



The Importance of Teaching Computer Science in High School

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WHAT IS COMPUTER SCIENCE?

Computer science studies computers and problem-solving processes, including their

- Principles
- Designs
- Applications
- Impact





WHY SHOULD STUDENTS STUDY COMPUTER SCIENCE?

Intellectually engaging and developmental

Flexible, creative, rewarding careers

Unmet workforce need

CS teaches vital 21st century skills

Design, logical reasoning, and problem solving
Creating and adapting, not just using, technology





CS contributes to local economy

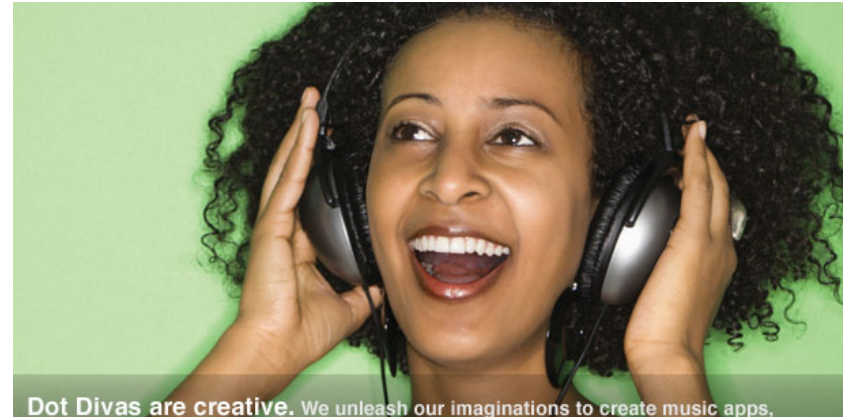


Many jobs can be done remotely

Great Career! Best Jobs in America 2011

1. Software Engineer
2. Mathematician
3. Actuary
4. Statistician
5. Computer Systems Analyst

According to CareerCast



Three of the top ten occupations are computing

Systems Engineer



Manage large complex projects

IT Project Manager



Plan, organize, and oversee the team on a computing project

Network Security Consultant



Protect important computer systems from infiltration

Source: CNNMoney.com, Best Jobs in America, 2011

Computing offers exciting work that affects our world and the people in it



Create technology for

- Tracking endangered dolphins
- Mobile forensics labs for instant analysis at crime scenes
- GPS systems that guide blind people
- Scanning DNA for childhood diseases
- Designing and displaying new fashions



Source: dotdiva.org

Computer Scientists work in every industry

Source: dotdiva.org

I design how animated characters move on film.



Kendal Sager
Animation/Film

I created a smartphone app for art museum visitors.



MaCherie Edwards
**Art History/
Education**

I develop computer simulations that increase our knowledge of nearby galaxies.



Gurtina Besla
Astronomy

I help bring high-speed Internet to disadvantaged communities around the world.



Clare Liguori
**Communications/
Internet Technology**

I develop software for a cochlear implant that will help people who are deaf to hear.



Sahray Gambaro
Disabilities

I create 3-D fashion design software.



Anamary Leal
**Fashion & Design/
Computer Graphics**

I develop software that can design easy-to-build shelters for victims of disasters.



Claudia Gold
**Humanitarian &
Disaster Relief**

I research ways to fight cybercrime and identity theft.



Tyelisa Shields
**Internet Technology/
Forensics**

I developed a "virtual nurse" for hospital patients.



Laura Pfeifer
Medicine

I work with artists and musicians to create software for music video games.



Maitland Lederer
Music/Gaming

I helped develop a microfinance site that combats poverty.



Janelle Tiulentino
**Poverty & Social
Justice**

I research how people in low-income communities use technology to address violence.



Sheena Lewis
**Public Safety/
Poverty**

I develop digital body sensors that can save the lives of firefighters.



Yolián Amaro-Rivera
**Public Safety/
Medicine**

I create musical robots that can play duets.



Angelica Lim
Robotics/Music

I develop features for a mobile app that helps people meet up with friends.

