Gender & Computing: Why It Matters
Why Teachers Matter

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Computing is about creation and problem solving

CS studies computers and problem-solving processes, including their principles:

- Designs
- Applications
- Impact

CS is an intellectual activity that asks questions like...

- Which information is relevant to solving a problem?
- How do data become knowledge?
- What method will solve this type of problem?
Computing occupations pay well

Median Annual Wage for Major Occupational Groups

- Management
- Computer and Mathematical
- Legal
- Architecture and Engineering
- Business and Financial Operations
- Healthcare Practitioners and Technical
- Life, Physical, and Social Science
- Education, Training, and Library
- Arts, Design, Entertainment, Sports, and Media
- Installation, Maintenance, and Repair
- Community and Social Service
- Construction and Extraction
- Protective Services
- Office and Administrative Support
- Production
- Transportation and Material Moving
- Healthcare Support
- Sales and Related
- Building and Grounds Cleaning and Maintenance
- Personal Care and Service
- Food Preparation and Serving
- Farm, Fishing, and Forestry

$0 $10 $20 $30 $40 $50 $60 $70 $80 $90 $100
(Thousands of Dollars)

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Computing occupations let you have a life

Average Hours Per Week for Major Occupational Groups

- Building and Grounds Cleaning and Maintenance
- Healthcare Support
- Food Preparation and Serving
- Office and Administrative Support
- Education, Training, and Library
- Personal Care and Service
- Construction and Extraction
- Life, Physical, and Social Science
- Community and Social Service
- Computer and Mathematical
- Healthcare Practitioners and Technical
- Production
- Business and Financial Operations
- Arts, Design, Entertainment, Sports, and Media
- Installation, Maintenance, and Repair
- Sales and Related
- Architecture and Engineering
- Transportation and Material Moving
- Legal
- Farm, Fishing, and Forestry
- Protective Services
- Management

Average Hours Per Week: 37 to 45
BUT COMPUTING HAS A PROBLEM.
IT ATTRACTS TOO FEW PEOPLE.
BLS Projected 2022 employment: Jobs requiring degree

- Accountants and auditors
- Aerospace engineers
- Biological technicians
- Chemists
- Child, family, & school social workers
- Civil engineers
- Computer hardware engineers
- Cost estimators
- Medical & health services managers
- Medical & clinical laboratory technologists
- Mechanical engineers
- Market research analysts & marketing specialists
- Logisticians
- Industrial engineers
- Human resources specialists
- Healthcare practitioners & technical workers, all other
- Graphic designers
- Graduate teaching assistants
- Financial analysts & specialists, including health
- Engineers, all other
- Electronics engineers, except computer
- Electrical engineers
- Cost estimators
- Medical & health services managers
- Personal financial advisors
- Mental health & substance abuse social workers
- Public relations specialists
- Meeting, convention, & event planners
- BLS Projected 2022 employment: Jobs requiring degree

Computing Occupations 27%
2015 Intended Major (national sample)

- Biological and Life Sciences, 14.9%
- Business, 13.2%
- Engineering, 13.1%
- Health Professions, 11.3%
- Arts and Humanities, 10.1%
- Social Sciences, 10.8%
- Undecided, 8.9%
- Other Majors, 4.9%
- Computer Science, 3.8%
- Math and Other CS, 1.6%
- Physical Science, 2.6%
- Education, 4.2%
- Other Majors, 4.9%

Let’s compare...
Demand and low production explains the CS initiatives

- January 30, 2016: President Obama introduced the “Computer Science for All” initiative
- CS curricula will become compulsory in:
  - primary and middle schools in San Francisco
  - primary schools in New York City
  - and for high school graduation in Chicago
- High schools in Arkansas, Texas, and New York City now must offer a CS course
BUT COMPUTING HAS A PROBLEM. IT ATTRACTS A NARROW RANGE OF PEOPLE.
Women’s Presence in STEM Disciplines Varies

Percent of Degrees Awarded 2013, Major Occupations: Women and Underrepresented Minority Men

Source for Employment Data: NSF, Women, Minorities, and Persons With Disabilities: 2015, Table 9-7
Source for Degree Data: IPEDS via WebCASPAR, omit for-profits
SO, WHY SHOULD THAT MATTER?

WHY DOES IT MATTER TO YOU?
The Value of Diversity to Computer Science

Enhances innovation
Expands the qualified employee pool
Improves the bottom line

Promotes equality
Reflects user/consumer base

ncwit.org/businesscase
WHY DOES HIGH SCHOOL MATTER SO MUCH?
High school is an important time for developing education & career goals.

Most college students majoring in STEM make that choice during high school.

Source: Unpublished data from Ward & Sonnert


Similarities and differences among high school girls and boys

**Similar Math**
- Grades
- Test Scores
- Attitudes
- Course Taking

**Different Influence**
- Math courses more strongly predicted girls’ likelihood of majoring in STEM

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Experience increases success

Experienced students get better grades in Intro CS. Experience typically assumed.
AP-takers are more likely to major in computing. The graph shows the percentage of students majoring in computing who have taken AP courses in computer science.

- CS AB: 32%
- CS A: 19%
- No CS AP: 3%
Girls are well qualified.

Girls take many engineering/CS pathway AP tests:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP Biology</td>
<td>60%</td>
</tr>
<tr>
<td>AP Calculus AB</td>
<td>49%</td>
</tr>
<tr>
<td>AP Calculus BC</td>
<td>42%</td>
</tr>
<tr>
<td>AP Chemistry</td>
<td>48%</td>
</tr>
<tr>
<td>AP Environmental Science</td>
<td>55%</td>
</tr>
<tr>
<td>AP Physics 1</td>
<td>40%</td>
</tr>
<tr>
<td>AP Statistics</td>
<td>52%</td>
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</tbody>
</table>

But fewer specific tests:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP Computer Science A</td>
<td>22%</td>
</tr>
<tr>
<td>AP Physics 2</td>
<td>32%</td>
</tr>
<tr>
<td>AP Physics Electricity/Magnetism</td>
<td>24%</td>
</tr>
<tr>
<td>AP Physics Mechanics</td>
<td>27%</td>
</tr>
</tbody>
</table>

Source: AP Program Participation and Performance Data 2015 (collegeboard.org)
Why do teachers matter?

Offering, but not requiring, CS courses is unlikely to overcome the biased belief systems that keep students from taking them in high school. Taking CS courses that don’t create sense of belonging is likely to cement negative attitudes.

Teachers can create an environment that fosters interest, ability, learning, sense of belonging, and occupational identity.