CS0 as a General University Requirement Course: Who’s Enrolling?

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Overview

CS Education Movement
Introductory CS education has received a massive amount of attention in recent years, including:
• White House’s CS for All Initiative [1]
• Hour of Code [2]
• Computer Science Education Week

Because only 25% of high schools offer CS courses [3], often college students enroll in CS courses with little or no programming experience.

The Rise of CS0
Consequently, the need for a CS0 course taught at a slower pace using a more beginner-friendly programming language is growing. Studies have found higher retention and success rates for CS1 students when they take CS0. As a result, many universities are offering an optional CS0 course.

Who Enrolls in CS0?
Students in CS0 vary significantly in terms of their:
• Programming experience levels
• Majors
• Math experience levels

To more successfully recruit students to CS0 and retain students as CS majors, we want to know more specifically who enrolls in CS0 and why. We propose to answer these questions and to provide insight into the effects of student enrollment when CS0 is offered as a general university requirement course (CptS 111).

CS0 at WSU

CptS 111
Introduction to Algorithmic Problem Solving
CptS 111 introduces students to computational thinking, and because it satisfies a quantitative general university requirement, students learn to solve quantitative problems from a wide variety of “real life” situations. Effort is made to engage students by introducing programming and lab assignments that are interesting, relevant, or fun while covering basic topics in the course, including functions, literals, operators, arithmetic, lists, loops, conditionals, and graphics.

Programming Tools Used
This course uses the Python programming language, APIs such as Google Maps, and hardware from AdaFruit Industries.

Survey Results

Responses to Survey by CptS 111 Students (N=87) in Fall 2016
(14 females, 69 males, 4 did not disclose gender; 133 surveyed; 46 did not respond)

• Are any of your family members in a CS-related profession?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Bar</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>5</td>
<td>11.63%</td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>12</td>
<td>27.91%</td>
<td></td>
</tr>
<tr>
<td>Sibling</td>
<td>5</td>
<td>11.63%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>24</td>
<td>55.81%</td>
<td></td>
</tr>
</tbody>
</table>

• 43 students (49.43%) attended a high school that offered a programming course; Java was the most common programming language.
• 36 students (41.38%) had programming experience prior to CptS 111.

• How did you obtain your programming experience?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Bar</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle school</td>
<td>1</td>
<td>2.78%</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>25</td>
<td>69.44%</td>
<td></td>
</tr>
<tr>
<td>Online course</td>
<td>12</td>
<td>33.33%</td>
<td></td>
</tr>
<tr>
<td>Coding camp or workshop</td>
<td>2</td>
<td>5.66%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>27.78%</td>
<td></td>
</tr>
</tbody>
</table>

• 33 students (38.37%) knew CptS 111 is a UCORE course satisfying the [QUAN] (quantitative reasoning) requirement when they enrolled.

• How did you hear about CptS 111?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Bar</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisor</td>
<td>70</td>
<td>82.35%</td>
<td></td>
</tr>
<tr>
<td>Friend</td>
<td>6</td>
<td>7.06%</td>
<td></td>
</tr>
<tr>
<td>Advertising</td>
<td>2</td>
<td>2.35%</td>
<td></td>
</tr>
<tr>
<td>Week of welcome event</td>
<td>1</td>
<td>1.18%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>12.94%</td>
<td></td>
</tr>
</tbody>
</table>

• 16 students (18.39%) saw a poster prior to enrolling; 3 said the poster influenced their decision to enroll in CptS 111:
  • “The ‘All Majors Welcome’ was very encouraging.”
  • “Made it seem interesting”
  • “I thought about it and decided that I wanted to gain a stronger understanding about computers”

• 57 students (65.52%) planned to enroll in CptS 121 (CS1) next semester.

Publicity and Outreach Efforts

Advisors
Advisors encouraged to inform students that CptS 111 is now UCORE and provide handouts to give to students during advising sessions.

Website http://school.eecs.wsu.edu/cpts111/
Describes the course, emphasizes no prior programming experience is necessary, showcases course projects, includes current CptS 111 student testimonials.

Posters Displayed Throughout WSU Campus

16 students (18.39%) saw a poster prior to enrolling; 3 said the poster influenced their decision to enroll in CptS 111:

Summary

Impact
Research investigating students enrolling in CS0 and tracking their progress toward degree completion is relevant to educators striving to continue or improve CS student retention and success rates. These are of increasing importance as demands for CS-related jobs continue to rise and as universities endeavor to produce innovative graduates to enter diverse and interdisciplinary technical fields.

Future Work
Future work includes tracking the progress of the Fall 2016 CS students and the long-term impact of transitioning CS0 to a UCORE course:
• Success in CS1 and CS2
• Numbers and retention of CS majors and minors
• Proficiency of graduates with programming proficiency
• CS0 included in more diverse majors, minors, and certificate programs
• Senior design/capstone project and research collaboration

References
[1] www.csforall.org