Taking IT to the Next Level: Why Computer Science is Critical

Dr. Chris Stephenson
Agenda

- Skills shortages and educational needs
- Computer science is crucial
- Challenges
- Working together
Fastest Growing Jobs

Computing Comprises Some of the Fastest Growing Occupations

Source: Bureau of Labor Statistics
Jobs and Graduates

Annual STEM Job Openings vs College Graduates Through 2018

## Very Scary Numbers

### Schools Offering Introductory Computer Science

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2007</th>
<th>2009</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>78%</td>
<td>73%</td>
<td>65%</td>
<td>69%</td>
</tr>
</tbody>
</table>

### Schools Offering Advanced Placement Computer Science

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2007</th>
<th>2009</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40%</td>
<td>32%</td>
<td>27%</td>
<td>36%</td>
</tr>
</tbody>
</table>
Female CS Test Takers

Joanne Cohoon, University of Virginia, 2012
National School Enrollment and APCS Exam Participation by Race and Gender

- Enrollment
- APCS Exams

<table>
<thead>
<tr>
<th>Race/Gender</th>
<th>Enrollment</th>
<th>APCS Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian</td>
<td>1.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Asian</td>
<td>5%</td>
<td>23%</td>
</tr>
<tr>
<td>Black</td>
<td>3%</td>
<td>17%</td>
</tr>
<tr>
<td>Latino</td>
<td>6%</td>
<td>19%</td>
</tr>
<tr>
<td>White</td>
<td>57%</td>
<td>67%</td>
</tr>
<tr>
<td>Female</td>
<td>49%</td>
<td>15%</td>
</tr>
<tr>
<td>Male</td>
<td>51%</td>
<td>85%</td>
</tr>
</tbody>
</table>
Computer Science is Critical in High School
Knowledge for Today and Beyond

We consider it critical that students be able to read and write and understand the fundamentals of math, biology, chemistry and physics. To be a well-educated citizen in today’s computing-intensive world, students must have a deeper understanding of the fundamentals of computing as well.
CS and Social Justice

• Students from minority homes are far less likely to be exposed to computer science knowledge in their home environment.

• Schools with high numbers of underrepresented minority students are far less likely to have access to rigorous computer science courses in schools.

• Access to this privileged knowledge has become to social justice issues of the 21st century.
CS Education and National Security

• Powerful link to securing the cyber-infrastructure, protecting national security, and making the energy infrastructure more efficient. All of these are linked to computer science education.

• Without knowledgeable computer scientists, we cannot hope to secure these vital systems.
Challenges
Tool Users vs Tool Builders

• Using technology tools is an important skill; however it is not where innovation happens.
  — Flying a plane is not the same as designing a plane.

• We need technology “tool builders” to create the tools that will solve problems and improve lives.

• Computer science creates tool builders.
Computer Science is Distinct from Literacy

Computer science is the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society. (ACM Model Curriculum)

• Computer Literacy: The ability to use various software applications (often called “point and click education”).

• Educational Computing/Educational Technology: The use of computers to support learning across the curriculum.
Which Courses Count and Who Can Take Them

• Because computer science is an “elective” rather than a “core” course it is becoming increasingly difficult for students to fit it into their schedules.

• This situation is exacerbated by the trend to increase the number of math and science courses students must take in order to graduate (when CS is counted as neither).

• Computer science courses are often classified as a “technology credit” rather than an “academic credit.”

• Access to rigorous computer science courses is often limited to high-end schools with low minority populations.
Chic vs. Geek

- Computer Scientist stereotypes distort reality and reduce the appeal for students

Showcase the reality – Promote the “coolness factor”

- Talented, successful men and women from all groups.
- Highly social work with emphasis on team collaboration.
- Working to solve important problems.
- Involved in exciting projects in every aspect of life.
- A vital skill for all career areas
- Amazing opportunities.
Local Success vs. National Disaster

• In the last few years the commitment to improving computer science education has resulted in pockets of excellence:
  — New tools (Alice, Scratch, Kodu, Phrogram, Bootstrap…)
  — New curricula (Exploring Computer Science, Media Computation…)
  — New ways of thinking about equity and engagement

• If we are going to achieve a true renaissance in CS education in K-12 we need to make both curriculum and policy changes at the state and national level and we need rigorous informal education programs to fill the gaps
Working Together to Address the Issues
CSTA’s Mission

CSTA is a membership organization that supports and promotes the teaching of computer science and other computing disciplines. CSTA provides opportunities for K-12 teachers and students to better understand the computing disciplines and to more successfully prepare themselves to teach and learn.
CSTA Today

CSTA is an international membership organization of 11,000 members

• CSTA is a learning community
• CSTA is an advocacy organization
• CSTA is a provider of professional development for teachers
• CSTA is a research body
• CSTA is a provider of resources
CSTA Regional Chapters

- Arizona
- Arkansas
- California (4)
- Canada-Alberta
- Canada-Saskatchewan
- Colorado
- Connecticut
- Florida
- Georgia
- Illinois
- Kansas
- Kentucky
- Maryland
- Massachusetts
- Michigan
- Missouri
- New Hampshire
- New Jersey
- New Mexico
- New York (3)
- North Carolina
- Ohio
- Oregon
- Pennsylvania
- South Carolina
- Texas (2)
- Utah
- Virginia (2)
- Washington
Standards: Running on Empty

- Examines current learning standards in core subject areas in every state.
- Shows that roughly two-thirds of the country have few computer science education standards for secondary school education, and most states treat high school computer science courses as simply an elective.

- Includes state-by-state standards report cards keyed to CSTA computer science standards.
New K-12 Computer Science Standards

• Introduce fundamental CS concepts to all students, beginning at the elementary school level.
• Present CS at the secondary school level in a way that can fulfill a CS, math, or science graduation credit.
• Encourage schools to offer additional secondary-level CS courses that will allow students to study CS in more depth and prepare them for entry into the work force or college.
• Increase the availability of rigorous CS for all students, especially those who are members of underrepresented groups.
Equity: Addressing Core Equity Issues

• An in-depth look at the barriers in our educational system
• Practical recommendations for solutions to address core equity issues
• Comprehensive recommendations for each stakeholder group
• Practical, achievable suggestions for working together to ensure that all students have the opportunities that rigorous computing provides
Posters and Brochures
CSTA Publications

- CSTA website (csta.acm.org)
- CSTA *Voice* (published bi-monthly)
- Advocate blog (blog.acm.org/csta/)
- Podcasts
- Videos
- Original research (national studies tracking CS education)
How Can We Work Better Together

• Help connect interested parties
  • Provide reciprocal links on website
  • Provide presenters for conferences and events

• Ensure consistent messaging across organizations and programs

• Share strategies

• Work together to advocate for improvements to access to computer science knowledge and skills for all children
THANK YOU!

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