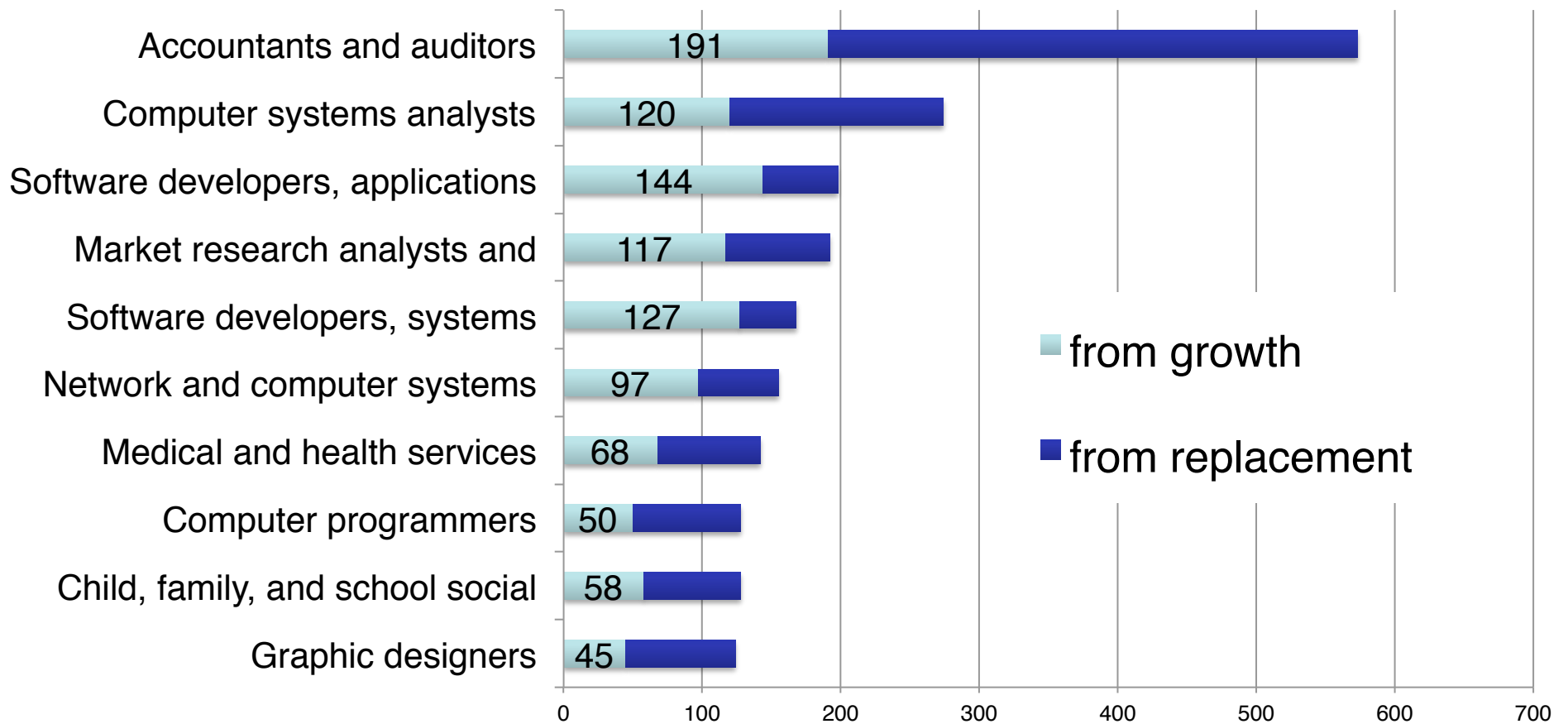


Siobhan Quinn
Social Networking



Excellent Job Opportunity Expected

Occupations with the Most Predicted Job Openings (in thousands) typically requiring a Bachelors Degree, but no experience or on-the-job training, 2010-2020

