

# Rediscovering the Passion, Beauty, Joy, and Awe: Making Computing Fun Again, part 4

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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 2007 SIGCSE Symposium, the ACM Education Board organized a special session to explore the underlying causes [7]. In his keynote at the same conference, Grady Booch exhorted us to share the “passion, beauty, joy and awe” (PBJA) of computing [4]. This led to a series of room-packed sessions at the following three SIGCSE symposia to explore that idea from different perspectives [8, 9, 12]. They have provided a forum for sharing:

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

Fortunately, enrollments have been continually rising, and there are colleges where the numbers are so strong (returning to historic highs), that some claim the crisis is over [10, 13]. Many dispute this, however, citing statistics that indicate under-represented students have not returned, and continuing negative connotations about the field [2]. Also, recent news of limited hiring in the information technology sector could have a dampening affect [11]. 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 tried to gather educators who brought a wide variety of perspectives (e.g., in 2010 we heard from international, domestic, high school, university and industrial representatives). This year, we’ve shifted from that “breadth-first” model to a “depth-first” one, and have invited three K-12 teachers who, collectively, have taught computing at an all-girls middle school, an under-served high school, and an affluent high school. The hope with this panel is to be able to drill down and understand the K-12 space, in terms of extolling the PBJA of computing.

## 2. MICHELE HUTTON

Middle school students are an extraordinary group, full of contradictions – thoughtful, obnoxious, loud, introspective, self-absorbed, and excited about making the world a better place. Middle school is when children become young adults, able to think deeply and grapple with abstract ideas. Additionally, we are free from the pressure to directly prepare students for college and the workforce. What better time to teach complex computing concepts, helping students find beauty, joy, and awe in what we are passionate about?

The Girls’ Middle School computer science program where I taught has engaged hundreds of students in a variety of computer science approaches, from programming to robotics to web design to computational thinking. There are significant advantages to providing a diversity of entry points and opportunities for students to find their own passion and joy in computer science. The notion of “differentiation” means providing work at different levels of

challenge and in different areas of strength – including non-technology-based activities.

Middle school is an opportune time to help students discover passion for computer science – while they're still joyful about learning and the sciences, and when they're able to see the beauty in complex concepts.

### 3. EUGENE LEMON

The vast majority of students in my school district are underrepresented ethnic minorities, and even though our district has an exemplary technology infrastructure with a high student-to-computer ratio, the computer science curriculum currently being taught at most of our schools leaves much to be desired (in terms of sharing PBJA).

I've been teaching for eighteen years, and on a few occasions I've been pulled out of my computer science classroom to work as a Teacher on Special Assignment (TSA). On some of my TSA assignments I would be asked to assist the HR office and other departments to design and manipulate PC databases. I would agree to leave the classroom on one condition; the department would have to allow me to bring some of my students to assist me.

Often these were students who were looked upon as outcasts; they were young people who came from dysfunctional homes; group homes; juvenile hall; and some were even homeless. As they worked in the district offices with me, you could really sense their PBJA. They were excited because they were using database software to manipulate information that provided a service to adult staff members who truly appreciated them for the work they were doing. They were “giving back” to these adults, who were sharing their honest appreciation for jobs well done.

In my talk I will discuss how, over the years, I've given my students a sense of self-esteem and joy by enabling them to provide a service that was greatly appreciated by adults who would otherwise have disdain for them. The realization that they could use computing to make a real difference was quite transformative for them, and I contend service-based projects (as in [5]) could have a profound impact for marginalized students.

### 4. JOSH PALEY

I currently teach four different CS courses: a variant of AP Computer Science AB, Programming Concepts in Scheme, Introduction to Java, and Animation Using Virtual Worlds (using Alice [3] and Scratch [14]). This last class is targeted at students who otherwise would never touch a CS class. The other classes are more demanding, particularly in terms of mathematics.

One of my notions of PBJA is mathematical in nature. I find the elegance of functional programming and the simplicity of a clean abstraction to be wonderful things. One of my favorite examples of this is the *binary mobile* problem [1, ex 2.29], which asks students to write selectors for given constructors for a mobile abstract data type with weights, then use their selectors to calculate the total weight of this recursive structure, and find out whether it is balanced or not. In AP CS, Programming Concepts, and Intro to Java, I work very hard to get students to produce clean programs with powerful results. This past summer, I was able to get *incoming ninth graders* – most of whom had no prior programming experience – to draw a fractal tree in 90 minutes using BYOB based on Scratch [6] on the first day of a programming camp. I accidentally stumbled on the card game

*War* as nature's perfect test for AP CS AB students: player hands (queues), wars on the table (stacks), deck of cards (hash set), interesting end-game conditions, the potential for non-terminating programs... and the students loved it!

I would like to see us try to make all of computing as exciting and glorious as these examples. This is why I am excited about seeing PBJA listed explicitly in the learning goals for the new AP curriculum. It has the spirit of all of these things in visually compelling and intellectually stimulating ways.

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