Introduction

This report describes the results of the CS SAC's evaluation of the core outcomes of *Culture Awareness* and *Self Reflection*. The assessment was conducted during the Winter 2012 term.

Computer Science is a transfer program designed to allow students to complete their lower-division undergraduate requirements for a four-year degree in Computer Science. Campus-based (Rock Creek and Sylvan) and Distance Learning courses focus on discrete mathematics, system architecture and design, and programming (C, C++, Java, and Assembly). Supplemental courses include Unix/Linux training, video game development, and a General Education (Science) survey course of computer video game development.

This report has two sections. The first section discusses changes to the program driven by last year's assessment of *Community and Environmental Responsibility* and *Communications*. The second section discusses this year's assessment of *Cultural Awareness* and *Self Reflection*, and the recommendations generated from this year's survey.

Improvements Based On Previous Year

The CS SAC's 2011 report identified three specific improvements that the SAC felt could improve our Program's support for PCC's college-wide outcomes:

I. Increase the requirement for group work
II. Increase the writing and composition component of our courses
III. Provide additional support to help students learn the technical vocabulary used in Computer Science

These improvements are being phased in throughout the curriculum, beginning with the introductory (100-level) courses. Students must be prepared to meet the additional requirements involved in these changes, and the required training should start when a student enters the CS program.

The number of assignments involving group work has increased in sections of the CS 133G, CS 161, CS 250, and CS 251 courses. A majority of students in the affected sections appear to embrace this change, although it is important to note that a few students have expressed a strong desire to avoid teamwork. Preliminary analysis of the effects of this change indicate that CS student require some additional instruction in teams and teamwork, including selecting team members, team communications, project management, and workload delegation.

Writing and composition has been increased in sections of CS 133G and CS 161. Implementing this change throughout the Program has proven more difficult than expected because of the specialized nature of some courses, and the SAC has yet to determine how to make this change in other courses.

The affected sections of CS 133G have nine major assignments per term, and formerly all nine were game development exercises. Three of these nine assignments are now essay assignments (1500, 3000, and 5000 words, respectively). CS 133G has a WR 121 pre-req, and students are able to complete the essay assignments with reasonable quality without additional instruction.

The affected sections of CS 161 have 7 major assignments per term, and all assignments are program development exercises. Each of these assignments now includes a technical writing component where the student must formally document the program in addition to creating a working program. CS 161 does not have a required writing pre-req, and the quality of the writing component of assignments indicates the need for additional technical writing instruction in the course.

Providing additional assistance with the technical vocabulary of Computer Science has proven problematic in our courses. Vocabulary is introduced in our courses, and web-based dictionaries are referenced in course materials. Many students in CS courses have marginal English skills, however, and the SAC has not yet been able to implement translation guides for technical terms.

Current Assessment

Design

The Computer Science SAC assessed Cultural Awareness and Self Reflection for the 2012 report. These outcomes were evaluated using an online (Desire2Learn) survey administered to selected sections of CS 133G, CS 161, and CS 250 during the Fall 2011 term. The survey was voluntary and anonymous, and 43 students submitted responses. The survey questions and response distributions are shown in Appendix A.

Results

Cultural Awareness

Five of the nine survey questions addressed cultural awareness in the context of Computer Science. The responses indicated a general lack of understanding how many common programming practices are rooted in specific cultural traditions. Key findings include:

- 75% of responding students believe all phone numbers have 10 digits and should be written in the form (xxx)xxx-xxxx

- 50% of responding students believe the American Standard Code for Information Interchange is used world-wide and bridges all cultural gaps among users

- 36% of responding students believe high-technology culture is the same everywhere, and so local culture is of no concern in multi-national projects

- Almost 60% of responding students believe there are no cultural considerations in C and C++ programming since everyone uses the same language

These results indicate that Computer Science needs to improve the cultural awareness elements in our Program.