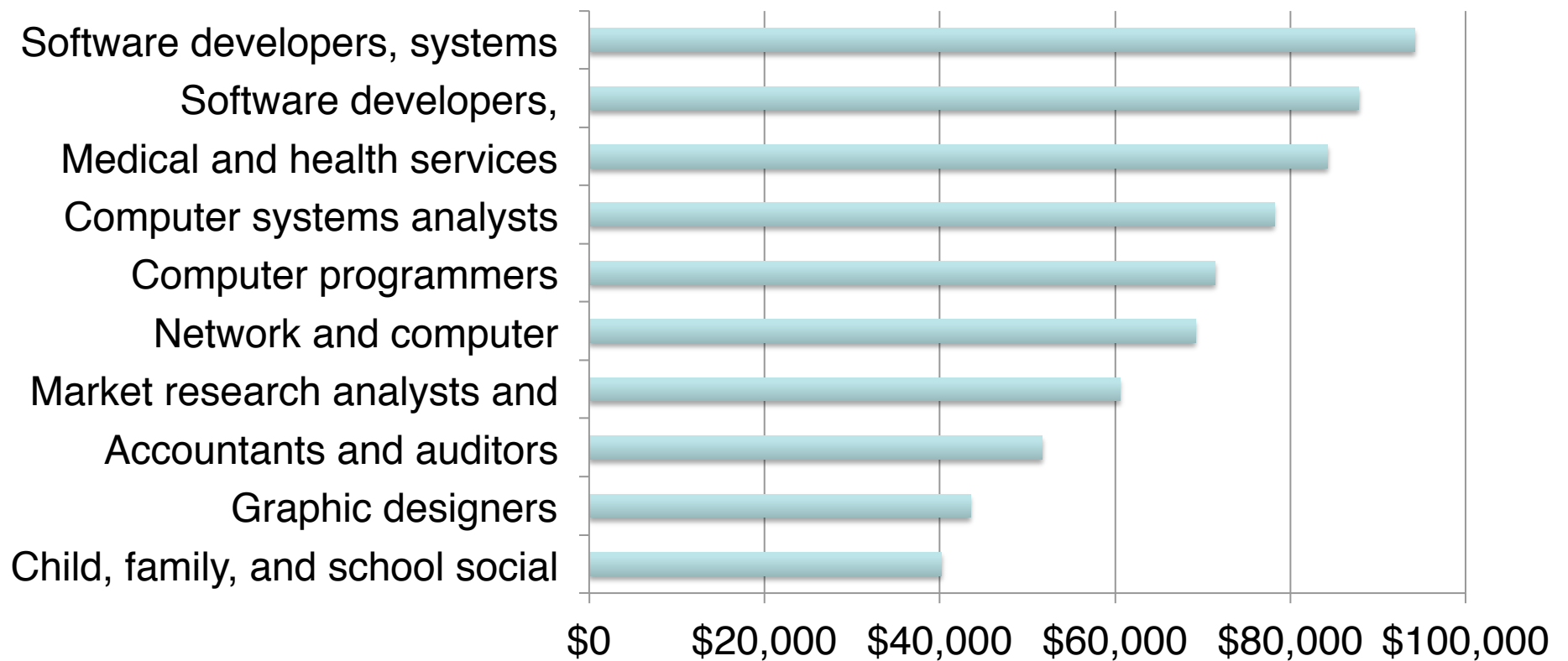


Source: BLS Occupational Employment Projections to 2020



Computing occupations are well paid

