. Nevertheless, the department is unable to maintain all of

the labs at the high-level demanded by the ever burgeoning computer science field.  Furthermore, the department is sometimes unable to provide the software that instructors would like to use in a course.

## Conclusion

First and foremost, the department wishes to thank Dr. Nicole Anderson, Dr. Kirk Love, Dr. Brett Ellis, and Prof. Jo Ellen Jonsson for their time and effort taken to review the WSU CS Department.  The perspectives of colleagues from outside the Department and outside the University are crucial to developing a more clear understanding of the successes and needs of the department.  Further, this understanding is essential to establishing the future direction of the department and to maintaining the highest level of instruction in the rapidly evolving computer science discipline.  The department also wishes to thank Dr. David Ferro, Dean of the College of Applied Science and Technology, for his continued support, especially in the recent hiring of new faculty members.

As always, our mission remains, "To become and be recognized as the outstanding undergraduate program in applied Computer Science in the Western United States."