Rediscovering the Passion, Beauty, Joy, and Awe: Making Computing Fun Again, part 6

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1. SUMMARY

In his keynote at SIGCSE 2007, Grady Booch exhorted us to share the "passion, beauty, joy and awe" (PBJA) of computing [2]. This led to a series of room-packed sessions at the following five SIGCSE symposia to explore that idea from different angles [5, 6, 7, 8, 10]. They have provided a forum for sharing:

- **What we've done**: Highlighting successful PBJA initiatives the presenters have undertaken or seen and wish to trumpet.
- **What we should do (curriculum)**: Pointing out where our curriculum is lacking in PBJA, and how to fix it.
- **How we should do it (pedagogy)**: Sharing how a change in attitude / focus / etc. can make strides to improving PBJA.

While the initial PBJA sessions evolved from a need to understand and combat the enrollment crisis of seven years ago, we are now seeing a resurgence in interest in our field, partially because "coders are hip and computer science is hot" [13]. Some point to "the Facebook Factor" as the source of inspiration for many young students, claiming this is a "Sputnik moment" [11].

Many dispute this, however, citing statistics that indicate under-represented students have not returned, and continuing negative connotations about the field [1]. Free computer science online courses are drawing hundreds of thousands of students [14], and there are colleges where the numbers have so exceeded historic highs, that some rightfully claim the crisis is over [12, 15]. This PBJA "movement" was born out of this enrollment crisis, but is not tied to it. There is always value in sharing novel best practices and advocating techniques that make computing fun.

In the past, we either tried to gather educators who either brought a wide variety of perspectives, or who would focus on a particular issue (e.g., K-12 education or broadening participation). This year we've gathered educators whose introductory class numbers are exploding or who have instituted very creative and successful paths into the major. The hope with this panel is to explore best practices in these crucial early years, in terms of extolling the PBJA of computing.

2. VALERIE BARR

In 2004, the Union College CS department was offering two sections per year of a typical CS1 course. Only 9% of annual enrollment was in the introductory class; 14% of those students were women. At that time, 31% of annual enrollment was in non-major courses. Beginning in 2005, inspired by the Georgia Tech media computation course, we embarked on an experiment in the use of contextualized computing. Today we offer *six* theme-based introductory CS courses, each of which covers the same concepts and skills. The course themes are big data, robotics, game development, artificial intelligence, media computation, and programming for engineers. In 2011-2012, 50% of the enrollments were in introductory CS, and 29% of the students were women (33% if we do not consider the *Programming for Engineers* course). In raw numbers we now enroll 3 to 5 times as many students in the introductory course per year as we did in 2004. While CS is not required college-wide, several majors (notably neuroscience and managerial economics) have joined the engineers in requiring the introductory CS course. It is a key component of the digital media minor and the computational methods minor. Finally, we have seen an increasing number of

departments add CS to their lists of allowable electives to satisfy math and science requirements.

3. MARK GUZDIAL

In 1999, Georgia Tech implemented a new general education requirement: everyone on campus had to take computer science, and it was the same introductory course for everyone. Students in Liberal Arts, Architecture, and Business programs withdrew-or-failed over 50% per term. In 2003, we decided to create three courses: One for CS and Science majors, one for Engineering majors (in MATLAB), and one for the rest. Media Computation was developed as an introduction to computing that answered the question for the other majors, "Why learn about computing?"

The idea of Media Computation is to learn the same introductory computing as a traditional CS1, while playing with the pixels in a picture (to implement Photoshop™ effects), the samples in a sound (to reverse or splice sounds), the characters in a Web page, or the frames in a video. Changing the data changes the context, which creates a purpose. Assignments in a Media Computation course involve creativity, as students build collages, music, animations, and comic strips. The average pass rate today in Media Computation is around 85%. We do get new CS majors or minors through Media Computation, but our greater goal is computational literacy across campus.

4. DAVID J. MALAN

CS50 is Harvard College's introductory course for majors and non-majors alike, enrollment in which both rose and fell along with the dot-coms. Although enrollment peaked in 1996 at 386 students, it had settled by 2002 in the neighborhood of 100.

We set out in 2007 to combat that trend by tackling two problems. We hypothesized that CS50 suffered from two problems, one of perception and one of design. Although, according to end-of-term surveys, the course had never lacked for good teachers or good content, the consensus on campus for years had been to beware this particular course. And the course's own syllabus may very well have been dated in the eyes of students who had begun to carry regularly modern hardware and software in their backpacks and pockets. Not only did we proceed to revamp every one of CS50's problem sets, we brought its syllabus more in line with technological trends already familiar to students.

We also altered the tone of the course to appeal to those "less comfortable" with computing on campus. But we took care to preserve the course's rigor and underlying fundamentals, lest we do our own students a disservice. Our new approach appears to be working [9]. Between 2006 and 2007, enrollment in CS50 more than doubled from 132 to 282 (+114%). Between 2007 and 2008, enrollment increased another 17% to 330, though even more striking was that year's 48% increase in female enrollment. By 2010, enrollment had risen to 494 students. In 2011, CS50 became the second-largest course at Harvard College, with 607 students (+360% since 2006) [3]. In 2014, the department itself will graduate 74 majors, up from 25 in 2006 (+204%) [4].

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