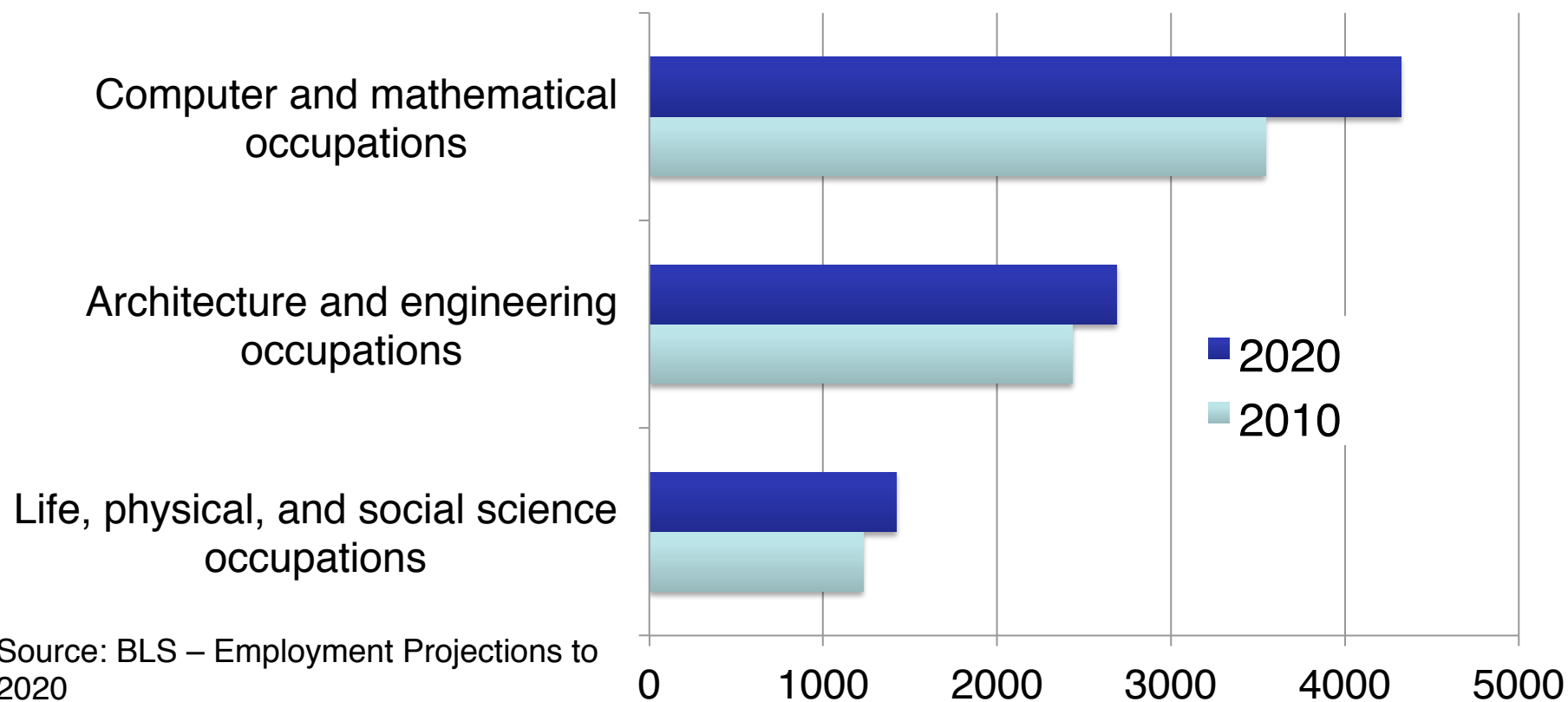
Median Annual Wages, 2010



Source: Bureau of Labor Statistics (BLS)