Self-Reflection

Four of the nine survey questions addressed self-reflection in the context of Computer Science. The responses indicated that most assignments and classes trigger self-reflection in most students, but there is room for improvement. Key findings include:

- 75% of responding students indicated feedback from CS instructors triggered self-reflection

- 76% of responding students indicated course lectures triggered self-reflection

- 73% of responding students indicated the research performed for assignments triggered self-reflection

- 84% of responding students indicated CS courses required students to apply self-reflection to assess their individual skills

There were anecdotal comments from students who completed the survey indicating a lack of common understanding of the meaning of “self reflection”, and a general feeling that this particular outcome was not applicable to Computer Science. These comments suggest the possibility of significant social response bias in responses to self reflection questions, resulting in may students simply responding as they perceive the instructor desires.

Changes to Teaching and Learning

The results of the current assessment suggest that our Program needs to improve support for the College’s Culture Awareness core outcome. The high-technology industry has a complex international multi-cultural structure, and the consumer markets for high technology products exist within the context of specific cultures. Poor communications and lack of teamwork due to cultural conflicts often are cited in trade journals as contributing to business failures, and system localization issues remain a key concern for technology marketers.

The introductory courses in our Program offer the greatest opportunity to emphasize the cultural awareness issues in Computer Science. Specific actions that can be taken include:

- In-depth discussion of system localization issues, including how and why major industry partners (e.g. Microsoft and Apple) incorporate localization in their products

- Inclusion of explicit cultural awareness criteria in assignment evaluation, particularly essay assignments

- Implementation of non-ASCII data encoding in assignments, including the use of international character sets

- Inclusion of reading assignments from trade journals highlighting case studies of cultural conflict in industry

Support for PCC's Self-Reflection outcome within the Computer Science program has not been reliably measured by this assessment, in our view. This opinion is based not so much on the assessment survey as on informal comparison between the survey results and the comments made by participants after of the survey. Simply put, some students expressed the opinion that the questions relating to self-reflection were "bogus" or "nonsense", and so their responses were designed to "make the course look good" instead of accurately reflecting their views. It is significant that these comments were **not** made with respect to the questions related to cultural awareness.

In this sense the survey results, which indicate effective support for the core outcome, contradict the informal feedback from students, which indicate self-reflection is ignored. In most cases anecdotal evidence is considered less reliable than survey results, but in this case anecdotes are given virtually equal consideration as a matter of caution.

Instructors will make self-reflection an explicit lecture element in some introductory courses (CS 133G, CS 161, CS 160) to build a common understanding of self-reflection and awareness of its importance in Computer Science. The SAC will investigate means of assessing self-reflection as a grade element in assignments, but no grading criteria are included at this time.

Changes to Assessment Strategies

The SAC used a survey to provide data for this year's assessment because self-reflection and cultural awareness are not explicit grading criteria in student assignments, and so a survey was deemed the most reliable means of gathering data. Nonetheless, there are significant issues with our assessment survey:

- The survey lacks psychometric validity. Since the instrument is neither reliable or valid the results are inconclusive

- The survey response rate is poor. Despite encouragement, many students opt out of the anonymous, voluntary survey

- The survey sampling is poor. Instructors volunteer to submit their sections for evaluation, thus the sample is non-random and exclusionary

The SAC has not yet decided how to proceed with future assessments, and surveys may be used again. Subject to approval at the Fall 2012 SAC meeting, future surveys will include the following:

- The assessment survey will be a graded assignment, and thus mandatory for students. The survey responses will be anonymous (participation only will be graded) but the survey will no longer be voluntary

- All sections of selected classes will be included to improve sampling

The preferred method of gathering assessment data is to use student assignment submissions rather than surveys. This requires core outcomes to be included in grading criteria, which involves restructuring many of the assignments. Course coordinators are working on this action item, and additional assessments will be done by analyzing student submissions where possible.

