Rediscovering the Passion, Beauty, Joy, and Awe: Making Computing Fun Again, part 3

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1. SUMMARY

In 2006, computing education was suffering from a crisis – enrollments were dropping sharply at universities and colleges across the United States, and interest in computing from high school and middle school students was waning significantly. At the SIGCSE Symposium in 2007, the ACM Education Board organized a special session to explore the underlying causes [3]; one of the culprits that emerged was the tarnished image of computing and computing professionals. At the same conference, keynote speaker Grady Booch shared that one of the "metaskills" lessons that should be taught is the "passion, beauty, joy and awe" (PBJA) of computing [2]. This led to room-packed special sessions at the following two SIGCSE symposia to explore that idea from different perspectives [4, 6]. The sessions have provided a forum for sharing:

What we've done: Highlighting successful PBJA initiatives the presenters have undertaken or have seen and wish to celebrate.

What we should do (curriculum): Pointing out, as Grady Booch did, 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/behavior/etc. can make strides to improving PBJA.

Fortunately, enrollments are rising again, and there are universities where the numbers are so strong (returning to historic highs), that some claim the crisis is over [5, 7]. Many dispute this, however, citing statistics that indicate under-represented students (women and ethnic minorities) have not returned, and there still exist strong negative connotations about the field [1]. This PBJA "movement" was born out of the enrollment crisis, but need not be tied to it. There is always value in sharing novel best practices and advocating techniques to your colleagues to make computing fun for the next generation. We have gathered educators who bring a wide variety of perspectives; this year, we hear from international, domestic, high school, university and industrial representatives.

2. GAIL CHAPMAN

Computer science teachers at the K-12 level rarely have the opportunity to experience the collaborative nature of computer science and all too often forget that what may have inspired passion, beauty, joy and awe for us has little relevance in the lives of today's diverse student population. The isolation that teachers feel can lead to teaching that models their own experiences rather than unleashing the bodies of knowledge related to computer science that students bring from their lives, culture, and communities.

In Los Angeles Unified School District, the K-12 Computer Science Equity Alliance, a University-District partnership funded by NSF to attract and retain more females and students of color in rigorous computing courses, has developed and supported an integrated approach to reframing computer science education; this includes curriculum, professional development for teachers, and ongoing support.

The curriculum builds off of learning theories that draw from students' funds of knowledge, emphasize collaborative inquiry, and develop algorithmic thinking. However, providing curricular resources alone is not enough to support teachers. Teachers need to experience models of engaging computing learning communities, which provide examples of projects that are conceptually grounded, but open-ended enough to allow students to make relevant connections with their own lives. Ongoing professional development is essential to support the teachers. In this session, I will share examples of how this integrated approach to teaching and learning has changed the nature of computer science classrooms in LAUSD and inspired passion, beauty, joy and awe for both students and teachers.

3. ORIT HAZZAN

My perspective is based on the fact that most computer science graduates eventually work as software engineers. If we just admit to this fact, and without changing the definition of what CS is, we might feel more comfortable to expand the scope of the educational offerings of CS programs and eventually let CS students rediscover at least some of the passion, beauty, joy, and awe of computing. According to this perspective, such CS programs should include also some engineering aspects that are manifested in the daily work of software engineers, such as teamwork experience, management skills, and a customer-oriented perspective. These elements, which point to the discipline's social facet, have the potential, in my opinion, to make computing fun, especially in light of the fact that this image clearly contrasts the image of CS that deters many potential students from entering the discipline. Accordingly, it is my belief that in order to generate greater excitement among potential CS students, we should highlight the fact that human aspects, in general, and teamwork, in particular, are at the heart of the actual work of the discipline's graduates. The importance of these skills has already been widely acknowledged by the software industry, which employs most of the CS graduates. In my presentation, I will introduce this perspective by highlighting connections between human aspects of software development and CS curricula.