Computing Offers More Jobs than other Science & Engineering Fields

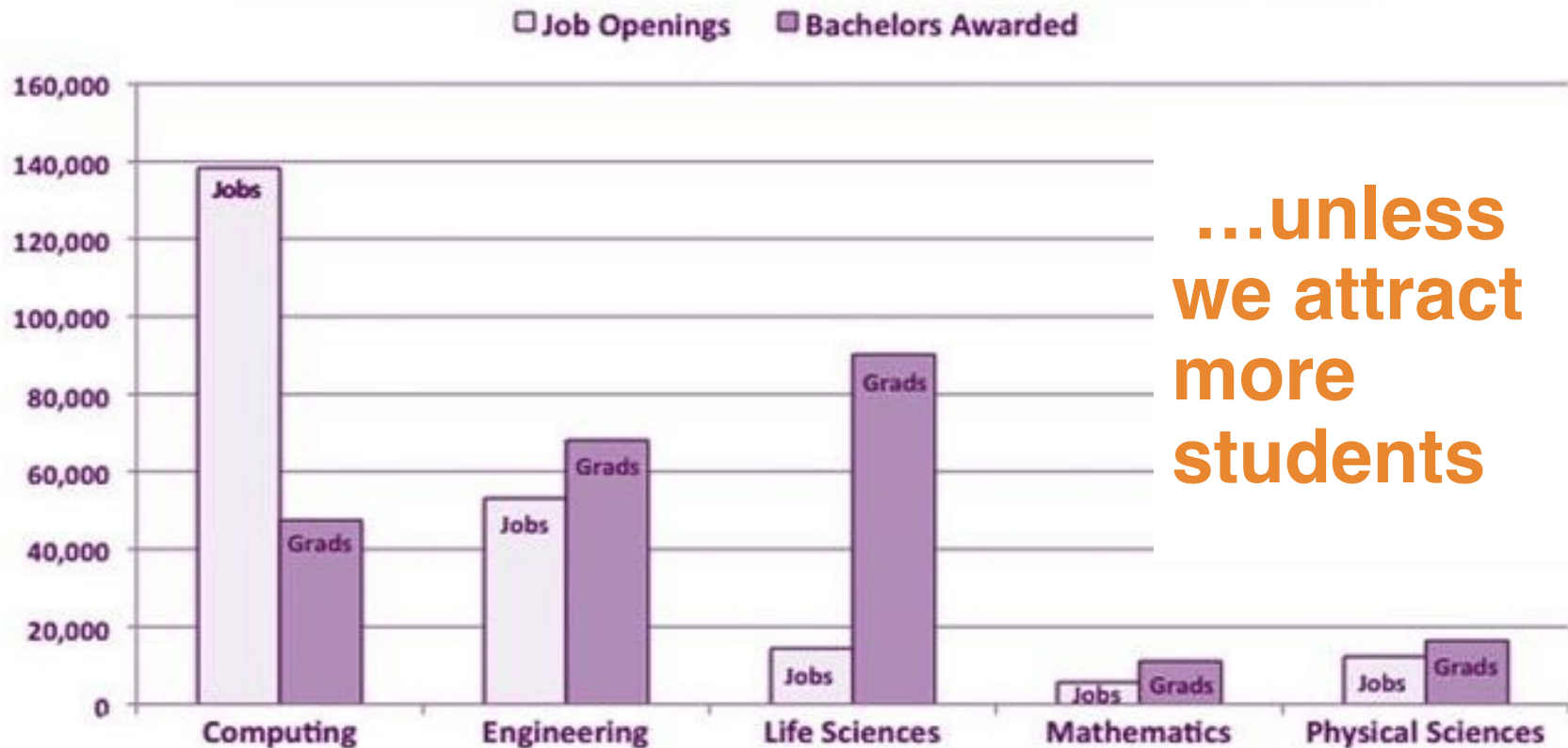
Employment in Major Occupational Groups Projected for 2020, in thousands



Source: BLS – Employment Projections to 2020

Workforce needs could go unmet

Annual STEM Job Openings vs College Graduates Through 2018

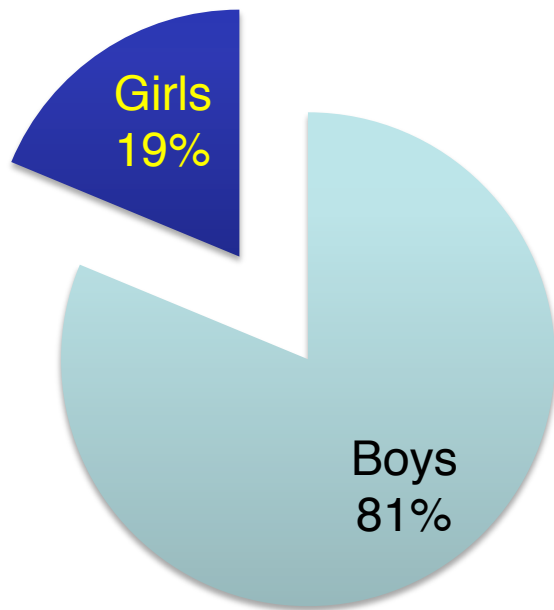


...unless
we attract
more
students

Data Sources: US-BLS Employment Projections, 2008-2018 (http://www.bls.gov/emp/ep_table_102.pdf), National Science Foundation Division of Science Resource Statistics (<http://www.nsf.gov/statistics/nsf08321/tables/tab5.xls>), and National Center for Education Statistics (http://nces.ed.gov/programs/digest/d08/tables/dt08_286.asp).