Appendix A - Survey Questions and Responses

The responses to all questions are given on a 5-point Likert-type scale anchored as:

1. *Strongly Disagree*
2. *Disagree*
3. *Neither Agree nor Disagree*
4. *Agree*
5. *Strongly Agree*

The questions are:

1. **All phone numbers have 10 digits - area code, prefix, and exchange - and should always be written in the form (xxx) xxx-xxxx**

2. **Any alphabet with more than 128 symbols must have a lot of useless symbols that can be ignored in C++**

3. **ASCII is used world-wide and so bridges all cultural gaps among users.**

4. **Local culture is not a concern for multi-national projects since the high-technology culture is the same everywhere**

5. **The feedback from your instructor triggered self-reflection in you**

6. **The research you performed for assignments required self-reflection from you**

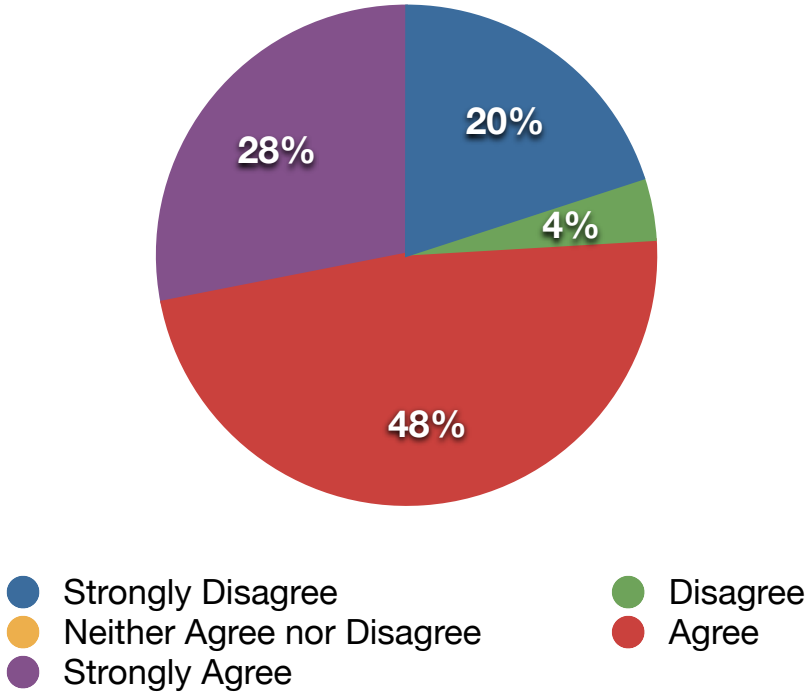
7. **The lectures in this course have not required any self-reflection from you**

8. **There are no cultural considerations in C++ programming since everyone uses the same language**

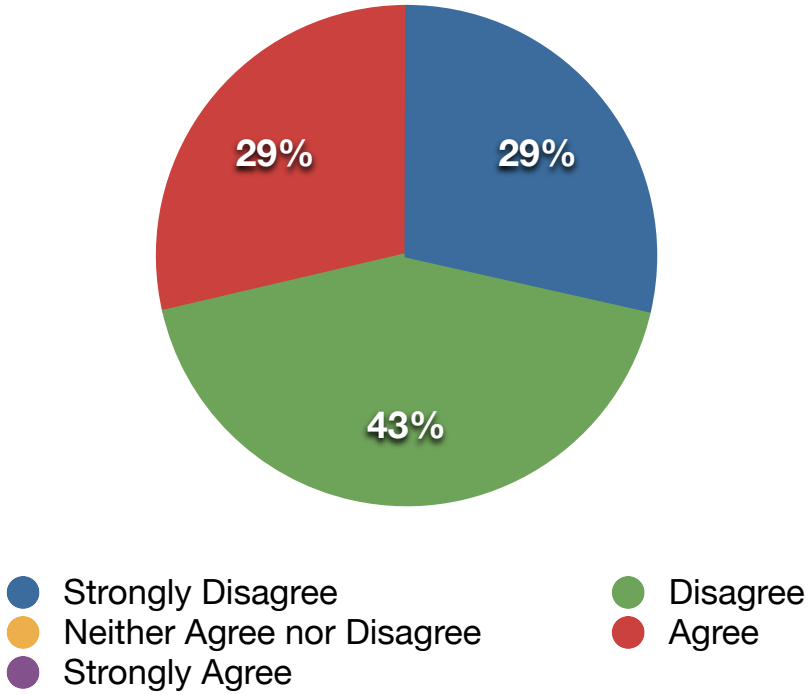
9. **This course has required you to apply self-reflection to assess your skills**

The survey response distributions are shown in the charts on the following pages.

