ACM Inroads - Preface to the Special Issue[1]

Computer Science Principles and the CS 10K Initiative
By Guest editors Amy Briggs and Lawrence Snyder

Overview

Computer Science educators worldwide are working to extend their reach to students who have not had access to a content-rich computer science curriculum. Some efforts are creating new courses to broaden participation and better prepare all students for a 21st-century workforce. Other curriculum reform projects are focusing on attracting and retaining populations of students traditionally underserved in secondary and post-secondary computer science education.

There are many exciting developments underway, and great opportunities to enact positive change in computing education. The contributions of this special issue all relate to the Computer Science Principles project and CS 10K initiative—ambitious collaborative efforts that seek to bring more computer science education opportunities to more students—and the required outreach, curricular reform, policy changes, and professional development to bring these to fruition.

The Critical Perspective and eight supporting contributions in the special issue are briefly highlighted below.

Transforming High School Computing: A Call to Action
Janice Cuny is a Program Officer in the Directorate for Computer and Information Science and Engineering at the National Science Foundation. Her Critical Perspective begins by assessing the current state of computer science education in the United States. Finding a significant lack of diversity among CS college graduates, and few opportunities to learn substantive computer science at K-12, she analyzes how these two problems (and others) can be addressed through focusing on pre-college education. She argues that high school is the key, and points out the advantages of focusing on the transition to college, specifically placement exams. The challenge, she notes, is preparing a sufficient number of teachers capable of offering a concepts-rich CS course in high school; she addresses how to bring professional development to so many teachers. Because the NSF cannot solve these problems on its own, she concludes by asking the reader, "Will you help?"

The CS Principles Project

Owen Astrachan and Amy Briggs are leaders of the Computer Science Principles project, a collaborative effort to design and launch a new introductory computer science course on a national scale in the United States. The course is the centerpiece of the CS 10K initiative, which aims to have a concepts-rich CS curriculum in 10,000 high schools taught by 10,000 well-prepared teachers by 2016. The authors describe the CS Principles course, how it was designed, and its future development into a new Advanced Placement offering in computer science.

Reforming K-12 Computer Science Education … What Will Your Story Be?

Coauthors Chris Stephenson, Executive Director of the Computer Science Teachers Association (CSTA), and Cameron Wilson, Director of ACM's Office of Public Policy, address how to answer Jan Cuny's call to action. The core of their article explains the "problem" of curriculum reform in a completely decentralized education system. They describe the many challenges, and identify paths toward solutions. In addition to the specifics on what must be done, they give several inspirational stories of educators who have made tangible reform in their localities. And, to assist others eager to become involved, they lay out constructive guidelines on how to solve reform issues.

Beyond Curriculum: The Exploring Computer Science Program

Joanna Goode, Gail Chapman, and Jane Margolis describe the *Exploring Computer Science* (ECS) program, a program that has its roots in the Los Angeles Unified School District and is now being taught at high schools nationwide in the United States. Their paper provides an overview of the ECS curriculum and program: starting with a discussion of the background of ECS, its curriculum, and pedagogical approaches, the paper then outlines related professional development, policy implications, impact, and lessons learned. The authors offer *Exploring Computer Science* as a model effective program for working in partnership with public schools to broaden participation in computing.

The First Five Computer Science Principles Pilots: Summary and Comparisons

The five instructors who piloted the Computer Science Principles course in 2010-11 present a summary of their courses. The five separately written contributions have a parallel structure that allows some measure of cross-course comparison. Though the classes were very different from each other, and served very different roles on their campuses, the collaborative effort still produced a remarkable amount of similarity. Prior to the five segments, Larry Snyder gives a brief introduction to the goals and participants. Then, afterwards, he presents summary data gathered as part of the study that indicates that CS Principles was effective at attracting underrepresented groups and engaging all students.

How to Implement a Peer Instruction-designed CS Principles Course

Beth Simon and Quintin Cutts designed the CS Principles pilot course offered at University of California at San Diego in 2010-11. Their Bits & Bytes article describes the use of Peer Instruction—a pedagogy developed to support students in developing deep understanding in a lecture environment—and its use in the UCSD pilot. They offer examples of how important skills such as communication, collaboration, and critical analysis can be enhanced with the use of peer instruction.

Computer Science Principles at Newbury Park High School

Rich Kick teaches computer science at Newbury Park High School in Southern California, one of ten high schools partnered with ten colleges participating as pilot schools in the CS Principles Project during 2011-12. His year-long high school course covers all aspects of the Big Ideas in the CS Principles curriculum framework, while taking much of its specific direction from the students in the course. Kick shares student work from his course along with student reflections on the impact of the course content on their lives.

Living in a Computing World: A Step Towards Making Knowledge of Computing Accessible to Every Student

Jody Paul, Professor at Metropolitan State College of Denver, and current Chief Reader of the AP Computer Science A exam, describes the pedagogical approach used in his pilot offering of CS Principles in 2010-11, titled *Living in a Computing World*. He shares a number of strategies for engaging student interest—tailoring discussion to current events, building on interests that the students bring to class, and helping students make connections between their own lives and the course material. Starting with "what worked and what didn't", the paper continues with specific advice for a student-centered approach, and concludes with a set of "lessons learned".

Status Update: High School CS Internationally

Lawrence Snyder, Emeritus Professor at the University of Washington, briefly summarizes concepts-rich CS education around the world. Using four countries as examples—Canada, Israel, India and New Zealand—he characterizes where each is and the challenges they are currently addressing. To look more deeply at one specific instance, he turns to the United Kingdom and the recently released Royal Society report, *Shut Down or Restart? The Way Forward for Computing in UK Schools*. This report, which finds most schools stuck offering low level skills instruction that students find boring and useless, carefully analyzes problems that range from the terms used to frame the discussion, to incentivizing administrators to make needed changes. They present a list of action items to address the key issues.

Enjoy the special issue -- and get involved in transforming computer science education for all students!

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