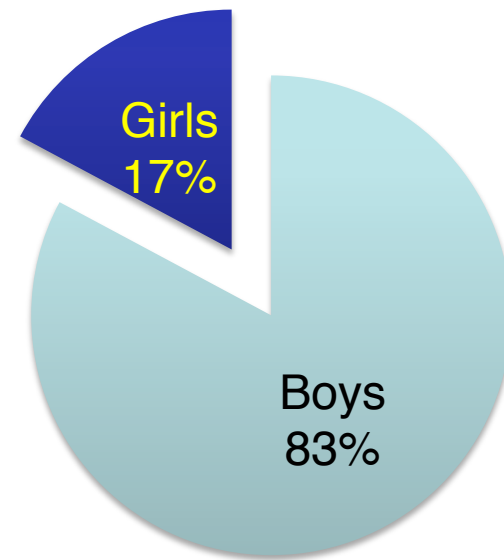
Too few HS students study CS

AP CS 2011



22,176

AP CS 2008



20,532

**Fewer than
took AP
micro
economics
or Physics
C-Mech**

Get state and local CS education and workforce data

U.S. Congressional District Computing Data

Virginia State-Level Data

These are the best available computing education and workforce indicators to date; however, they do have limitations. They should only serve as a starting point for advocating for CS education and NOT as a way to rank or evaluate specific states and districts. Please see [Sources/FAQ](#) for more information.

Education Indicators

Number of AP Computer Science Test-Takers, 2009: 1289
 Number of Associate's Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 1967
 Number of Bachelor's Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 965
 Number of Master's Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 546
 Number of Doctoral Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 15

Workforce Indicators* Projection Period 2006-2016

Projected Average Annual Number of Computing Job Openings: 10888
 Projected 10-year Percent Change in Computing Jobs: 38.1%
 Projected 10-year Change in Number of Computing Jobs: 69875

Projected Average Annual Number of Computing Job Openings

vs.

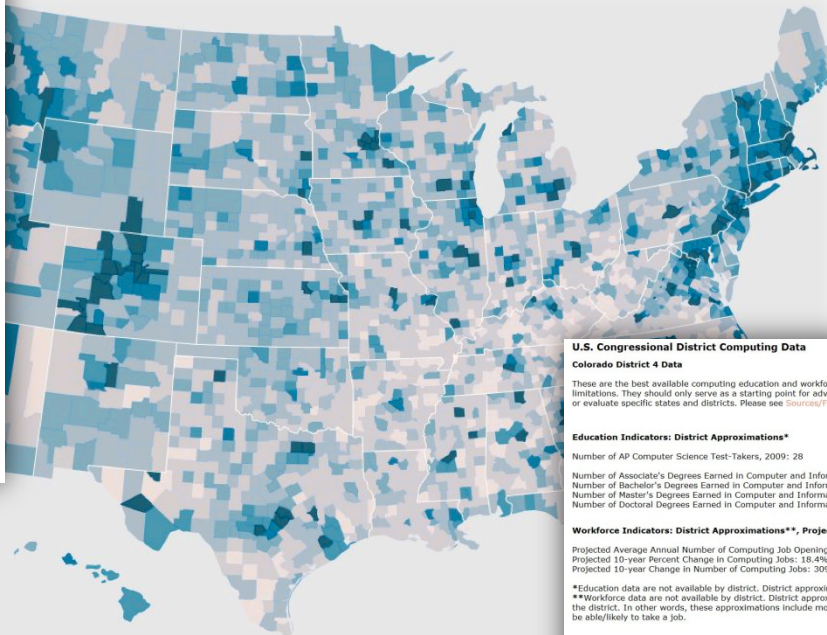


Sources:

Workforce Indicators, Computer and Mathematical Occupations, Data come from each State Department of Labor, Long-term Occupational Projections, Completed Degree Data, Computer and Information Sciences, 2007-08, National Center for Education Statistics. See [Sources/FAQ](#) for more information.

View District Data: 1 2 3 4 5 6 7 8 9 10 11

- » download combined spreadsheet
- » choose another state
- » back to caucus admin home



Click a county to zoom in

Percentage of adults with bachelor's degree
 Compare counties with U.S. average



U.S. Congressional District Computing Data

Colorado District 4 Data

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Education Indicators: District Approximations*

Number of AP Computer Science Test-Takers, 2009: 28
 Number of Associate's Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 24
 Number of Bachelor's Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 53
 Number of Master's Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 32
 Number of Doctoral Degrees Earned in Computer and Information Sciences, 2007-08 Academic Year: 3

Workforce Indicators: District Approximations**, Projection Period 2009-2023

Projected Average Annual Number of Computing Job Openings: 662
 Projected 10-year Percent Change in Computing Jobs: 18.4%
 Projected 10-year Change in Number of Computing Jobs: 3096

*Education data are not available by district. District approximations are based on zip code-based data.
 **Workforce data are not available by district. District approximations are based on regional data in and near the district. In other words, these approximations include most areas where people living in this district would be able/likely to take a job.