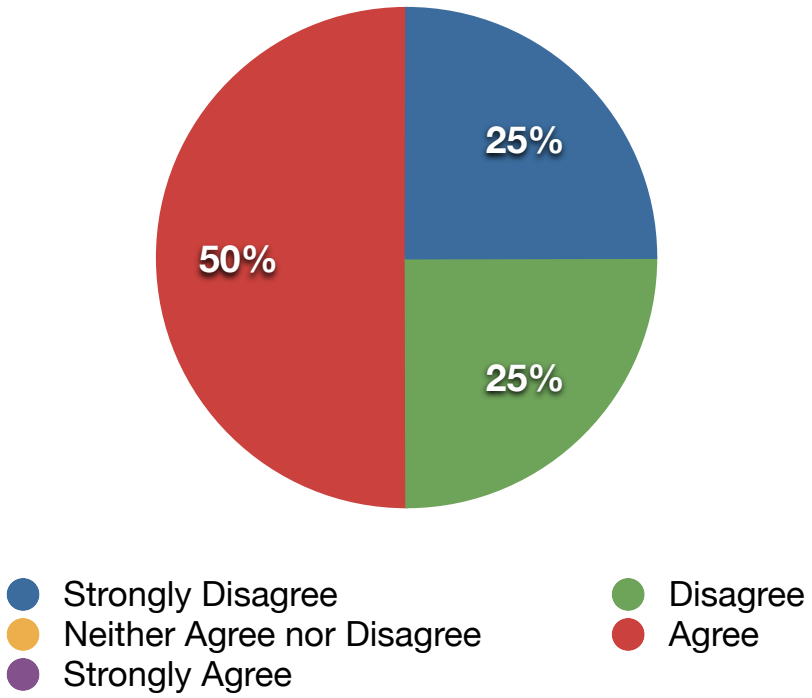
All phone numbers have 10 digits - area code, prefix, and exchange - and should always be written in the form (xxx) xxx-xxxx



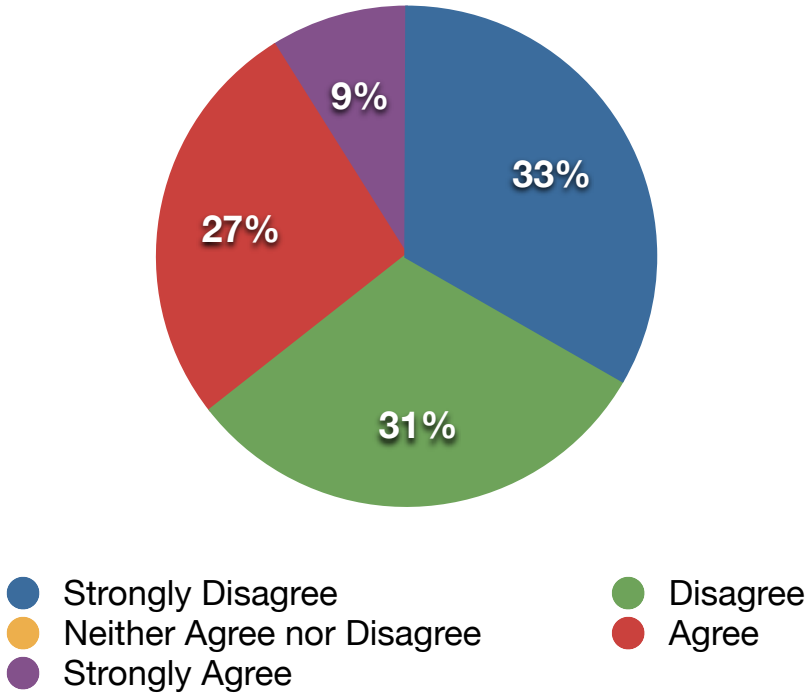
Any alphabet with more than 128 symbols must have a lot of useless symbols that can be ignored in C++