4. MAGGIE JOHNSON

Google has a commitment to contributing to computer science education initiatives, as well as increasing diversity in the field. At the undergraduate and graduate level, we have created programs such as the Fuse retreat for freshmen, CSSI for rising sophomores, BOLD for rising juniors, and Google Summer of Code. Google sponsors efforts with NSF, NCWIT, CS4HS and CS Unplugged as well as programs that support the educational use of our products and technologies such as Google for Educators, the Google Teacher Academy, App Inventor for Android, and Google Code University. These are all important efforts, but none directly address bridging the achievement and diversity gap in computer science at the K12 level.

One of our current initiatives focuses on bridging this gap. We are developing middle school Algebra and Science curriculum that incorporates simple programming exercises to help students recognize, generalize and represent patterns, and then construct corresponding algorithms. These exercises support and enhance the learning of Algebra and Science through interactive exploration, and by building solutions to problems which students find not only fun, but also very rewarding.

5. LEIGH ANN SUDOL

Although it may seem counter-intuitive, the fact that computers have become ubiquitous could actually have a detrimental effect on student's interest in computer science. The Apple slogan *"There is an App for that"* implies that the majority of useful things people use everyday is already done. The programs that we ask students to write in our introductory classes can be found on Google, already complete, faster than students can open up the editor they are going to write their programs in.

Introductory computer science used to be about getting the computer to do something you wanted it to do that did not exist before. We have moved away from this mentality of creating new programs, to instead become an introductory discipline in recreating existing works. Part of the joy of early computer science is still found in that moment of creation and completion.

With this in mind early introductions to computer science should focus not only on core concepts of the discipline, but what new and exciting things are being created right now with those concepts. Using iGoogle as a way to develop mash up software aimed at a particular audience, motivating early machine learning with Weka and the Netflix prize can help students come to understand and appreciate data. Asking introductory programming students to write programs that will help them with other classes, or support a small piece of current research can help them feel a part of and come to understand the beauty in the larger field of computer science.

6. REFERENCES

[1] ACM, WGBH. Interim report. *New Image for Computing*. April, 2009. **www.acm.org/membership/NIC.pdf**

[2] Booch, G. 2007. Readn', writ'n, 'rithmetic..and code'n. *SIGCSE Bull.* 39, 1 (Mar. 2007), 197-197. **http://doi.acm.org/10.1145/1227504.1227380**

[3] Cassel, L., McGettrick, A., Guzdial, M., and Roberts, E. 2007. The current crisis in computing: what are the real issues?. In *Proceedings of the 38th SIGCSE Technical Symposium on Computer Science Education* (Covington, Kentucky, USA, March 07 - 11, 2007). SIGCSE '07. ACM, New York, NY, 329-330. **http://doi.acm.org/10.1145/1227310.1227426**.

[4] Garcia, D. D., Cutler, R., Dodds, Z., Roberts, E., and Young, A. 2009. Rediscovering the passion, beauty, joy, and awe: making computing fun again, continued. In *Proceedings of the 40th ACM Technical Symposium on Computer Science Education* (Chattanooga, TN, USA, March 04 - 07, 2009). SIGCSE '09. ACM, New York, NY, 65-66. **http://doi.acm.org/10.1145/1508865.1508889**

[5] NY Times. *CS Programs Make a Comeback in Enrollment*. **www.nytimes.com/2009/03/17/science/17comp.html**

[6] McGettrick, A., Roberts, E., Garcia, D. D., and Stevenson, C. 2008. Rediscovering the passion, beauty, joy and awe: making computing fun again. In *Proceedings of the 39th SIGCSE Technical Symposium on Computer Science Education* (Portland, OR, USA, March 12 - 15, 2008). SIGCSE '08. ACM, New York, NY, 217-218. **http://doi.acm.org/10.1145/1352135.1352213**

[7] Reges, S. Email to SIGCSE-members mailing list. *enrollment crisis over?* 2009-05-21.