K-12 COMPUTER SCIENCE EDUCATION: Unlocking the Future of Students

August 2012
OVERVIEW
U.S. Workforce through 2020

All Occupations 164 million

All STEM Jobs 9.2 million

Computing Jobs 4.6 million


August 2012
Quick Facts about Computing Jobs Though 2020

Computing and mathematics is one of the TOP 10 fastest growing major occupational groups 2010-2020.

150,000+ job openings in computing annually.

1 in every 2 STEM jobs will be in computing in 2020.

THE BRIGHT FUTURE FOR COMPUTING JOBS
U.S. Employment through 2020
How Computing Stacks Up To Healthcare

**22%** job growth rate in computing jobs, as **comparable to healthcare** job growth rates 2010-2020.

**51,000** projected shortfall in qualified **health IT workers** 2011-2015.

**90%** of physicians to use **electronic health records** by 2019 as a result of the federal HITECH Act of 2009.

<table>
<thead>
<tr>
<th>Growth Rates</th>
<th>Database Administrators</th>
<th>31%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optometrists</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Dentists</td>
<td>31%</td>
<td></td>
</tr>
<tr>
<td>Registered Nurses</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Pharmacists</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Informatics Research &amp; Development</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Data &amp; Info Security</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Software Developers</td>
<td>30%</td>
<td></td>
</tr>
</tbody>
</table>

**ALL HEALTHCARE PRACTITIONERS**

26%

**ALL COMPUTING OCCUPATIONS**

22%

* Healthcare practitioners and technicians

## Total Employment in STEM in 2020

**Science, Technology, Engineering, and Mathematics**

<table>
<thead>
<tr>
<th>Category</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STEM</strong></td>
<td>9.2 million</td>
</tr>
<tr>
<td>Architecture/Engineering</td>
<td>2.8 million</td>
</tr>
<tr>
<td>Computing</td>
<td>4.6 million</td>
</tr>
<tr>
<td>Mathematics</td>
<td>0.1 million</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>0.6 million</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>0.4 million</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>0.6 million</td>
</tr>
</tbody>
</table>

*Subtotals do not equal 9.2 million due to rounding.*

Source: Jobs data are calculated from the Bureau of Labor Statistics (BLS), Employment Projections 2010-2020, available at [http://www.bls.gov/emp/]. STEM is defined here to include non-medical occupations.
Where the STEM Jobs Will Be
Projected Annual Growth of Total STEM Job Openings 2010-2020

- Computing 51%
- Engineering 27%
- Mathematics 1%
- Life Sciences* 7%
- Physical Sciences 5%
- Social Sciences 9%

* STEM is defined here to include non-medical occupations.

Where the STEM Jobs Will Be
Projected Annual Growth of NEWLY CREATED STEM Job Openings 2010-2020

<table>
<thead>
<tr>
<th>Field</th>
<th>Annual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computing</td>
<td>62%</td>
</tr>
<tr>
<td>Engineering</td>
<td>20%</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>6%</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>3%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>8%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>1%</td>
</tr>
</tbody>
</table>

* STEM is defined here to include non-medical occupations.

Where the STEM Jobs Will Be
Degrees vs. Jobs Annually

Where the STEM Jobs Will Be
Top 10 STEM Occupations by Total Employment in 2020

Source: Jobs data are calculated from the Bureau of Labor Statistics (BLS), Employment Projections 2010-2020, available at http://www.bls.gov/emp/. STEM is defined here to include non-medical occupations.
EARNINGS POTENTIAL IN COMPUTING
# Where the U.S. Jobs Will Be

**Top 10 Major Occupational Groups 2010-2020 and Average Salaries in May 2011**

<table>
<thead>
<tr>
<th>Major Occupational Group</th>
<th>% Growth 2010-2020</th>
<th>2011 Average Annual Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Healthcare Support Occupations</td>
<td>35%</td>
<td>$27,370</td>
</tr>
<tr>
<td>2 Personal Care and Service Occupations</td>
<td>27%</td>
<td>$24,620</td>
</tr>
<tr>
<td>3 Healthcare Practitioners and Technical Occupations</td>
<td>26%</td>
<td>$72,730</td>
</tr>
<tr>
<td>4 Community and Social Service Occupations</td>
<td>24%</td>
<td>$43,830</td>
</tr>
<tr>
<td>5 Construction and Extraction Occupations</td>
<td>22%</td>
<td>$44,630</td>
</tr>
<tr>
<td><strong>6 Computing and Mathematical Occupations</strong></td>
<td><strong>22%</strong></td>
<td><strong>$78,730</strong></td>
</tr>
<tr>
<td>7 Business and Financial Operations Occupations</td>
<td>17%</td>
<td>$68,740</td>
</tr>
<tr>
<td><strong>8 Life, Physical, and Social Science Occupations</strong></td>
<td><strong>16%</strong></td>
<td><strong>$67,470</strong></td>
</tr>
<tr>
<td>9 Education, Training, and Library Occupations</td>
<td>15%</td>
<td>$50,870</td>
</tr>
<tr>
<td>10 Transportation and Material Moving Occupations</td>
<td>15%</td>
<td>$33,200</td>
</tr>
</tbody>
</table>