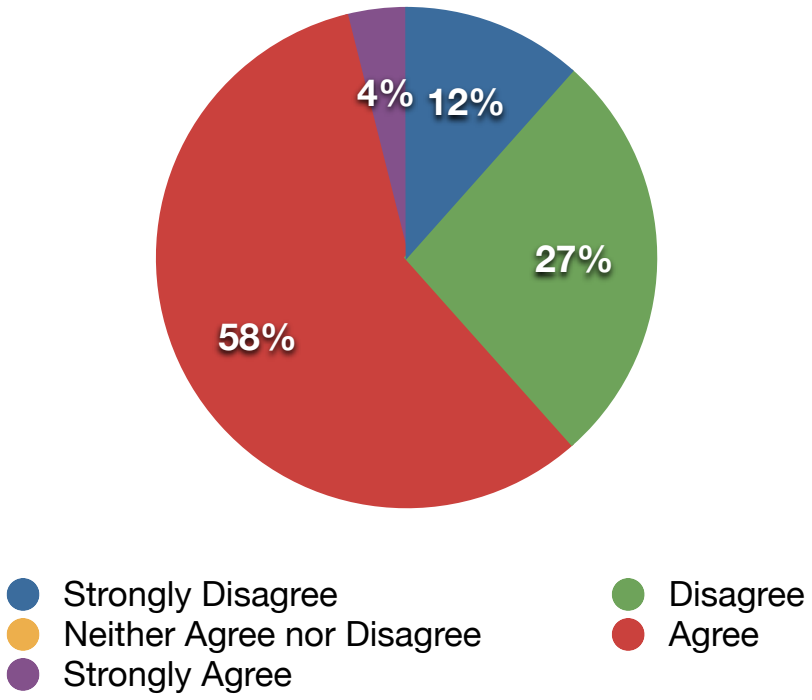
ASCII is used world-wide and so bridges all cultural gaps among users.



Local culture is not a concern for multi-national projects since the high-technology culture is the same everywhere