Projected Average Annual Number of Computing Job Openings

vs.



Sources:

Workforce Indicators, Computer and Mathematical Occupations, Data come from each State Department of Labor, Long-term Occupational Projections, Completed Degree Data, Computer and Information Sciences, 2007-08, National Center for Education Statistics. See [Sources/FAQ](#) for more information.

View District Data: 1 2 3 4 5 6 7 or go back to State-level Data



Online soon at www.ncwit.org/work.campaigns.cse.html



**HELP MEET THE NEED BY
OFFERING CS IN HIGH SCHOOL**

Colleges often expect familiarity

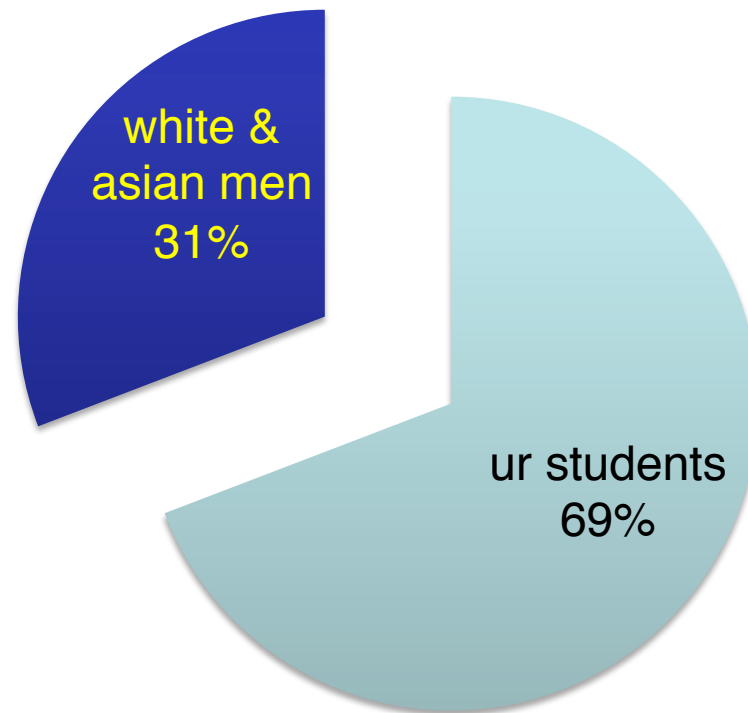
Students are more likely to succeed in computing if they have positive early experiences



Attract more diverse students

Draw from the underutilized majority

college student demographics, 2009









SOURCES FOR MORE INFORMATION

NCWIT has free resources for more information

Talking Points Cards Programs in a Box Practice Sheets Facts & Figures

National Center for Women & Information Technology
PROMISING PRACTICES CATALOG

K-12 Education	Undergraduate
	
Graduate	Career
	

NCWIT offers practices for increasing and benefiting from gender diversity in IT at the K-12, undergraduate, graduate, and career levels.

Women & Information Technology By the Numbers

Revolutionizing the Face of Technology

Percentage of U.S. women in various IT fields:

- 65% of U.S. computer and software engineers are women
- 57% of 2016 and graduate degree recipients who were female
- 18% of 2016 computer and software engineers were under-25s
- 12% of 2016 computer and software engineers were under-30s
- 37% of 2016 computer and software engineers were under-40s
- 9% of 2016 computer and software engineers were under-50s
- 1% of 2016 computer and software engineers were under-60s

Percentage of AP Computer Science Exams taken by women:

- 17% of AP Computer Science Exams taken by women in 2016
- 35% of AP Computer Science Exams taken by women in 2015
- 27% of AP Computer Science Exams taken by women in 2014
- 33% of AP Computer Science Exams taken by women in 2013
- 33% of AP Computer Science Exams taken by women in 2012
- 1% of AP Computer Science Exams taken by women in 2011

Computer Science Gives Students Vital 21st Century Skills

Computer science strengthens local community, national innovation, and opportunities for youth. Computer science — not computer literacy — underlies most innovation today, from biotechnology to cybersecurity to national security. Yet the majority of U.S. schools require only that students use computers. Instead, schools prepare students to innovate and create the new technologies that drive local and national economies. This ability to innovate with technology is also important for students' future success and ability to make a difference in a global society.