# Where the STEM Jobs Will Be
Projected Growth of Selected STEM Jobs 2010-2020

<table>
<thead>
<tr>
<th>STEM Job</th>
<th>2010 Total Employment</th>
<th>% Growth 2010-2020</th>
<th>2011 Average Annual Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering and Architectural Managers</td>
<td>176,800</td>
<td>9%</td>
<td>$129,350</td>
</tr>
<tr>
<td>Computer and Information Systems Managers</td>
<td>307,900</td>
<td>18%</td>
<td>$125,660</td>
</tr>
<tr>
<td>Aerospace Engineers</td>
<td>81,000</td>
<td>5%</td>
<td>$103,870</td>
</tr>
<tr>
<td>Software Developers, Systems and Applications</td>
<td>913,100</td>
<td>30%</td>
<td>$96,250</td>
</tr>
<tr>
<td>Biochemists and Biophysicists</td>
<td>25,100</td>
<td>31%</td>
<td>$87,640</td>
</tr>
<tr>
<td>Civil Engineers</td>
<td>262,800</td>
<td>19%</td>
<td>$82,710</td>
</tr>
<tr>
<td>Database Administrators</td>
<td>110,800</td>
<td>31%</td>
<td>$77,350</td>
</tr>
<tr>
<td>Environmental Scientists</td>
<td>89,400</td>
<td>19%</td>
<td>$68,810</td>
</tr>
<tr>
<td>Chemists</td>
<td>82,200</td>
<td>4%</td>
<td>$74,780</td>
</tr>
<tr>
<td>Anthropologists and Archeologists</td>
<td>6,100</td>
<td>21%</td>
<td>$59,040</td>
</tr>
</tbody>
</table>

Higher Education Pipeline in Computing

Higher Education Pipeline in Computing
CRA Taulbee Survey Results

High School Advanced Placement
Exams 2011

Calculus: 330,000
Biology: 175,000
Statistics: 140,000
Physics: 110,000
Chemistry: 100,000
Environmental Science: 80,000
Computer Science: 20,000

High School Advanced Placement
Exams 1997-2011

High School Advanced Placement

Exams 2011

Male

Total AP Tests
45% Male, 55% Female

Biology
42% Male, 58% Female

Environmental Science
45% Male, 55% Female

Statistics
49% Male, 51% Female

Calculus
53% Male, 47% Female

Chemistry
53% Male, 47% Female

Physics
69% Male, 31% Female

Computer Science
81% Male, 19% Female

How Computer Science “Counts” In K-12

**FIGURE 12** How Computer Science Courses Count Toward Graduation Requirements

- Elective: 35
- Mathematics: 8
- Science: 6
- District Determined: 1

Findings: Standards
Percentage of Secondary School Computer Science Standards
Level II and Level III Adopted by State

Findings: Standards

National Snapshot: Adoption of Computer Science Standards*

*categories of computer science education standards

# Diminishing Access to Computer Science Courses

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>PERCENTAGE OF HIGH SCHOOL STUDENTS EARNING CREDITS IN COMPUTER SCIENCE COURSES</td>
<td>25%</td>
<td>19%</td>
</tr>
</tbody>
</table>

Exposure to Computer Science Matters

- Students that take AP CS are 8 times more likely to major in CS.

- In the summer of 2010, Google surveyed a sample of its US employees about exposure to CS prior to college.
  
  - Nearly all CS majors (98%) reported being exposed to CS prior to college, compared to less than half of non-CS majors (45%). The nature of the exposure varied from reading about CS, after-school programs or camps, to middle or high school CS classes.
  
  - Those who went on to major in CS were more likely than non-majors to have had a CS class offered in their high school.
  
  - CS majors were more likely to have known that CS was a possible career path when they were in high school.

Conclusion

K-12 computer science education will open more economic opportunities than any other subject for the 21st Century.

The future is bright for students entering in this field or gaining this critical knowledge to apply to almost any field of employment.

Jobs in computing are among the fastest growing of any profession and pay higher wages.

Despite these opportunities, significant barriers exist to exposing students to computer science in K-12 and keeping them in the computing education pipeline.

We need to put computer science within the core of a student’s education.