The feedback from your instructor triggered self-reflection in you



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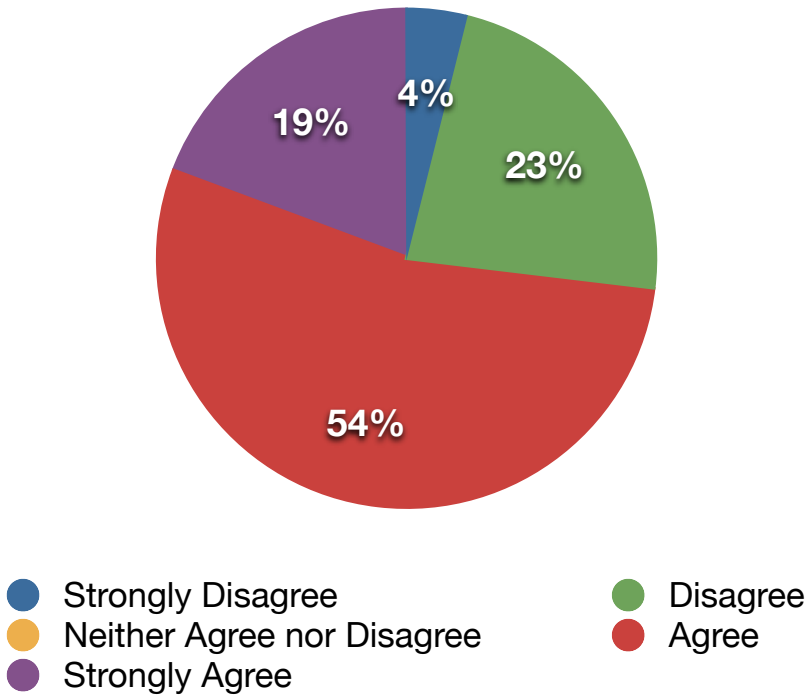
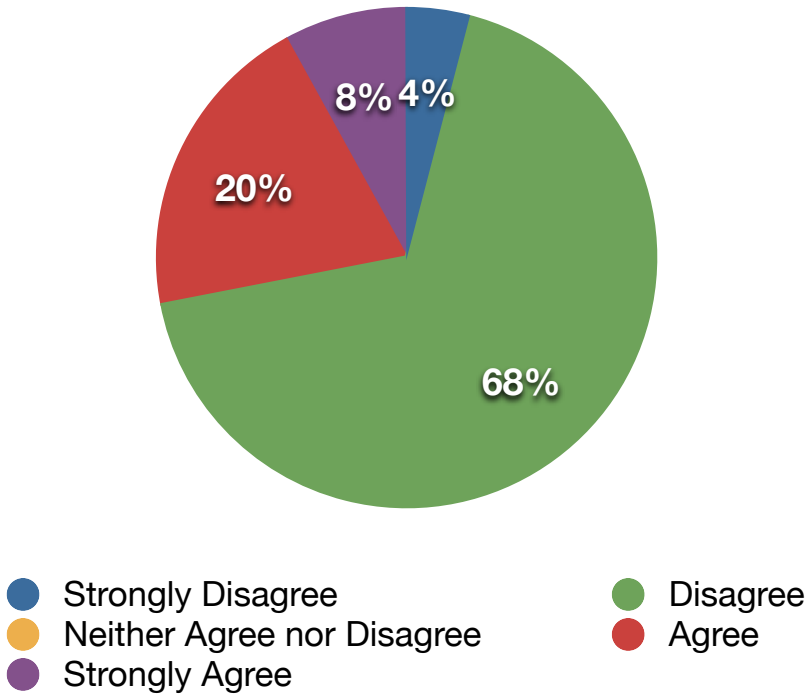
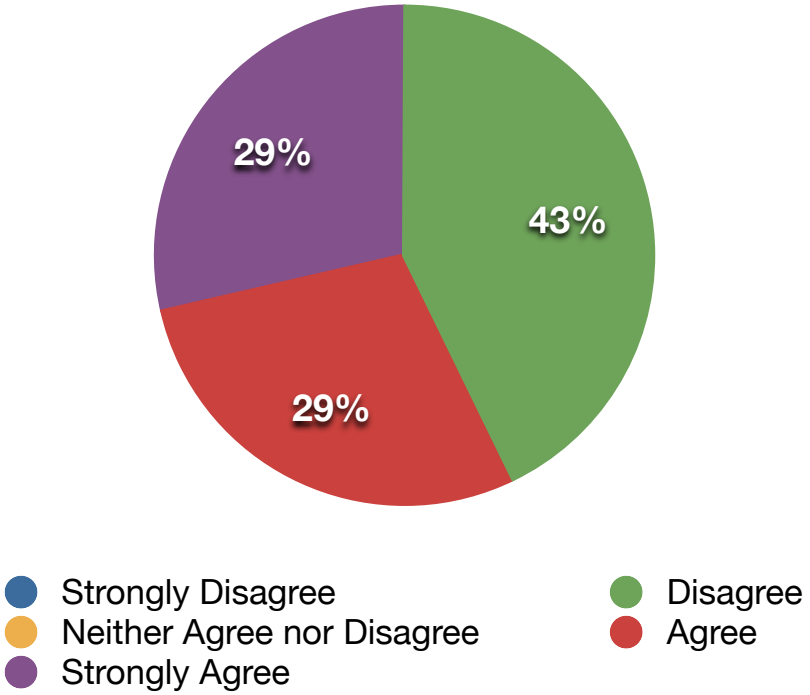


The lectures in this course have not required any self-reflection from you



There are no cultural considerations in C++ programming since everyone uses the same language



This course has required you to apply self-reflection to assess your skills