Computer Science Means Rewarding Careers

Jobs are plentiful, interesting, and flexible. The U.S. Department of Labor predicts that computer science-related jobs will be among the fastest growing and highest paying over the next decade. Job prospects have remained strong despite economically challenging times. Computer scientists also enjoy a wide range of career options since all industry sectors today involve computing (e.g., the arts, film, finance, health care, journalism, manufacturing, music, security).

Computer Science: More than Just Using Technology

Computer science teaches students design, logical reasoning, and problem solving — all valuable well beyond the computer science classroom. The ability to create and adopt new technologies distinguishes computer science from computer literacy, which focuses more on using existing technologies (e.g., word processing, spreadsheets).

Computer Literacy Teach Computer Science

What can your school do to successfully incorporate computer science education?

- Implement computer science classes. Provide rigorous and engaging computer science courses. Excellent curricula are available, as are additional units for integrating computing concepts into other content areas.
- Align computer science to course-based graduation. Student schedules are overcrowded, making effective difficult. Allow students to count computer science courses as math or science graduation credit.
- Make courses accessible for all. Ensure students who are underrepresented in computer science and use inclusive pedagogies in these courses.
- Improve teacher preparation and professional development. Expand teacher certification requirements to include computer science. Provide professional development for teachers who teach, or would like to teach, computer science.

Find out more: www.ncwit.org, csta.net, or www.csis.org

What more Talking Points!

100+ free, printable talking points and practice sheets.

HOW AVAILABLE IS SHARED?

Why would you give someone a career in computer science? This card gives school talking points on additional resources that a computer science major can use. The main message is that IT offers meaningful work, security, and high salaries with a student's degree, and flexibility for travel.

Visit www.ncwit.org for more information.



CSTA has free resources for more information

Additional Resources for Talking with Curriculum Decision Makers

Association for Computing Machinery (ACM)

ACM provides a variety of materials for working with educators and policymakers: www.csedweek.org.

Computer Science Teachers Association (CSTA)

The CSTA Leadership Cohort consists of trained teacher leaders from each state who advocate for K-12 computer science education. More information on the Leadership Cohort, including contacts in each state, can be found at: http://csta.acm.org/Advocacy_Outreach/sub/LeadershipCohort.html.

Make your case with local education and workforce data

While national data can be quite useful, it often is even more persuasive to have local data to back up your arguments. [Download a PDF copy of data NCWIT uses in Colorado.](#)

You can create a similar data set with local employment data from your State Department of Labor's website, and there is state-specific education data available at the National Center for Education Statistics website, or email us at datarequest@ncwit.org.

K-12 Curriculum Resources

Computer Science Teachers Association (CSTA)

CSTA provides the ACM Model Curriculum for K-12 Computer Science available at: <http://csta.acm.org/Curriculum/sub/ACMK12CSModel.html>

CSTA provides three levels of Objectives and Outcomes documents (Level 1, Level 2, Level 3) to support computer science learning available at: <http://csta.acm.org/Curriculum/sub/Implementation.html>.

CSTA also endorses the "Exploring Computer Science" Curriculum for implementing a rigorous, college-prep course for juniors and seniors. The curriculum is available at: <http://csta.acm.org/Curriculum/sub/ExploringCS.html>.

NCWIT

- "How Do You Introduce Computing in an Engaging Way?" series and its six accompanying case studies, www.ncwit.org/practices.
- NCWIT's Computer Science-in-a-Box: Unplug Your Curriculum offers a selection of activities designed for use with students ages 9 to 14, www.ncwit.org/unplugged. Additional activities and resources are also available at www.csunplugged.org.

Software Programs

- Scratch lets kids create 2D animations and games using drag-and-drop programming, www.scratch.mit.edu.
- Alice lets students create 3D movies and games, www.alice.org. Storytelling Alice is a programming environment with storytelling features designed for middle school students (particularly girls), www.alice.org/kelleher/storytelling/
- Python is open source software that works well as a first language, www.python.org.
- AgentSheets lets you develop agent-based [games and situations](#); a free trial download is available, www.agentsheets.com. AgentSheets offers educators resources for incorporating AgentSheets in the classroom, www.agentsheets.com/education.

Questions





**Revolutionizing the Face
of Technology**

